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ECONOMIC AND SOCIAL CHANGES: FACTS, TRENDS, FORECAST

A peer-reviewed scientific journal that covers issues of analysis and forecast of changes in the economy and social spheres in various countries, regions, and local territories.

The main purpose of the journal is to provide the scientific community and practitioners with an opportunity to publish socio-economic research findings, review different viewpoints on the topical issues of economic and social development, and participate in the discussion of these issues. The remit of the journal comprises development strategies of the territories, regional and sectoral economy, social development, budget revenues, streamlining expenditures, innovative economy, and economic theory.

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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.

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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).

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Nationwide Poverty – "a Threat to Steady Development and Our Demographic Future"[1]

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Abstract. In our paper "Trends in Public Opinion Regarding the Effectiveness of Public Administration. Presidential Cycles 2000–2021" published in the previous issue of the journal (December 2021), we identified several critical internal and external challenges that accompany the process of establishing a new Russian statehood and strengthening Russia's geopolitical role in the context of the global historical process – the transition from a unipolar to a multipolar world order. We identified the problem of poverty as one of the main "sore spots", citing expert opinions and official statistical data revealing its scale and the complex nature of its implications. In the present article, we continue this topic and analyze in detail the problem of poverty – its geopolitical significance, objective and subjective components, how the

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

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dynamics of the standard of living and quality of life are perceived in various socio-demographic groups, as well as the key reasons that, in our opinion, explain why poverty has been an acute problem for Russia for more than a decade.

Key words: poverty, standard of living, subjective perception, "sixth column", internal and external challenges.

Throughout the entire period of Vladimir Putin's presidential terms, the process of formation of a new post-Soviet Russian statehood has been accompanied by a number of internal and external challenges that restrain the development of Russia's geopolitical role in the context of the formation of a multipolar world and pose risks of internal political crises caused by the ineffectiveness of public administration in a number of areas critical to the country and society.

Some of these challenges (such as poverty, inequality, transformation of the education system into a service sector, modernization of the health system, "stalling" national projects[2]) are connected, first of all, with the quality of the ruling elites that evolved in the post-Soviet period, or rather, with the motives that they are guided by when making certain managerial decisions.

It is worth noting that when we talk about the "quality" of the post-Soviet ruling elites, we mean, first of all, **the bourgeois-liberal ideology** that has developed in this environment, which determines the goals and interests that they are guided by when making managerial decisions. It is the ideology, and not just a set of unrelated and chaotic motives.

Under the Constitution of the Russian Federation (including its new version, effective as of 2021) "no ideology may be established as the state or obligatory ideology" (Article 13). However, as some experts note, "ideology has existed in society throughout the history of mankind... society cannot live without ideology", which means that Russia has an ideology as well. It can be called a bourgeois and liberal ideology, since it puts personal interests "at the forefront".

> "In the early 1990s, our country officially declared, through the Constitution, that it was a state without an official ideology. But as already mentioned, the point is that society cannot live without ideology, because ideology is not just an invention of communists. And this means that Russia also has its own defining ideology. And it is a bourgeois ideology, a liberal ideology in other words. It determines everything in our life, from education to culture.... And it is plain and simple: in a competitive struggle (the vastness of this concept in our life is evidenced even by the fact that it has thoroughly entered even into education!) in the market, you have to get as much money, i.e. benefits, as possible"[3].

[2] Ilyin V.A., Morev M.V. (2021). Trends in public opinion regarding the effectiveness of public administration. Presidential cycles 2000–2021. *Economic and Social Changes: Facts, Trends, Forecast*, 14(6), 9–32.

[3] Menshikov V.M. (Doctor of Sciences (Pedagogy), Professor, Head of the Department of Theology and Religious Studies at Kursk State University; expert of the Kursk branch of the Izborsk Club). Is it possible to create a modern national ideology for Russia and how to do it? *Zavtra*. February 5, 2022. Available at: https://zavtra.ru/blogs/mozhno_li_i_kak_sozdat_sovremennuyu_obshenarodnuyu_ideologiyu_rossii

The liberal bourgeois ideology of the ruling elites is becoming the main factor in the ineffectiveness of public administration, manifested in the stalling of the implementation of publicly declared national development goals (national projects), and in high and stable levels of poverty and inequality; all this creates risks to the legitimacy of the current government at all levels (including the RF President) in the assessments of public opinion.

Another group of problems that our country is facing is of an external nature, connected with the global, centuries-old historical confrontation between the Anglo-Saxon and Eurasian civilizations. Its aggravation accompanies the process of transition from a unipolar to a multipolar world.

> "The Big War unfolding before our eyes is not just about a geopolitical confrontation, redistribution of the spheres of influence or ensuring national interests, but about something much deeper and more important... this is a confrontation between two civilizations... A confrontation between the poles of reality – between good and evil... **Since the main players – the United States and Russia – are powers with strong weapons, this war concerns all the peoples of the Earth"**[4].

Despite the fact that Russia has repeatedly proven its leadership to the whole world in terms of development of its military-industrial complex and defense capability, the negative influence of external factors is being spread, first of all, along a different, "hybrid" line. It is expressed in the systemic and complex attempts of the collective West to restrain Russia's development through economic sanctions, whipping up anti-Russian sentiments in European countries, harsh (sometimes exceeding the bounds of decency) public rhetoric against Russia and Vladimir Putin personally, the financing of certain organizations and individuals representing the so-called "fifth column", etc.

> "It is probably difficult to give a scientific definition of where the opposition ends and the "fifth column" begins... But still, the line between the oppositionists and the "fifth column" is internal; it is difficult to see it externally. What is this line? **An oppositionist, even a very tough one, eventually fights to the end for the interests of their homeland. And the "fifth column" consists of those people who fulfill what is dictated by the interests of another state, they are used as a tool to achieve political goals that are alien to us"**[5].

Perhaps the most painful and tragic "method" by which the West is trying to prevent its main competitor (at least ideologically) from strengthening its geopolitical status includes attempts to pit historically fraternal peoples against each other. Sometimes these attempts are relatively successful (as, for example, in the case of Georgia or Ukraine), sometimes they are still unsuccessful (as in the case of Belarus or Kazakhstan).

The tragedy of this method of conducting a hybrid war on the part of the West lies not only in the casualties, but also in the fact that once fraternal peoples, united by a common culture, history, kinship ties of their citizens, are actually become

[4] Dugin A. About the fronts of the ongoing global war. September 26, 2017. Available at: http://ruspravda.info/Dugin-o-frontah-idushchey-globalnoy-voyni-28987.html

[5] Vladimir Putin's big press conference, December 18, 2014. *Official website of the RF President*. Available at: http://www.kremlin.ru/events/president/news/47250

enemies; and this information and ideological background is "zombifying" the living generations, is transmitted to the following generations, leading to the threat that historical ties may be lost forever.

> "We understand that the threat to Kazakhstan's statehood that has arisen is not caused by spontaneous protest actions over fuel prices, **but by the fact that destructive internal and external forces have taken advantage of the situation... At the same time, the elements of "Maidan" technologies consisting in power and information support for protests were actively used...**
>
> **The events in Kazakhstan are not the first and certainly not the last attempt of outside interference in the internal affairs of our states...** And the measures taken by the CSTO have clearly shown that we will not allow the situation to be rocked at home and will not allow the scenarios of the so-called color-coded revolutions to be implemented"[6].

By and large, in the historical confrontation between Russia and the West, the latter has only two "channels" of influence left: the "sixth column" and the undermining of statehood in neighboring countries.

> **V. Korovin** (Director of the Center for Geopolitical Expertise): "The sixth column consists of the bearers of liberal pro-Western ideology, who at the same time wear the "friend of Putin" badge and occupy some formal position in the state system"[7].

At the same time, while "maniacally" (just as the "consumer society" ideology "prescribes") pursuing their personal ambitions to preserve the unipolar world, the world of "one sovereign", the key representatives of the Anglo-Saxon countries ignore the security of the whole world.

> "...what is a unipolar world? No matter how this term is prettified, it ultimately means only one thing: **it is one center of power, one center of force, one center of decision-making. This is the world of one master, one sovereign. And this is ultimately disastrous not only for everyone who is within this system, but also for the sovereign itself, because the unipolar world is destroying the sovereign from within...**
>
> For the modern world, the unipolar model is not only unacceptable, but also impossible in general. And not only because with sole leadership in the modern – we emphasize it: in the modern – world, neither military-political nor economic resources will be enough. But what is even more important: **the model itself is not working, since it is not and cannot be based on the moral foundation of modern civilization"**[8].

The gradual, but purposeful and steady escalation of the international political situation against the background of Russia's futile attempts to "make contact" suggests that the West is ready to sacrifice all the foundations of global security achieved by mankind since the Nuremberg trials in order to revive a unipolar world and once again single-handedly rule over what will remain after the Big War that will somehow affect all countries and lead to the formation of new laws of the world order.

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[6] Vladimir Putin's speech at the session of the Collective Security Council of the CSTO, January 10, 2022. *Official website of the RF President*. Available at: http://www.kremlin.ru/events/president/news/67568

[7] Trump's victory: What will happen to the liberal "zoo" in Russia? Experts on what awaits the fifth and sixth columns after Donald Trump's victory. Available at: https://tsargrad.tv/articles/pobeda-trampa-chto-budet-s-liberalnym-zooparkom-v-rossii_34288)

[8] Vladimir Putin's speech at the Munich Security Conference, February 10, 2007. *Official website of the RF President*. Available at: http://www.kremlin.ru/events/president/transcripts/24034

"At the end of 2021 – beginning of 2022, the world information space faced **a media campaign unprecedented in its scale and sophistication, the purpose of which was to convince the world community that the Russian Federation was preparing an invasion of the territory of Ukraine.**

Thus, we can talk **about the collusion of Western governments and the media in order to escalate artificial tension around Ukraine by massive and coordinated stuffing of false information to pursue their own geopolitical interests, in particular, to distract attention from their own aggressive actions"**[9].

Hence the growing tension in the global situation, which has been observed over the past years, and especially in recent months (which may be due to a significant "blow" to the authority of the United States after its "shameful flight"[10] from Afghanistan, called by experts "the biggest failure in the history of NATO"[11]),

The very fact that the RF President had to introduce the term "red lines" into public rhetoric (he did it in his Address to the Federal Assembly of the Russian Federation on April 21, 2021) is most suggestive.

And the way in which the context for the term "red lines" was changing quite clearly reflects the development dynamics of the entire international political situation *(Insert 1)*: first, the President made transparent hints that in each particular case Russia itself would determine where these "red lines" were marked; then he made confident and even irritated statements that with the expansion of NATO to the East, Russia was *"cheated, just brazenly deceived"*, and therefore not Russia, but the West should provide security guarantees, and *"immediately, now"*; and eventually there emerged official draft documents of the Russian Foreign Ministry on ensuring legal security guarantees from the United States and NATO, which the West called no less than "Putin's ultimatum"[13].

"What was Putin's message behind the "red lines"? **Obviously, it is not just a warning** that any attempt to expand NATO's zone of influence to the East, that is, to the post-Soviet or post-Imperial (which is the same thing) territory, will face a military response from Moscow. **We are faced with a refusal to recognize the strategic status quo that has developed since the collapse of the USSR, as well as questioning the legitimacy of the Baltic states' accession to NATO and the entire US policy in the Eastern zone.**

Vladimir Putin makes it clear: when we were weak, you took advantage of our weakness and took away what, according to historical logic, belongs only to us, Russians; now we have come to our senses, overcome liberal insanity and are overcoming the treacherous – Western-inspired – trends of the 1980s and 1990s inside Russia itself; **so we are now ready to conduct a full-fledged dialogue from the position of strength"**[12].

[9] Examples of publications of a large-scale disinformation campaign by Western media promoting the thesis of Russia's allegedly impending invasion of Ukraine. *Official website of the RF Ministry of Foreign Affairs*. February 11, 2022. Available at: https://www.mid.ru/ru/press_service/publikacii-i-oproverzenia/oproverzenia1/nedostovernie-publikacii/1798160/

[10] Kozin V. (Corresponding member of the Academy of Military Science of Russia and Corresponding Member of the Russian Academy of Natural Sciences). The USA and NATO: An escape unworthy of the great powers. Available at: https://zvezdaweekly.ru/news/2021921333-QCBBW.htmll

[11] The biggest failure in the history of NATO: International reaction to the events in Afghanistan. Vesti. August 16, 2021. Available at: https://www.vesti.ru/article/2601284

[12] Dugin A. Putin integrates the post-Soviet space from Ukraine to Kazakhstan with a chord of decisive actions. *Voronezh independent socio-political portal "Chetyre pera"*. Available at: http://4pera.com/news/feysbuchnye_truth/aleksandr_dugin_putin_integriruet_postsovetskoe_prostranstvo_ot_ukrainy_do_kazakhstana_akkordom_resh/

[13] "Putin's ultimatum": What will NATO's reckless scheme in Ukraine turn out for the world? Available at: https://www.ntv.ru/novosti/2648130/

In the context of increasing international political tension, a special role belongs to the internal situation in the countries that are key players in the foreign policy arena. Their economic, technological, moral, etc. situation has an impact not only on their own national security, but also the security of the whole world. As for Russia, its "main enemy" on this "internal front" was quite clearly defined (actually recognized) by Vladimir Putin who said that **"the low average income of our citizens, of millions of people, is our main enemy, a threat to steady development and our demographic future"**[14].

2000: "We must certainly continue our efforts to decrease the number of people with incomes below the subsistence level, eradicate poverty, decreasing its level and the number of low-income people, which is **a threat for the stability and unity of our society as it denigrates people"**[15].

2021: "The fight against poverty is **a clear priority.** We regularly discuss this issue, which is directly connected to our response to the demographic challenge"[16].

However, according to experts, poverty is a relative concept that has both an objective and a subjective side, which makes it difficult to objectively assess not only poverty itself, but also its complex implications. The increase in the standard of living and quality of life causes a corresponding increase in the level of claims and needs, and this introduces a contradiction between objective indicators of poverty and its subjective perception for the general population.

L. Ovcharova (Director of the Institute for Social Policy, HSE University): "Poverty is a relative phenomenon in time and space. There are always several definitions of poverty. In the scientific mainstream of the twenty-first century, it is a combination of several criteria of poverty. It is one thing when there is less money than the subsistence level ... and it is another thing when there are enough resources for survival, but consumption is significantly lower than the prevailing consumption standard in the country"[17].

In the context of our analysis (poverty as a factor contributing to national security in the context of the escalation of the current geopolitical confrontation and the longer historical process of confrontation between Eurasian and Western civilizations), it is the subjective perception of poverty that is of primary importance, since it determines the nature of public sentiment, the internal state of society.

"In the "competition" between subjective and objective assessments of people's well-being, subjective indicators are still of primary significance ... objective indicators are a kind of limiter that does not allow for the development of a situation in which a high level of life satisfaction is combined with low objective indicators of well-being"[18].

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

[15] Vladimir Putin's speech at the plenary session of the 17th Congress of United Russia, December 23, 2017. Official website of the RF President. Available at: http://www.kremlin.ru/events/president/news/56478

[16] RF President's speech at the Meeting of the Council for Strategic Development and National Projects, December 15, 2021. *Official website of the RF President*. Available at: http://www.kremlin.ru/events/president/transcripts/67366

[17] Poverty is a threat to the quality of economic growth (materials of an interview with L. Ovcharova, Director of the Institute for Social Policy, HSE University). *Ekspert*. July 15, 2019. Available at: https://expert.ru/expert/2019/29/bednost---ugroza-kachestvu-ekonomicheskogo-rosta/

[18] Zubets A.N. (Doctor of Sciences (Economics), Director of the Institute of Socio-Economic Research of the Financial University under the Government of the Russian Federation) (2020). *Russian and International Approaches to Measuring the Quality of Life*. Moscow. Pp. 14–15.

Insert 1

Chronology of development of the "red lines" theme in Russia's public rhetoric

Date	Source	Citation
April 21, 2021	Presidential Address to the RF Federal Assembly, April 21, 2021. Official website of the RF President. Available at: http://www.kremlin.ru/events/president/transcripts/messages/65418	"We have enough patience, responsibility, professionalism, self-confidence and certainty in our cause, as well as common sense, when making a decision of any kind. But I hope that no one will think about crossing the "red line" with regard to Russia. We ourselves will determine in each specific case where it will be drawn".
November 30, 2021	Vladimir Putin's speech at the Russia Calling! Investment Forum, November 30, 2021. Official website of the RF President. Available at: http://www.kremlin.ru/events/president/news/67241	"Our relationship was almost idyllic, especially in the mid-1990s, when we nearly became allies. However, despite all our warnings, conversations and requests, the [bloc's] infrastructure ultimately approached our border. The situation went as far as the deployment of BMD systems in Poland and Romania, and the launchers that have been stationed there, the Mk 41, can be used to launch Tomahawk missiles and other strike systems. This is creating a threat to us – this is an obvious fact... You have asked about Ukraine and where the red lines run. They are, above all, the threats to us that can come from that territory'.
December 17, 2021	On Russian draft documents on legal security guarantees from the United States and NATO. Official website of the RF Ministry of Foreign Affairs. Available at: https://www.mid.ru/ru/foreign_policy/news/1790809/); RIA-novosti. Available at: https://ria.ru/20211217/bezopasnost-1764226189.html	• to prevent further eastward expansion of the North Atlantic Treaty Organization and deny accession to the Alliance to Ukraine; • to abandon any military activity of NATO in Ukraine, Eastern Europe, Transcaucasia, Central Asia; • the Parties shall undertake not to deploy ground-launched intermediate-range and shorter-range missiles outside their national territories, as well as in the areas of their national territories, from which such weapons can attack targets in the national territory of the other Party; • the Parties shall not undertake actions nor participate in or support activities that affect the security of the other Party; • the Parties shall refrain from deploying their armed forces and armaments in the areas where such deployment could be perceived by the other Party as a threat to its national security; • the United States of America shall undertake to prevent further eastward expansion of the North Atlantic Treaty Organization and deny accession to the Alliance to the States of the former Union of Soviet Socialist Republics; • the United States of America shall not establish military bases in the territory of the States of the former Union of Soviet Socialist Republics that are not members of the North Atlantic Treaty Organization, use their infrastructure for any military activities or develop bilateral military cooperation with them.

End of Insert 1

Date	Source	Citation
December 21, 2021	Vladimir Putin's speech at the Expanded Meeting of the Defence Ministry Board, December 21, 2021. Official website of the RF President. Available at: http://www.kremlin.ru/events/president/news/67402	"If our Western colleagues continue their obviously aggressive line, we will take appropriate military-technical reciprocal measures and will have a tough response to their unfriendly steps. And, I would like to stress that we are fully entitled to these actions that are designed to ensure Russia's security and independence. As we know well, they are operating thousands of kilometers away from their national territory under different pretexts, including the need to ensure their own security. When international law and the UN Charter get in their way, they declare them obsolete and unnecessary. However, when something meets their interests, they immediately refer to the norms of international law, the UN Charter, international humanitarian law and so on. These manipulations are annoying".
December 23, 2021	Vladimir Putin's annual news conference, December 23, 2021. Official website of the RF President. Available at: http://www.kremlin.ru/events/president/transcripts/press_conferences/67438	"We remember, as I have mentioned many times before and as you know very well, how you promised us in the 1990s that [NATO] would not move an inch to the East. You cheated us shamelessly: there have been five waves of NATO expansion, and now the weapons systems I mentioned have been deployed in Romania and deployment has recently begun in Poland. We are not threatening anyone. Have we approached US borders? Or the borders of Britain or any other country? It is you who have come to our border, and now you say that Ukraine will become a member of NATO as well. Or, even if it does not join NATO, that military bases and strike systems will be placed on its territory under bilateral agreements. This is the point. And you are demanding guarantees from me. It is you who must give us guarantees, and you must do it immediately, right now, instead of talking about it for decades and doing what you want, while talking quietly about the need for security guarantees to everyone".
February 8, 2022	News conference following Russian-French talks. Official website of the RF President. Available at: http://www.kremlin.ru/events/president/news/67735	I want to reiterate, I have said this before, but I would really like you to hear me this time and convey this message to your readers, viewers and internet users. Do you realize that if Ukraine joins NATO and decides to take Crimea back through military means, the European countries will automatically get drawn into a military conflict with Russia? Of course, NATO's united potential and that of Russia are incomparable. We understand that, but we also understand that Russia is one of the world's leading nuclear powers, and is superior to many of those countries in terms of the number of modern nuclear force components. But there will be no winners, and you will find yourself drawn into this conflict against your will. You will be fulfilling Paragraph 5 of the Treaty of Rome in a heartbeat, even before you know it.

Analyzing the position of Russia in the international arena, domestic experts[19] (based on the theoretical approaches of E. Fromm and the research by R. Inglehart) say that our country is:

✓ first, among the relatively poor states (annual incomes are less than 10 thousand US dollars), in contrast to China (10–13 thousand US dollars), the U.S., Germany and the UK (13 thousand US dollars and more);

✓ second, among the states focused on "being" rather than "having", or, in other words, on the "value of self-realization" rather than "accumulation of material wealth"[20].

Thus, among the key countries (such as the USA, China, Germany, the UK) Russia is the only one that does not have a high standard of living and does not put material security above everything else; this is confirmed by the results of sociological studies, which clearly demonstrate how sociocultural, spiritual and moral, ideological, rather than material and consumer, aspects of life are important for Russians. For example, in 2014, when Crimea and Sevastopol became part of the Russian Federation in the context of a political crisis that broke out in Ukraine, the level of approval of the President of the Russian Federation (according to VCIOM) literally soared from 63.1 to 81.4% compared to 2013; although during the same period the share of Russians who considered inflation in the country to be "very high" increased from 57 to 59%[21], and the proportion of those who believe that if they lose their job, it would be difficult or impossible for them to find another one of equal value increased from 45 to 47%[22] *(Tab. 1)*.

According to the data of a regional monitoring conducted by VolRC RAS, the share of positive assessments of the President's work in 2014 compared to 2013 increased from 55.3 to 64.1%, but at the same time the proportion of those who subjectively classify themselves as "poor and extremely poor" increased from 47 to 49%; the share of those who had enough money "for food, at best" increased from 32.4 to 33.5%; the share of those who believe that "the next 12 months will be bad for Russia's economy" increased from 24.9 to 27.7% (See Tab. 1).

We have but to add that, according to official statistics, 2014 has not brought any significant positive changes to the dynamics of national living standards: the share of people living below the poverty line in 2014, compared with 2013, increased from 10.8 to 11.3%, or by almost a million people[23].

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[19] Poduzov A.A., Yazykova V.S. (2021). On the ratio of the level of material security and the subjective quality of human life. *Problemy prognozirovaniya*, 5.

[20] Scientists describe the countries focused on "being" and those focused on "having" as follows: speaking about "having" and "being", Fromm does not use the ordinary meanings of these words, rather, he speaks about two main types of value orientations of an individual, two ways of human existence in the world. A person with an orientation toward "having" treats the world as an owner would treat their own property. Whereas, when focusing on "being", one considers the latter as the opposite of possession: it means love of life, the desire to live not only for oneself, and genuine involvement in the world. In our opinion, this concept can be interpreted as an idea of a wide range of options for the meaning of human life and the content of its quality in modern society, a spectrum that is limited on one side by a person's full aspiration to accumulate material wealth, and on the other is completely focused on the values of self-realization, that is, on the full disclosure of one's own personal potential" (Source: Poduzov A.A., Yazykova V.S. (2021). On the ratio of the level of material security and the subjective quality of human life. *Problemy prognozirovaniya*, 5, 90).

[21] The wording of the question "How would you assess the price increase (inflation) over the last month or two?"

(One answer, % of respondents). Answer option: "Inflation is very high". Source: Inflation perception Indices. *Official website of VCIOM*. Available at: https://wciom.ru/ratings/indeksy-vosprijatija-infljacii

[22] The wording of the question "If you lose your job, do you think it will be easy for you to find an equivalent job?" (Closed question, one answer, % of those who work). Answer options: "I think I will be able to find an equivalent job only with great difficulty", "I think it is almost impossible". Source: Employment index. *Official website of VCIOM*. Available at: https://wciom.ru/ratings/indeks-trudoustroistva

[23] Federal State Statistics Service. Available at: https://rosstat.gov.ru/storage/mediabank/urov_51g.doc

Table 1. Dynamics of public opinion assessments regarding the RF President's work and respondents' own financial situation in 2013–2014, % of respondents

Answer option (population group)	2013	2014	Dynamics (+/-), 2014 to 2013, p.p.
VCIOM data (for the Russian Federation)			
The level of approval of the RF President's work	63.1	81.4	+18
The proportion of those who consider inflation in the country to be "very high"	57.0	59.0	+2
The proportion of those who believe that in case of job loss it will be difficult or impossible for them to find another, equivalent one	45.0	47.0	+2
VolRC RAS monitoring data (for the Vologda Oblast)			
The level of approval of the RF President's work	55.3	64.1	+9
The proportion of those who subjectively classify themselves as "poor and extremely poor"	46.9	49.1	+2
The proportion of those who have "just enough money to buy food"	32.4	33.5	+1
The proportion of those who believe that "the next 12 months will be bad for the national economy"	24.9	27.7	+3

Thus, in 2014, in the wake of a patriotic upsurge due to the events of the "Crimean spring", the support for the head of state increased significantly, although there were no economic prerequisites for it. This is the important role of the subjective, non-material factor that influences the state of Russian society and places our country among the countries focused on "being" rather than "having" (according to the classification of A.A. Poduzov and V.S. Yazykova).

A similar effect (a significant increase in support for the head of state in the absence of any tangible positive changes in the dynamics of the standard of living and quality of life) could be expected in 2018, when Vladimir Putin delivered his Address to the Federal Assembly of the Russian Federation, in which he outlined the general vector of Russia's immediate development prospects – "to achieve a real breakthrough in improving the quality of life"[24]. However, in fact, it turned out that the support for the head of state even decreased (from 83.5 to 71.0% according to VCIOM and from 67.3 to 66.4% according to VolRC RAS), which was mainly due to people's negative perception of the pension reform that had been announced in June 2018.

Nevertheless, we should note that placing Russia among the countries oriented toward "being" rather than "having" is still quite conditional; it is necessary, first of all, to compare different societies at the international level, to understand the deep differences between societies of different states, with different histories, cultural and religious features, mentality, etc. we mean that it does not negate the fact that Russians expect a dynamic development of the standard of living and quality of life and an increase in the availability of conditions for ensuring and improving material well-being.

Experts from Boston Consulting Group (BCG), an international consulting company, having analyzed the motives of consumers in 18 countries, came to the conclusion that the top five key motives of Russians' consumer behavior include "a desire to keep in touch with their cultural and historical heritage", and in this respect our country is truly unique, since in other countries (including the USA, China, Germany, the UK, etc.) such motives were not found[25]. But at the same time, the researchers note:

[24] Presidential Address to the Federal Assembly of the Russian Federation, March 1, 2018. *Official website of the RF President*. Available at: http://www.kremlin.ru/events/president/news/56957

[25] The study involved 18 markets that account for about 60% of the world's population, and 40,000 respondents from Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Nigeria, Russia, Saudi Arabia, South Africa, the UAE, the United Kingdom and the United States. Available at: https://news.rambler.ru/sociology/47731693/?utm_content=news_media&utm_medium=read_more&utm_source=copylink

"Although Russian consumers have a completely different way of thinking than those in the United States, their needs, for luxury goods, for example, are surprisingly similar"[26]. Moreover, Russians place the importance of "being an individual" on the top among the key motives of consumer behavior, which was not the case in any other country in the world. Even in the USA, buyers' main motive turned out to be "a preference for communication with a narrow circle of closest friends".

One way or another, with all the specific and general features of Russia, the processes taking place in Russia are similar to those in other key countries. According to the World Bank's regular assessments, "since the early 1990s, the proportion of the world's population living below the absolute poverty line (1.9 US dollars per day) has decreased from 35 to 8.4%"[27]. Due to the growing living standards during the 21st century *(Tab. 2)* the World Bank has to revise the absolute poverty line from

Table 2. The proportion of the population below the poverty line in some countries of the world, %

Country	Poverty line*	1999	2002	2005	2008	2010	2012	2016	Dynamics (+/-), 2016 to 2002, p.p.
Russia	1.9 USD (147.2 rubles)	4.5	1.1	0.8	0.1	0.1	0.0	0.0	-1.1
	3.2 USD (247.9 rubles)	16.8	6.6	4.5	0.9	0.8	0.5	0.4	-6.2
	5.5 USD (426.1 rubles)	43.4	26.2	18.5	7.3	5.6	4.3	4.1	-22.1
China	1.9 USD (147.2 rubles)	4.5	31.7	18.5	14.9	11.2	6.5	0.5	-31.2
	3.2 USD (247.9 rubles)	68.4	57.7	43.2	34.7	28.6	20.2	5.4	-52.3
	5.5 USD (426.1 rubles)	88.9	80.6	70.5	60.7	53.5	44.4	24.0	-56.6
USA	1.9 USD (147.2 rubles)	0.7	0.7	1.0	1.0	1.0	1.0	1.0	+0.3
	3.2 USD (247.9 rubles)	0.7	1.0	1.2	1.2	1.2	1.2	1.2	+0.2
	5.5 USD (426.1 rubles)	1.2	1.5	1.5	1.7	1.7	1.7	1.7	+0.2
Germany	1.9 USD (147.2 rubles)	no data	0.0	0.0	0.2	0.0	0.0	0.0	0.0
	3.2 USD (247.9 rubles)	no data	0.0	0.0	0.2	0.2	0.0	0.2	+0.2
	5.5 USD (426.1 rubles)	no data	0.2	0.2	0.2	0.2	0.2	0.5	+0.3
UK	1.9 USD (147.2 rubles)	0.2	0.2	0.5	0.3	0.1	0.2	0.2	0.0
	3.2 USD (247.9 rubles)	0.5	0.5	0.8	0.5	0.3	0.2	0.3	-0.2
	5.5 USD (426.1 rubles)	1.0	0.7	1.2	1.0	0.7	0.6	0.5	-0.2

* Calculations in rubles are given at the US dollar exchange rate as of February 1, 2022.
Source: World Bank. Available at: https://data.worldbank.org/indicator?tab=all

[26] Comment by Patrick Witschi, associate director in Singapore for Boston Consulting Group and one of the authors of the study. Dulneva M. Analysts have found similarities between Russians and Americans in the love of luxury. *Forbes*. December 9, 2021. Available at: https://www.forbes.ru/society/448981-analitiki-nasli-shodstvo-mezdu-rossianami-i-amerikancami-v-lubvi-k-roskosi

[27] Kosyrev D.E. (orientalist scholar, journalist, political commentator for RIA-novosti). Back to poverty: The World Bank is sad, China is full of optimism. October 18, 2020. Available at: https://ria.ru/20201018/bednost-1580259778.html?in=t

time to time (it has been 1.9 US dollars per day since 2015[28]).

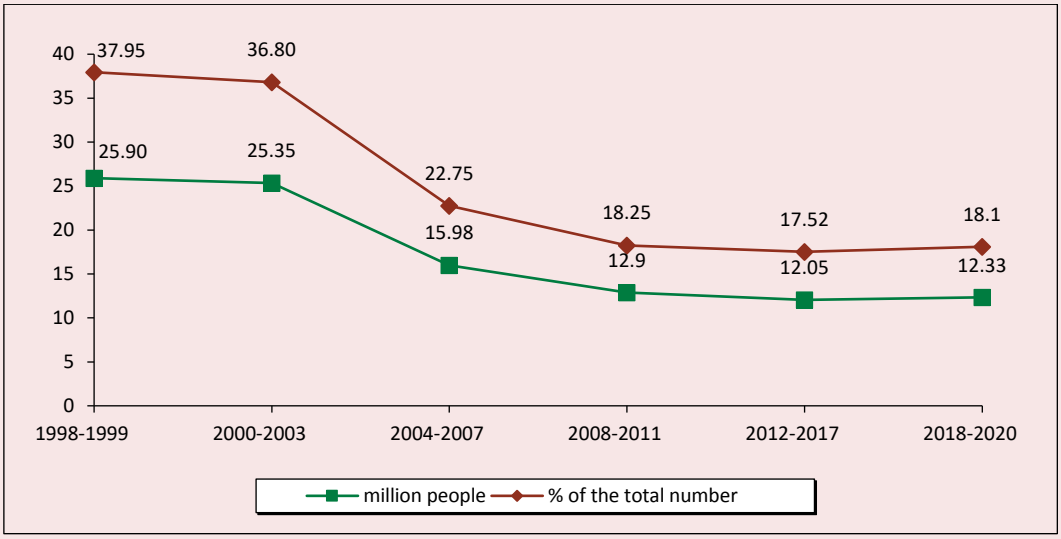
However, according to Rosstat data, in fact, since Dmitry Medvedev's presidential term (that coincided with the 2008 global financial crisis) there have been no positive changes in the dynamics of the poverty level. Despite the fact that, in general, during Vladimir Putin's presidential terms the share of Russians with incomes below the subsistence level has almost halved (from 25 to 12% of the total population, or from 37 to 18 million people; *Fig. 1*), since the 2008–2011 period, this indicator has remained stable (12%, or 18 million people).

The presented dynamics of official statistics are confirmed by the findings of sociological studies.

> "By the time of the current [2021] April Presidential Address, the number of the registered poor was 18 million people. But it is a rosy picture painted by Rosstat. Experts, criticizing official statistics for changing the calculation parameters and embellishing the data in favor of the authorities, name higher figures. Surveys of independent sociological groups indicate that only 25% of our fellow citizens believe that their incomes are above the necessary minimum"[29].

Thus, based on the results of all-Russian surveys that help to identify a minimum set of household furniture and appliances that a Russian family requires so as to have a normal standard of living[30],

Figure 1. Russia's population with monetary incomes below the subsistence level (average annual data)



Source: Rosstat. Available at: https://rosstat.gov.ru/storage/mediabank/urov_51g.doc

[28] From 2008 to 2015, the poverty line was 1.25 USD. Source: How the World Bank assesses the level of poverty. *TASS-DOSYE*. January 15, 2020. Available at: https://tass.ru/info/7525997

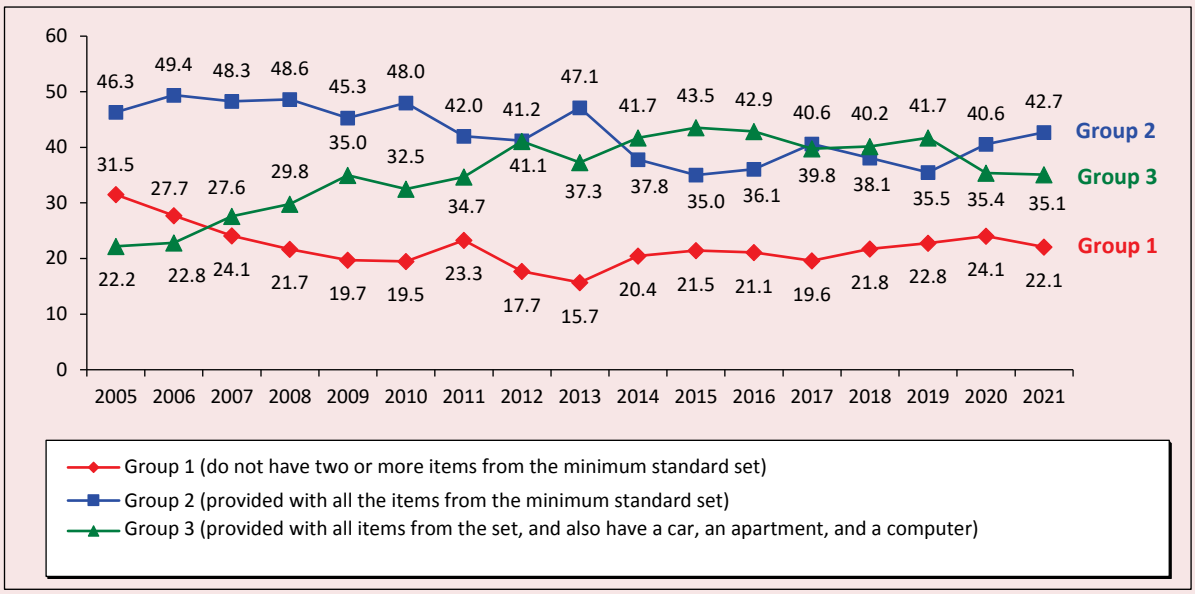
[29] Kostikov V. (Head of the "AiF" strategic planning center). At least they don't wear bast shoes. Why has the problem of poverty so alarmed the authorities? *Argumenty i fakty*. April 28, 2021. Available at: https://aif.ru/politics/russia/horosho_chto_ne_v_laptyah_pochemu_problema_bednosti_tak_vstrevozhila_vlast

[30] "... in the course of the research, we identified a number of durable items that the vast majority of Russians possesses and which this majority currently recognizes as absolutely necessary for a normal standard of living. According to the results of the research, the standard set includes six items: a refrigerator (1.3% of respondents did not have it as of March 2003), a color TV (5.4% of respondents did not have it), a carpet or a palace (6.7% of respondents), as well as a washing machine, a vacuum cleaner and a set of furniture (from 14.9% to 17.9%). This means that if a Russian family does not have these items, then its standard of living is really low. The absence of two or more of the above items (first of all, a refrigerator and a TV) means that the family is poor" (Source: Davydova N.M., Popova I.P., Tikhonova N.E. (2004). The index of living standards and the stratification model of Russian society. *Sotsiologicheskiye issledovaniya*, 6, 120–130).

and also using our own accumulated database of the public opinion monitoring[31], we analyzed the changes in the number of people within the three groups identified according to the level of provision of industrial goods and real estate[32].

Trends in the number of people within these groups are obvious *(Fig. 2)*: over the period from 2005 to 2021, the share of people who possess all the goods listed in the survey (including such expensive things as a computer, motor vehicle, and apartment) increased from 22 to 35%; the proportion of those who have only the minimum necessities decreased from 46 to 43%; the share of those who do not have two or more things even from a minimal set (although this does not mean that such people do not have, for example, a computer or a car) decreased from 32 to 22%.

Figure 2. Dynamics of the level of provision of industrial goods and real estate (VolRC RAS data), % of respondents



[31] The monitoring is held since 1996 once every two months 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 volume of the sample is 1,500 people 18 years of age and older. 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 adult inhabitants of the Vologda Oblast. The method of the survey is a questionnaire poll by place of residence of respondents. Sampling error does not exceed 3%.

[32] The conditionality of the designated categories is due to the fact that during the monitoring of public opinion, representatives of the so-called "social bottom" and, conversely, people who can be classified as "super-rich" are not interviewed.

The wording of the question is "How would you assess your family's need for industrial goods, real estate?" Answer options: "We have them in a sufficient amount", "There is no need in them".

Three groups were formed according to the level of provision of items from the minimum set (refrigerator, TV, washing machine, vacuum cleaner, furniture and since 2009 – cell phone):

Group 1 – do not have two or more items from the set;

Group 2 – have all items from the set;

Group 3 – have all items from the set, and also have a car, an apartment, and a computer.

The answer option "cell phone" has been added to the standard set since 2009. According to Rosstat, it was in 2009 that the number of mobile communication devices per thousand people stopped growing, that is, the number of their owners reached a certain "plateau", and we considered this "point" as the moment when the cell phone ceased to be a luxury item, and became a means of communication accessible to the vast majority of citizens.

Thus, the information obtained (even despite its conditionality and methodological limitations) reflects the following general trend registered according to the official statistics indicated above: **the standard of living (financial security) as a whole has been increasing over a significant period of time (2005–2021), alongside a virtually complete "stalling" of its dynamics in the 2010s**. Thus, over the past eight years (from 2013 to 2021), the share of representatives of group 1 increased by 6 p.p. (from 16 to 22%); group 3 – decreased by 2 p.p. (from 37 to 35%); group 2 – decreased by 4 p.p. (from 47 to 43%).

It is noteworthy that we observe similar dynamics in the subjective perception regarding the relevance of such problems as inflation and low standard of living in the estimates of the population. The severity of these problems as a whole has increased over the period from 2000 to 2021, primarily due to negative changes in public opinion over the past 13 years.

In 2000–2004 the share of people who note the relevance of the problem of inflation and poverty decreased (by 5 p.p., from 45 to 40%, and by 18 p.p., from 51 to 33%, respectively), while their share has not actually changed since 2008 (55–60 and 40–50%, respectively; *Tab. 3*).

The results of sociological findings also indicate that the socio-demographic portrait of poverty has expanded during Vladimir Putin's presidential terms.

Table 3. Ten most pressing issues of concern to the population*

Issue	1999		2000		2004		2008		2012		2018		2021	
	%	*Rank*	%	*Rank*	%	*Rank*	%	*Rank*	%	*Rank*	%	*Rank*	%	*Rank*
Inflation	54.5	*2*	44.7	*2*	39.5	*1*	56.3	*1*	55.3	*1*	53.7	*1*	62.3	*1*
Low standard of living, poverty	57.1	*1*	50.8	*1*	32.8	*4*	41.4	*2*	43.2	*2*	51.1	*2*	52.3	*2*
Stratification of the population into poor and rich	21.3	*9*	27.7	*7*	30.8	*5*	31.4	*4*	37.5	*3*	35.9	*3*	31.9	*3*
Housing provision, low housing affordability	11.8	*14*	16.8	*9*	23.1	*9*	36.3	*3*	28.6	*4*	23.5	*4*	25.5	*4*
Economic instability, shutdown of enterprises	39.6	*4*	29.1	*6*	14.8	*13*	17.0	*10*	16.5	*11*	22.5	*6*	22.3	*5*
Social insecurity	32.5	*6*	34.4	*4*	28.7	*6*	24.8	*7*	22.3	*8*	19.9	*9*	22.2	*6*
Political instability	21.9	*8*	16.0	*10*	8.7	*17*	7.8	*15*	11.2	*16*	23.1	*5*	20.5	*7*
High crime rate, insecurity from criminality, hooliganism	33.4	*5*	36.9	*3*	34.2	*3*	28.4	*5*	25.5	*6*	19.0	*10*	20.0	*8*
Unavailability of healthcare, poor quality of medical services	12.4	*13*	14.6	*13*	24.0	*8*	15.8	*11*	18.5	*9*	15.7	*10*	18.8	*9*
Corruption, bribery	14.8	*11*	15.4	*11*	18.7	*10*	17.5	*9*	19.8	*9*	21.9	*7*	17.7	*10*

* Ranked according to the data as of 2021. In total, 23 issues appear in the survey.
Source: VoIRC RAS public opinion monitoring.

To reflect this process, we examined socio-demographic features of the population groups identified according to self-assessment of income level and social self-identification, the two criteria in the public opinion monitoring. At that, the former criterion more objectively reflects the actual situation, which follows from the calculation methodology[33].

The data obtained suggest that the socio-demographic portrait of low-income population groups has not changed significantly during Vladimir Putin's presidential terms: as in the early 2000s, they still include mainly women, middle-aged people (30–55 years old), people with secondary and incomplete secondary education, inhabitants of districts, and childless respondents.

Certain "risk groups", according to the average annual data for the period from 2000–2003 to 2018–2021, showed tangible positive shifts. For example, among people who classify themselves as least affluent, the proportion of women decreased by 8 p.p. (from 62 to 54%), the proportion of people with secondary education decreased by 9 p.p. (from 54 to 45%); the proportion of persons aged under 30 decreased by 7 p.p. (from 26 to 19%; *Tab. 4*).

However, there is much more data that allows us to conclude that the socio-demographic portrait of the group of the bottom 20% has expanded due to the inclusion of other categories of population in it. During the period under consideration (from 2000–2003 to 2018–2021), other categories: men (+8 p.p., from 38 to 46%), persons aged over 55

Table 4. Socio-demographic portrait of the bottom 20% group (the proportion of those who consider themselves "bottom 20%"), % of respondents)

Population group	Presidential terms (average annual data)						Dynamics (+/-), p.p.
	1998–1999	2000–2003	2004–2007	2008–2011	2012–2017	2018–2021	2018–2021 to 2000–2003
Sex							
Men	39.9	38.1	42.6	41.7	42.7	46.3	+8
Women	60.1	61.9	57.5	58.3	57.4	53.8	-8
Age							
Under 30	24.4	25.9	24.4	27.7	22.6	19.0	-7
30–55	60.6	54.9	48.5	51.3	54.9	56.7	+2
Over 55	15.1	19.2	27.1	21.0	22.4	24.3	+5
Education							
Secondary and incomplete secondary	51.2	53.8	57.0	49.6	49.3	44.5	-9
Secondary vocational	35.3	33.6	30.1	35.0	34.1	38.7	+5
Higher and incomplete higher	13.5	12.6	12.9	15.4	16.5	16.8	+4

[33] Self-assessment of one's own income: the "bottom 20%", "middle 60%" and "top 20%" groups are identified according to Vologda Oblast inhabitants' subjective assessments of their monthly income (the wording of the question "Would you calculate the actual average monthly income per member of your family for the last month?").

Social self-identification: based on the answer to the question "Which category do you belong to, in your opinion?" there are groups of people who classify themselves as "rich", "people with average income", "poor" and "extremely poor". Since the share of the "rich" and "extremely poor" is very small, these four groups are combined in pairs ("rich and with average income", "poor and extremely poor") for a more objective interpretation of the data.

A variety of factors can influence people's subjective identification with the "poor and extremely poor" or "people with average income" (comparing their current financial situation with the crisis of the 1990s; comparing their wealth with the wealth of, for example, a more affluent neighbor; comparing the standard of living in Russia and in the West (information about which is becoming more and more accessible thanks to the Internet); regular information from the media about the excess profits of celebrities and officials, the amount of bribes, etc.). When distributing population groups according to self-assessment of income level, we consider only the figure that the respondent indicated when describing the level of their own monthly income.

End of Table 4

Population group	Presidential terms (average annual data)						Dynamics (+/-), p.p.
	1998–1999	2000–2003	2004–2007	2008–2011	2012–2017	2018–2021	2018–2021 to 2000–2003
Territory							
Vologda	17.5	16.1	13.4	14.3	14.6	12.4	-4
Cherepovets	8.5	7.9	10.2	8.9	10.4	12.6	+5
Districts	74.1	76.0	76.4	76.8	75.1	75.1	-1
Number of minor children in the family							
No children	33.9	39.4	48.7	47.4	43.6	44.3	+5
1 child	33.1	31.6	28.8	29.4	30.0	24.5	-7
2 children	25.0	23.1	19.5	20.0	22.0	23.6	+1
3 and more children	8.2	5.9	3.0	3.3	4.4	7.6	+2

(+5 p.p., from 19 to 24%), persons with secondary vocational and higher education (+4–5 p.p., from 34 to 39%), and residents of Cherepovets (+5 p.p., from 8 to 13%; see Tab. 4) "came much closer" to these "traditional" groups of "poverty".

Having analyzed the dynamics of the average annual data on social self-identification, we can draw the following main conclusion: in 2018–2021, in almost all groups, about half of the citizens (45–50%, and in some categories even more) considered themselves to be "poor and extremely poor" (the only exceptions are persons who, according to self-estimates of income, belong to the top 20% in the region; *Tab. 5*). Although we cannot but note a number of positive aspects, for example, the fact that during Vladimir Putin's presidential terms, people in most socio-demographic strata began to identify themselves with the "poor and extremely poor" less often (in the Vologda Oblast in general, their share decreased by 7 p.p., from 55 up to 48%),

Table 5. Socio-demographic portrait of the "poor and extremely poor" group (proportion of those who consider themselves "poor and extremely poor"), % of respondents

Population group	Presidential terms (average annual data)						Dynamics (+/-), p.p.
	1998–1999	2000–2003	2004–2007	2008–2011	2012–2017	2018–2021	2018–2021 to 2000–2003
Sex							
Men	63.1	50.8	47.7	42.8	46.8	46.1	-5
Women	68.7	57.9	52.2	46.1	48.8	48.6	-9
Age							
Under 30	56.6	41.4	39.9	36.9	43.0	44.5	+3
30–55	67.0	56.0	48.3	44.2	47.5	45.3	-11
Over 55	73.2	67.6	62.7	52.1	51.8	51.6	-16
Education							
Secondary and incomplete secondary	70.8	60.3	58.7	52.3	55.9	55.0	-5
Secondary vocational	66.4	56.1	49.4	46.6	47.6	44.9	-11
Higher and incomplete higher	58.9	46.6	41.4	34.1	39.9	42.9	-4
Income groups							
Bottom 20%	83.9	70.9	68.2	62.6	68.4	63.8	-7
Middle 60%	71.1	60.8	54.1	48.8	49.9	50.7	-10
Top 20%	40.5	30.0	22.2	18.7	24.8	27.3	-3

End of Table 5

Population group	Presidential terms (average annual data)						Dynamics (+/-), p.p.
	1998–1999	2000–2003	2004–2007	2008–2011	2012–2017	2018–2021	2018–2021 to 2000–2003
Territory							
Vologda	66.7	57.7	44.3	44.8	48.2	44.2	-13
Cherepovets	59.3	48.7	38.2	33.9	41.4	50.9	+2
Districts	69.4	56.9	58.7	49.9	51.2	47.4	-9
Oblast	66.3	54.9	50.2	44.6	47.9	47.5	-7
Number of minor children in the family							
No children	52.2	55.5	60.7	63.1	60.5	60.7	+5
1 child	28.9	29.2	26.5	23.7	24.2	21.1	-8
2 children	15.4	13.2	11.3	11.8	13.1	14.9	+2
3 and more children	3.5	2.1	1.5	1.5	2.1	3.3	+1

with the exception of persons under the age of 30 and childless persons: the proportion of the "poor and extremely poor" among them increased by 4–5 p.p. (from 41 to 45% and from 56 to 61%, respectively).

In addition, over the past period, various population groups have significantly levelled off according to the criterion of relating themselves to the category of the "poor and extremely poor". Moreover, it happened not by increasing the share of those who had not previously referred themselves to the category of the "poor and extremely poor", but due to fact that the share of those who in the early 2000s made up the bulk of the "poor and extremely poor" has decreased at a greater pace: these are people who assess their own income level as low (by 2018–2021, their share among the "poor and extremely poor" has decreased by 7 p.p., from 71 to 64%), and persons aged over 55 (by 16 p.p., from 68 to 52%).

Thus, we can draw two conclusions from the sociological data presented above.

First, the absence of positive dynamic changes in reducing the level of poverty has a psychological effect and is reflected, among other things, in the increasing urgency of the problem of people's negative perception of the dynamics of the standard of living and quality of life.

Second, at present we are talking not only about the fact that almost half of the inhabitants consider themselves "poor and extremely poor", but also about the fact that over the past 20 years the socio-demographic portrait of poverty has become more diverse; poverty has "taken root" in those strata of Russian society, whose representatives previously did not consider themselves poor (men, people with secondary vocational and higher education).

However, the main threat of poverty lies in the fact that its subjective perception becomes the main factor that has a complex psychological impact on people's assessment of various aspects of life: their daily emotional state, attitude toward the work of authorities, toward the general state of affairs in the country, toward their own future and the future of their children.

Having analyzed the dynamics of the average annual data of the socio-demographic portrait for the periods of presidential terms according to the key indicators of public opinion monitoring, we came to the conclusion that the negative assessment is given most often by people who, according to self-assessment of their income, belong to the category of the bottom 20%. In this case, the key monitoring parameters are as follows:

1. The level of approval of the work of the RF President (as the one who takes personal

responsibility for the state of affairs in the country (Vladimir Putin spoke about this during his first inauguration) and governs the country and the public administration system via the "hands-on approach", and finally, as a person who enjoys people's exceptional trust, compared to all other government institutions and political leaders).

> **Vladimir Puti**n (a speech at his first inauguration on May 7, 2000): "I understand that I have taken on a great responsibility, and I know that in Russia the head of state has always been and will always be the person who is responsible for everything in the country"[34].

2. Social mood (one of the most representative indicators reflecting people's emotional and psychological well-being in everyday life).

3. Protest potential (not just reflecting people's attitude toward the living conditions in the country (region, locality), but showing how ready they are to take part in protest actions, that is, their willingness to move from value judgments to concrete actions).

4. Stock of patience[35] (another indicator that reflects people's psychological perception of the present, living conditions in the country, in one's personal life).

5. Consumer sentiment index (an integral indicator characterizing people's forecasts regarding the prospects for development of the economic situation in the country and their personal financial situation; it reflects respondents' attitude not only toward the dynamics of the standard of living and quality of life, but also toward the psychological perception of the future).

6. Confidence/lack of confidence in the future (an indicator that characterizes people's general psychological perception of their "tomorrow", the future of their children, which basically depends to a great extent on their perception of "today" and is its reflection).

Thus, from the total number of indicators presented in the monitoring, we selected those that most representatively reflect people's perception of the state of affairs in the country *(Insert 2)*, their present *(Insert 3)* and future *(Insert 4)*. **The results of the study show that according to all the above criteria, those Vologda Oblast inhabitants who belong to the category of the bottom 20% according to self-assessment of their income, most often express negative judgments, compared with representatives of other socio-demographic groups.**

The dynamics of statistical data, the results of foreign and Russian studies, the information we received during sociological surveys conducted at the regional level since the mid-1990s – all this indicates that the problem of poverty remains urgent and it is becoming even more acute, despite the fact that in general "Russians are now living a better life, in any case, compared to the turbulent 1990s and the 2000s"[36].

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[34] Vladimir Putin's inaugural speech on May 7, 2000. *Moskovskie novosti*. May 7, 2012. Available at: https://www.mn.ru/blogs/blog_reference/80928

[35] Unlike the protest potential, the stock of patience reflects only people's attitude toward the situation in the country and in their personal life (The wording of the question "In your opinion, which of the following statements describes the current situation most accurately?", answer options: "Everything is not so bad, and life is livable"; "Life is hard, but we can endure it"; "It is already impossible to bear such plight"; "I find it difficult to answer").

The protest potential implies not just an attitude, but the implementation of concrete behavior. It is formed by respondents who answered the question "What are you ready to do to protect your interests?" as follows: "I will take part in a rally, a demonstration"; "I will participate in strikes, protest actions"; "If necessary, I will take up arms, man the barricades".

[36] The language of poverty. How has the standard of living of Russians changed in 20 years?: Transcript of the broadcast of the program "Big Country" on the OTR channel, February 15, 2020. Experts: K. Kalachev, political scientist, head of the "Political Expert Group", and D. Zavorotny, head of the Center for Economic Strategies. Available at: https://otr-online.ru/programmy/bolshaya-strana/yazyk-bednosti-kak-izmenilsya-uroven-zhizni-rossiyan-za-20-let-41337.html

Insert 2

The level of approval of the RF President's work and the protest potential, % of respondents

Population group	Proportion of positive assessments of the RF President's work							Population group	Protest potential						
	Presidential terms (average annual data)						Dynamics (+/-), p.p.		Presidential terms (average annual data)						Dynamics (+/-), p.p.
	1998–1999	2000–2003	2004–2007	2008–2011	2012-2017	2018–2021	2018–2021 to 2000–2003		1998–1999	2000–2003	2004–2007	2008–2011	2012–2017	2018–2021	2018–2021 to 2000–2003
Sex								*Sex*							
Men	12.7	65.8	69.0	63.1	59.6	53.3	-13	Men	43.3	30.8	29.8	23.3	21.0	20.2	-11
Women	9.9	66.0	68.9	66.5	64.9	59.0	-7	Women	30.1	22.6	23.9	18.0	17.4	19.6	-3
Age								*Age*							
Under 30	10.4	68.8	70.7	64.7	61.2	53.3	-16	Under 30	36.7	26.5	27.5	20.3	17.6	17.1	-9
30–55	11.0	65.2	68.6	64.4	61.4	53.9	-11	30–55	40.1	27.9	27.1	21.2	20.0	20.2	-8
Over 55	12.3	64.4	67.9	66.0	65.1	60.9	-4	Over 55	27.6	21.6	24.8	19.0	18.5	20.6	-1
Education								*Education*							
Secondary and incomplete secondary	11.9	61.9	65.3	60.4	56.9	51.2	-11	Secondary and incomplete secondary	36.7	25.6	25.3	20.6	20.4	21.8	-4
Secondary vocational	10.5	66.6	70.2	65.8	63.8	58.1	-9	Secondary vocational	37.2	26.6	27.0	21.0	18.7	17.9	-9
Higher and incomplete higher	10.9	70.1	71.9	69.1	67.2	59.8	-10	Higher and incomplete higher	33.2	26.0	27.6	19.3	18.0	20.4	-6
Income groups								*Income groups*							
Bottom 20%	9.5	55.4	60.8	55.4	50.2	42.5	-13	Bottom 20%	44.6	24.3	28.0	24.9	25.8	27.6	+3
Middle 60%	11.1	68.3	71.4	66.7	64.8	59.0	-9	Middle 60%	34.7	27.4	27.7	20.6	18.7	19.1	-8
Top 20%	15.2	73.2	76.5	72.7	71.9	66.4	-7	Top 20%	28.8	24.8	23.3	15.9	12.6	12.7	-12
Territory								*Territory*							
Vologda	10.4	66.2	65.3	64.5	61.1	52.0	-14	Vologda	33.2	27.6	29.9	22.3	21.8	23.1	-5
Cherepovets	10.4	64.6	72.5	73.7	74.1	64.2	0	Cherepovets	34.6	28.1	25.7	20.0	20.9	27.2	-1
Districts	11.9	66.5	68.8	60.7	56.9	54.5	-12	Districts	37.8	24.3	25.5	19.6	16.5	13.8	-10
Oblast	11.2	65.9	68.9	64.9	62.5	56.4	-9	Oblast	35.9	26.1	26.6	20.4	19.0	19.8	-6

In the dynamics of the average annual data throughout the entire measurement period (from 1998 to the present**), the lowest level of approval of the RF President's work** was noted among people who, according to self-assessments of their income, belong to the bottom 20% (moreover, during Vladimir Putin's presidential terms it decreased by 12 p.p., from 55 to 43%); this group also showed **the highest level of protest potential** (from the first to the fourth presidential terms of Vladimir Putin, the level of protest potential increased by 4 p.p., from 24 to 28%).

Insert 3

Estimates of social mood and the stock of patience, % of respondents

Population group	Proportion of positive assessments of social mood							Population group	Proportion of positive assessments of the stock of patience						
	Presidential terms (average annual data)						Dynamics (+/-), p.p.		Presidential terms (average annual data)						Dynamics (+/-), p.p.
	1998–1999	2000–2003	2004–2007	2008–2011	2012–2017	2018–2021	2018–2021 to 2000–2003		1998–1999	2000–2003	2004–2007	2008–2011	2012–2017	2018–2021	2018–2021 to 2000–2003
Sex								*Sex*							
Men	34.1	53.6	62.5	63.3	69.5	67.4	+14	Men	44.5	67.8	72.8	73.7	77.7	75.4	+8
Women	26.7	46.5	56.6	59.7	68.1	67.0	+21	Women	40.2	66.0	70.3	74.2	79.1	75.7	+10
Age								*Age*							
Under 30	45.8	60.4	66.7	69.1	75.7	75.5	+15	Under 30	50.5	71.9	75.0	76.7	81.2	77.4	+5
30–55	28.4	48.2	59.5	61.2	68.8	68.8	+21	30–55	40.9	65.6	71.2	73.9	78.1	75.8	+10
Over 55	19.3	40.3	52.1	54.7	64.0	61.6	+21	Over 55	37.1	63.7	68.5	71.8	77.2	74.5	+11
Education								*Education*							
Secondary and incomplete secondary	25.7	44.9	55.3	55.9	61.6	61.6	+17	Secondary and incomplete secondary	37.5	63.4	67.5	70.2	72.3	71.7	+8
Secondary vocational	28.8	49.1	58.8	60.5	69.3	68.7	+20	Secondary vocational	41.8	67.4	71.9	73.5	79.3	77.2	+10
Higher and incomplete higher	38.2	56.1	64.2	68.0	75.5	71.2	+15	Higher and incomplete higher	49.8	70.6	75.3	78.7	84.0	77.6	+7
Income groups								*Income groups*							
Bottom 20%	18.7	34.8	48.8	46.0	51.0	52.1	+17	Bottom 20%	27.4	53.7	59.7	60.6	61.6	62.8	+9
Middle 60%	27.1	48.3	58.6	61.8	70.9	68.4	+20	Middle 60%	42.8	67.1	72.3	75.3	81.2	77.1	+10
Top 20%	48.5	65.3	71.6	74.3	82.6	79.9	+15	Top 20%	62.2	79.1	81.9	84.6	89.7	87.0	+8
Territory								*Territory*							
Vologda	32.5	52.4	58.0	64.2	73.6	65.2	+13	Vologda	45.2	67.4	70.0	73.3	81.0	72.7	+5
Cherepovets	41.8	53.0	63.1	66.2	74.3	69.6	+17	Cherepovets	51.8	67.7	76.7	83.3	85.6	77.2	+10
Districts	23.2	46.3	57.9	57.5	63.1	66.9	+21	Districts	36.2	65.9	69.5	69.7	73.2	76.1	+10
Oblast	30.0	49.5	59.2	61.3	68.7	67.2	+18	Oblast	42.1	66.8	71.4	74.0	78.4	75.6	+9

According to the average annual data for the presidential terms, "the bottom 20%" group has **the lowest share of positive assessments of social mood** (although from 2000–2003 to 2018–2021 it increased from 35 to 52%) **and the lowest indicator of the stock of patience** (during Vladimir Putin's 1st–4th presidential terms it increased by 9 p.p., from 54 to 63%).

Insert 4

Consumer sentiment index, points and the assessment of confidence in the future, % of respondents

Population group	Consumer sentiment index							Population group	Proportion of people who don't have confidence in the future						
	Presidential terms (average annual data)						Dynamics (+/-), p.p.		Presidential terms (average annual data)						Dynamics (+/-), p.p.
	1998–1999	2000–2003	2004–2007	2008–2011	2012–2017	2018–2021	2018–2021 to 2000–2003		1998–1999*	2000–2003	2004–2007	2008–2011	2012–2017	2018–2021	2018–2021 to 2000–2003
Sex								*Sex*							
Men	57.8	93.9	103.9	88.8	85.2	88.1	-6	Men	no data	55.6	36.7	45.8	53.9	50.3	-5
Women	56.1	89.8	100.0	87.3	84.5	87.7	-2	Women	no data	61.4	43.6	50.6	55.2	52.5	-9
Age								*Age*							
Under 30	67.8	102.4	109.6	93.8	89.8	92.3	-10	Under 30	no data	48.9	32.1	37.0	47.6	44.3	-5
30–55	55.6	89.6	102.2	86.6	84.7	88.7	-1	30–55	no data	63.8	41.5	52.2	53.6	52.6	-11
Over 55	50.1	83.5	93.6	84.0	81.6	84.9	1	Over 55	no data	58.4	46.5	52.2	61.0	53.3	-5
Education								*Education*							
Secondary and incomplete secondary	53.9	88.5	96.3	84.6	79.4	83.4	-5	Secondary and incomplete secondary	no data	58.0	40.6	51.7	59.6	55.2	-3
Secondary vocational	57.0	89.9	100.8	86.5	84.6	88.9	-1	Secondary vocational	no data	63.0	42.6	50.0	55.2	51.5	-12
Higher and incomplete higher	61.4	97.1	108.9	93.2	90.7	91.3	-6	Higher and incomplete higher	no data	56.2	38.4	43.2	48.7	47.6	-9
Income groups								*Income groups*							
Bottom 20%	46.9	77.0	88.9	76.2	69.7	72.9	-4	Bottom 20%	no data	69.3	45.2	55.5	64.0	54.9	-14
Middle 60%	53.6	89.5	101.0	86.3	84.3	87.8	-2	Middle 60%	no data	61.7	41.0	50.5	54.9	53.1	-9
Top 20%	73.5	109.1	118.0	101.0	100.7	102.3	-7	Top 20%	no data	47.9	35.6	39.8	44.5	42.7	-5
Territory								*Territory*							
Vologda	58.0	93.6	101.0	86.7	85.3	84.2	-9	Vologda	no data	55.0	45.9	48.4	49.4	47.7	-7
Cherepovets	64.4	92.7	106.2	92.0	89.9	89.7	-3	Cherepovets	no data	54.6	39.1	49.5	51.4	53.3	-1
Districts	53.0	89.3	99.8	85.9	81.9	89.0	0	Districts	no data	63.3	38.8	48.0	59.0	52.7	-11
Oblast	56.9	91.5	101.7	87.7	84.8	87.9	-4	Oblast	no data	59.0	40.5	48.4	54.6	51.5	-8
* Included in the survey since 2000.															

Over the entire measurement period (according to the average annual data for the presidential terms), **the lowest value of the consumer sentiment index** was noted in the group of the bottom 20% (during Vladimir Putin's presidential terms it decreased from 77 to 73 points; while any value of the CSI below 100 points means the predominance of pessimistic forecasts regarding the future of the economy and one's personal financial situation).

This group also regularly shows **the highest proportion of those who face the problem of uncertainty about the future** (even though during Vladimir Putin's 1st–4th presidential terms their share among the least affluent segments of the population decreased by 14 p.p., from 69 to 55%).

There have been no noticeable changes in the dynamics of the number of people living below the poverty line since 2008; poverty (according to the findings of our research) is "taking root" in the structure of Russian society and is affecting more social strata (according to our surveys – men, people over 55, people with secondary vocational education); finally, the subjective perceptions of poverty and the dynamics of its change become key factors determining people's social perception of the surrounding reality, living conditions, assessment of the work of the authorities, one's own present and future.

"The most amazing thing is that now (unlike the mid-2000s), when you study poverty in Russia, you no longer feel either shock or surprise. And this indifference is dangerous, as it characterizes the usual social depression. There is no surprise, because not only the poor are poor in Russia, almost all of Russia is poor"[37].

Thus, the problem is not so much poverty in itself as its complex implications that affect the state of public consciousness and behavior.

But the problem of poverty also lies in the fact that the fight against it is in direct contradiction with the interests of the part of the ruling elites, which experts call the "sixth column" and which focuses primarily on personal enrichment, which in fact means personal use of national resources.

We should bear in mind that Russia has already witnessed the time when the ineffectiveness of the fight against poverty eventually led to the collapse of statehood.

"Governmental policy in any sphere of life of the country's citizens is the actions of PEOPLE working in the power structures... Naturally, performance indicators, as well as the ways to achieve them, depend on how these people perceive what is "good" and what is "bad". **That is, the actions of people working in government agencies are based on a set of views and ideas, according to which they perceive and evaluate their attitude toward reality and other people. In other words, actions are based on a certain ideology.**

The existing ideology and the corresponding economic policy have caused a long-term decline in the welfare of the majority of households in Russia. **And if the ideology is not changed, then this trend will continue"**[38].

Thus, according to some experts, it was not the collapse of the Soviet ideology, but the long process of "fermentation" of the Soviet nomenclature, when the motives gradually shifted from public (national) to personal interests, which became the main reason why the USSR collapsed. And only after this process reached a certain "boiling point", it became necessary to dismantle the ideology; and this process was carried out by the elites as rapidly and peremptorily as some reforms that clearly contradict the interests of the majority of the population continue to be implemented today ("monetization of benefits" (2005), reform of the Russian Academy of Sciences (2013), pension reform (2018)).

[37] An unpromising people (editorial). *Ekspert*. July 15, 2019. Available at: https://expert.ru/expert/2019/29/neperspektivnyij-narod/

[38] Mokiy M.S. (2021). Economic policy and ideology in modern Russia: Status and prospects. *Economics of Contemporary Russia*, 3, 77–87.

"The transition to capitalism began with the decisive dismantling of ideology and the institutions associated with it. In retrospect, in many people who feel nostalgic about the USSR, this created an idealistic illusion that it was the rejection of ideological dogmas that caused the collapse of the system, but in reality (in strict accordance with Marx's theory) the situation was quite the opposite. The evolution of the system urged the ruling circles to get rid of the shackles of ideology"[39].

This trajectory, which led to the collapse of the USSR (as experts note), still exists today. Perhaps this is the major reason that explains why poverty remains our "main enemy" and why publicly stated goals and objectives aimed at alleviating it, in practice, turn into revisions of the deadlines for the implementation of plans and calculation methods; or relevant indicators "quietly" disappear from the national development goals (as it happened with the task of Russia's joining the top five countries with the highest level of economic development: this task no longer appears in national projects after their revision in 2020).

"In fact, the trajectory of development that Russia has been following up to the present time was fully formed in the late Soviet years"[40].

In fact, when Vladimir Putin named poverty the "main enemy" of the backbone of a new post-Soviet statehood he was building, he simultaneously declared "war" on the "sixth column", which is quite logical after his decisions actually weakened the "fifth column", as well as with the support of the Mishustin Government, in which, according to experts, "the work on the modernization of the economy and public administration is system-wide, comprehensive and is already bearing fruits"[41].

"It is fundamentally important that the Mishustin Government was able to turn the solution of current problems into the first step toward solving strategic problems aimed at institutional changes, increasing the flexibility and effectiveness of public administration in order to address two fundamental tasks: economic growth that promotes the achievement of national development goals, and economic adaptability that promotes sustainability. Traditionally, multi-level tasks and plans have been fused into a single structured system, which is a model of the basic principles of state planning, redesigned for the needs and conditions of a modern, digital economy.

The unified plan for achieving national development goals for the period up to 2024 and for the planned period up to 2030 integrates the short-term task of returning to sustainable economic growth and growth of people's incomes and the long-term task of achieving the above-mentioned tasks in a rapidly changing external environment in a "post-COVID" world[42]".

[39] Kagarlitsky B. From the conscientious nomenclature – to the bourgeois oligarchy. *Ekspert*. December 20, 2021. Available at: https://expert.ru/expert/2022/01/ot-sovestlivoy-nomenklatury-k-burzhuaznomu-oligarkhatu/

[40] Ibidem.

[41] Delyagin M. Two years of "sturm und drang": The silent success of the Mishustin Government. Available at: https://universe-tss.su/main/politika/russia/106824-mihail-deljagin-dva-goda-buri-i-natiska-molchalivyj-uspeh-pravitelstva-mishustina.html.

[42] Ibidem.

"Mishustin's important achievement (and here we can talk about his personal achievement) consists in the transition to a situation in which **government leaders realized their personal responsibility for the orders they received.** Indeed, the time of responsibility has not yet come, but even the information that appears in the public field suggests that all members of the government are seriously concerned about the results of their work. Someone will say that this is a normal situation, but those who were familiar with the actual performance of the government know that for many years officials had no real responsibility"[43].

Thus, the main task that the head of state and his inner circle are facing now is to make the fight against poverty a lively and dynamic process noticeable by all the strata (and not only by socially vulnerable ones); it can be done only through tough decisions that would limit the "appetites" of the "sixth column".

> "...the greatness of the state does not consist in its vast territory and global military-political influence; rather, it consists in ensuring that all Russians have a high standard of living that corresponds to our vast natural and human wealth"[44].

Today, this issue, which determines the degree of legitimacy of the government and the conditions for progressive historical development initiated by the President in the 2000s, is of key importance not only for Russia. It is a matter of a larger, historical significance, since it primarily determines the security of the "rear" in the context of an extremely tense international situation and the civilizational confrontation between Russia and the West, which is entering the next phase of turbulence.

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[43] Khazin M. On the work of Mishustin. *Official website of M. Khazin*. January 20, 2020. Available at: https://khazin.info/articles/10-vlast-i-obshhestvo/98539-o-rabote-mishustinaa

[44] Perkhavko V. The deep origins of Russian imperialism. *Nezavisimaya gazeta*. December 2, 2021.

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Methodology for Assessing Regional Specifics of Interaction between Foreign Scientists and Russian Scientific Organizations and Universities

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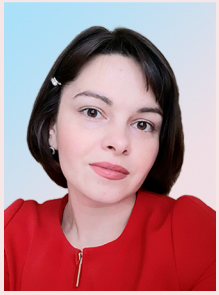

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Abstract. The article examines the features of interactions between Russian scientific organizations and universities and foreign scientists. Despite the effort to collect and compile data on different types of international interactions between scientists, Russian academic literature does not pay sufficient attention to the activities of foreign scientists working in Russia. Therefore, the purpose of the study is to close the gaps in scientific knowledge connected to the research on academic mobility including identification of types and features of interactions between Russian scientific organizations and foreign scientists, to discover the connection between academic mobility and productivity of scientists, and to improve methods of arrangement for the data related to the status and performance of the academia. To accomplish this goal, we propose a methodology for monitoring the interaction of Russian organizations with foreign scientists. We carry out the monitoring taking into account the priorities formulated in the Strategy of Scientific and Technological Development of the Russian Federation (hereinafter – STD Strategy of Russia). The monitoring provided the data about the quantity of foreign scientists, who visited Russian scientific organizations and higher education institutions in 2018 and 2019, the statistics on the distribution of foreign scientists working in Russia by age groups, by scientific fields, by types of interaction, and by Russian regions. The following issues require thorough consideration: the choice of parameters for assessing the work of educational and scientific organizations and the need to take into account priorities of STD Strategy of Russia for monitoring and evaluating the interaction between Russian organizations and foreign scientists, the presence or absence of stable links between the mobility of scientists and their scientific productivity, the absence and fragmentation of data on foreign scientists working in Russia, and flaws in the methods for collecting and monitoring such data. The methodology has been tested using data from previous surveys. Following the test, we propose specific steps for improving data collection on broad participation of Russia in global science processes. The obtained results can be used by private and state organizations, including the management of higher education organizations, heads of scientific organizations (scientific departments), which will serve as the basis for accurate positioning of Russia on the world map of scientific and technological cooperation.

Key words: circulation of scientific personnel, researchers, international academic mobility, monitoring, international scientific and technological cooperation.

Introduction

Academic mobility is important for countries seeking to prove themselves in the international arena, it is the key to many of the challenges facing states. These include gaining and maintaining the status of a scientific power, raising and maintaining the level of research, and internationally disseminating own achievements, such as research, technology, and equipment.

In order to formulate science policy, it is important to understand the movement of migration flows, migration trends depending on age, fields of science, and scientific organizations. However, the study of academic mobility is a complex task, and researchers are faced with insufficient and incomplete information, or the inability to process the bodies that may contain this information (e.g., scholarly summaries). With dramatic changes in lifestyles and ways of interacting, there is an increasing demand for research on a large number of parameters.

It is necessary to analyze the features of cooperation of Russian universities and scientific organizations with foreign scientists, which would allow assessing systematically the state and performance of the field of science, technology and innovation, changes in research areas in accordance with the priorities of scientific and technological development of the Russian Federation, due to the features of interaction of Russian organizations with foreign scientists.

Defining the nature, features and problems of interaction between Russian organizations and foreign scientists and developing specific measures for a broader participation of Russia in global processes in science are also relevant because in the era of globalization the successful development of universities and scientific organizations is directly linked to their positioning in the international arena. The level of involvement in international academic exchange is one of the important parameters for assessing the activities of educational and scientific organizations. Universities with leading positions in the world-famous QS World University Rankings and THE World University Rankings invite a significant number of foreign specialists. Thus, the assessment of mobility is associated, among other things, with the performance of organizations, which is important for various rankings of scientific and educational organizations.

Extent of prior research

The Scientific and Technological Development Strategy of the Russian Federation (hereinafter – STD Strategy of Russia) contains the principle of effective interaction of scientific organizations with various groups, including the international community[1] (paragraph 34d). An indicator of effective interaction can be the increased scientific productivity of a researcher, but there are different views in the foreign literature on the impact of mobility of scientists on scientific productivity. According to some authors, the advantages of attracting foreign specialists are their research orientation[2] (Welch, 1997) and high productivity (Dostie, Leger, 2009; Azoulay et al., 2011; Dubois et al., 2014; Halevi et al., 2016). Others find no connection between the mobility of scientists and their productivity (Bolli, Schläpfer, 2015). Thus, examining data on the mobility of Swedish scientists, O. Ejermo, C. Fasio, and J. Källström conclude that the effects of mobility depend largely on the scientific field (Ejermo et al., 2019). Thus,

[1] Scientific and Technological Development Strategy of the Russian Federation (approved by Presidential Decree No. 642, dated December 1, 2016). SPS "Konsul'tantPlyus".

[2] Industry Canada. International mobility of highly skilled workers: A synthesis of key findings and policy implications of the Skills Research Initiative. 2008. Available at: http://www.ic.gc.ca/epic/site/eas-aes.nsf/en/h_ra01877e.html

any analysis of the effectiveness of interactions with foreign scientists requires consideration of particular interactions and their features.

However, identifying the features of interactions with foreign scientists becomes a difficult task because of the paucity of information on the interactions and movement of scientists in the world. (Gahungu, 2011; Gomez et al., 2020). Open statistical information on scientists invited from abroad to Russia (D'yachenko et al., 2017), which is collected as part of the monitoring conducted by the Ministry of Science and Higher Education of the Russian Federation: Monitoring the performance of scientific organizations[3] and Monitoring the effectiveness of higher education organizations, according to the team of authors from the HSE University, is fragmentary.

Based on the results of a 2019 international study on the migration of all scientists from the Web of Science Core Collection database for 2008–2015, we have not yet been able to get a deep understanding of migration flows, their directions, and the causes of migration (Robinson-Garsia et al., 2019).

Partially filling the gaps in statistical data and tracing the migration patterns of scientists allow studies of migration of representatives of both individual organizations (Koksharov, Agarkov, 2018) and industries (D'yachenko, 2017; Yurevich, Aushkap, 2018; Antoshchuk, Ledeneva, 2019). In the paper on attraction of highly qualified foreign specialists to Russian universities, B.V. Zheleznev and A.V. Melikyan come to the conclusion that there are rather facilitated procedures for employment of foreign citizens in Russia, but point to the problem of lack of coverage of issues related to activities of foreign scientists in the Russian scientific literature (Zheleznev, Melikyan, 2012). Studies of foreign specialists working in Russia usually deal with the practices of attracting foreign specialists to certain universities in the country[4] (Zheleznev, Melikyan, 2012; Drugova et al., 2016).

Types of international scientific and technical cooperation (hereinafter – ISTC) are diverse. K.A. Zadumkin and S.V. Terebova divide them into two large groups – commercial and non-commercial (Zadumkin and Terebova, 2009), which are not limited to the circulation of scientific personnel. The researchers suggest evaluating the effectiveness of other types of ISTC, such as joint preparation of publications by scientists and specialists, participation in international conferences, symposia, etc.

The first attempt to collect and summarize data on the types of interaction of foreign scientists was made in 2019 by the Ministry of Education and Science of Russia with the participation of RIEPL. The study involved 441 organizations that interacted with foreign scientists in 2018. The following information was obtained and summarized: age groups of scientists, their research interests correlated with the priorities of STD Strategy of Russia, the countries from which scientists came, the main areas of interaction, and the Russian organizations that attracted the largest number of foreigners[5].

Thus, the processes of interaction of foreign scientists with Russian organizations are observed by Russian and foreign researchers, but require systematic and further comprehension. In our opinion, in order to improve the quality of ongoing research, information should be collected

[3] Available at: https://www.sciencemon.ru/

[4] International Academic Recruitment at NR TSU: Current State and Prospects for Development: Analytical Report. Available at: http:// innomap.tsu.ru/ UploadFiles/13017.pdf (accessed: July 21, 2021).

[5] Trubnikov G.V. et al. (2019). Interaction of Russian scientific organizations and educational institutions of higher education with foreign scientists in 2018. Moscow: IMG Print. Available at: https://riep.ru/activity/publications/drugie-izdaniya/676162/ (accessed: July 21, 2021).

using special techniques, which can improve the efficiency of its processing and interpretation. In our case, this is reflected in the methodology for monitoring the interaction of Russian organizations with foreign scientists, which consists of four areas, generally representing an algorithm for obtaining and processing results.

Research methods

In 2020, the Ministry of Education and Science of the Russian Federation and RIEPL conducted the second monitoring of interaction between Russian scientific organizations and institutions of higher education with foreign scientists[6]. A total of 976 Russian organizations participated in the monitoring, including 499 organizations that provided information on interaction with foreign scientists in 2019, of which 162 organizations provided facilities of their research infrastructure for use by foreign specialists[7] (Zolotarev et al., 2019). Regional branches of organizations in the study were counted as separate organizations. In total, data on 13,722 scientists were obtained in the course of the monitoring.

The algorithm for obtaining and processing the results includes four directions. Such a division is conditional, but at the same time problem-oriented, allowing to fully systematize the survey materials by fields of science, directions and geographical features of interaction, priorities of the STD Strategy of Russia, provision of access to the research infrastructure, etc. *(Fig. 1, 2)*.

In the first direction, data are presented on the age groups of foreign scientists, their research interests and directions of interaction with Russian scientific organizations and universities. Based on where they came from (EU countries, Asia or North and South America) we assessed some regional features of interaction. The results of the analysis in this area present the most general information on cooperation with foreign scientists and can be used for strategic planning in the scientific and technical field.

The second direction is devoted to the generalization of data on the geographical basis: from which countries scientists came and in which organizations, the research interests of scientists broken down by the country from which they came and the federal districts visited, the age of scientists broken down by their country. The analysis identifies the regions and organizations that use the most successful engagement strategies, which can be used to develop strategies for other regions. Also, the data obtained characterize scientific ties between Russia and foreign countries and can be useful for agencies.

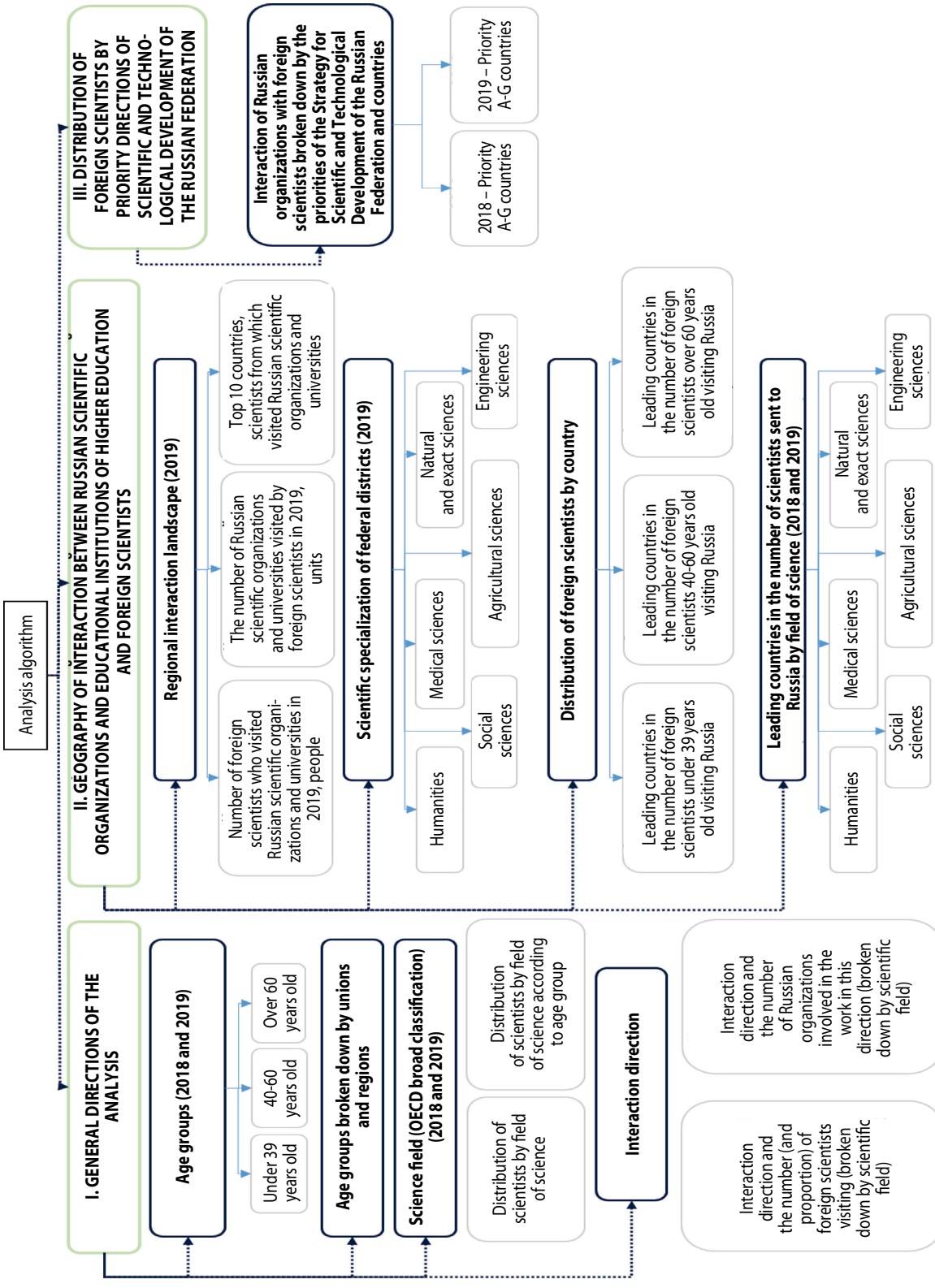
In the third direction, data on various scientific specialties correlated with the priorities outlined in the STD Strategy of Russia were compared in terms of the countries from which foreign scientists came. The results of the analysis can be used to assess the implementation of the STD Strategy of Russia.

The fourth direction presents organizations that interacted with foreign scientists in 2019, analyzes information on the stay of foreign scientists in Russia to use research infrastructure facilities, tools to attract foreign scientists to work at Russian infrastructure facilities, as well as data on providing access of Russian researchers to foreign research infrastructure facilities. The tools for attracting foreign scientists to work at the

[6] On June 25, 2020, letter MN-13/1076 was sent to Russian scientific organizations and educational institutions of higher education, as well as to the Joint Institute for Nuclear Research with a request to provide information on interaction with foreign scientists and on use by foreign scientists of Russian research infrastructure facilities (centers of collective use, unique scientific installations, scientific collections, research fleet, megascience facilities) in 2019 by July 10, 2020.

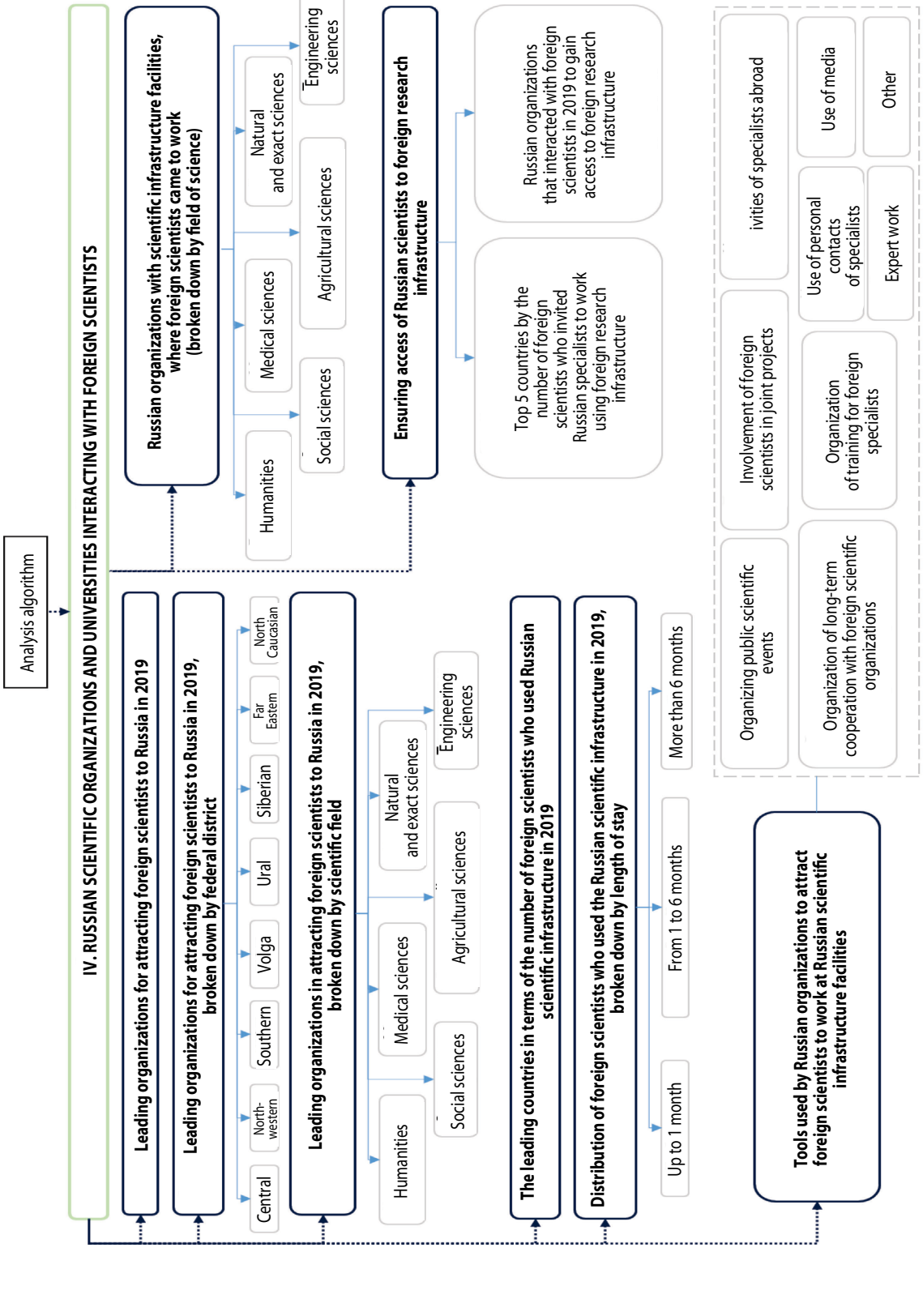
[7] Il'ina I.E. et al. (2020). Interaction of Russian scientific organizations and educational institutions of higher education with foreign scientists in 2019. Moscow: IMG Print. Available at: https://riep.ru/activity/publications/drugie-izdaniya/2065562/ (accessed: July 21, 2021).

Figure 1. Methodology for monitoring the interaction of Russian organizations with foreign scientists (directions 1–3)



Source: own compilation.

Figure 2. Methodology for monitoring the interaction of Russian organizations with foreign scientists (direction 4)



Source: own compilation.

facilities of the Russian research infrastructure were evaluated, and the facilities themselves were presented broken down by field of science. In total, we obtained data on 4,518 scientists who worked at Russian research infrastructure facilities in 162 Russian organizations, broken down by duration of their stay in Russia and the countries from which they arrived. For the purposes of the study, the research infrastructure facilities include research equipment sharing centers, unique scientific installations, scientific collections, the research fleet, and megascience facilities. The results of the analysis in this direction can be used to develop a concept for the promotion of Russian infrastructure facilities abroad.

Monitoring results and their interpretation

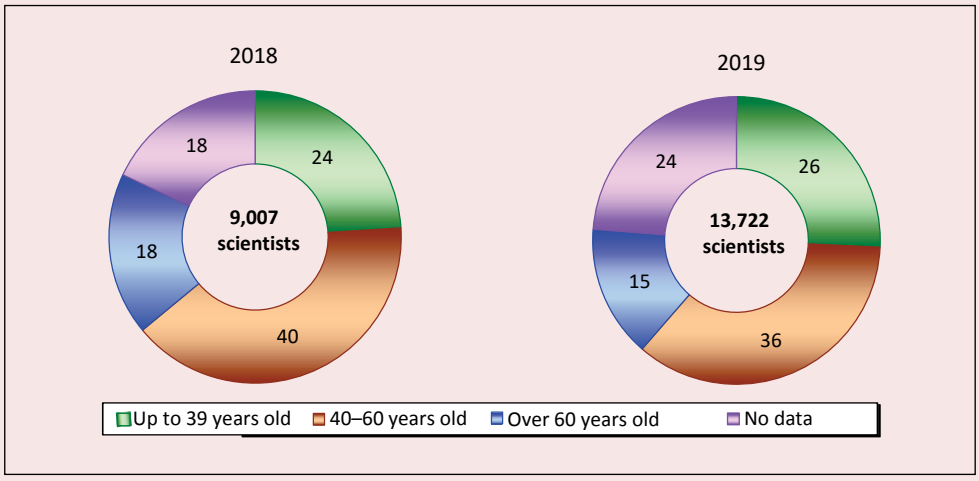
The results of monitoring the interaction of scientific organizations with foreign scientists will be presented by stages in accordance with the methodology under consideration.

General lines of analysis

In 2020, the number of Russian organizations that provided information on interaction with foreign scientists increased by 58 units (499 versus 441 in 2019). The number of foreign scientists about whom information was provided increased significantly. First of all, this happened because in 2020 data were received from large organizations that did not participate in the 2019 survey, such as the HSE University, Ural Federal University (UrFU), and Kazan Federal University (KFU).

In 2018 and 2019, mostly established scientists aged 40–60 came to Russia. The proportion of young scientists under 39 years old in 2019 was 26%, while the proportion of older scientists over 60 years old was 15% *(Fig. 3)*.

Figure 3. Distribution of foreign scientists by age group, %

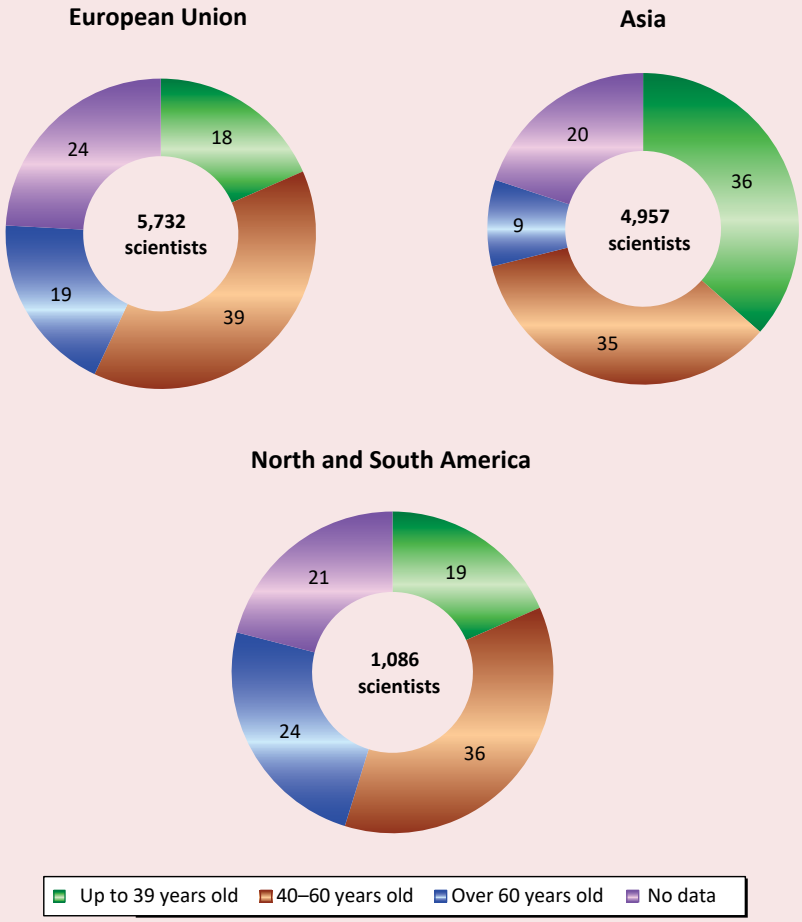


Source: own compilation according to the data of the monitoring of interaction of Russian scientific organizations and institutions of higher education with foreign scientists in 2018 and 2019.

Most young foreign specialists came to the organizations of the Siberian Federal District. Thus, 34% of all foreign scientists who visited Siberian scientific organizations and universities were in the age group under 39 years old. The proportion of young scientists among Chinese researchers was especially high: about 39% of all scientists who came to Russia from China in 2019 were under 39 years old.

Younger and older scientists generally have lower mobility rates, but this trend does not apply to scientists coming from Asia *(Fig. 4)*.

Figure 4. Distribution of foreign scientists by affiliation and age groups, %



Source: own compilation according to the data of the monitoring of interaction of Russian scientific organizations and institutions of higher education with foreign scientists in 2019.

Young scientists from Asia are much more mobile than their colleagues from other regions, while scientists over the age of 60 came to Russia quite rarely, which can be explained both by the higher level of foreign language skills among young researchers and by national characteristics, such as the state's priority support for foreign trips and foreign employment for young scientists.

In 2019, the first place in the number of foreign scientists who came to Russia was occupied by representatives of natural sciences, the second and the third by representatives of social sciences and humanities, respectively *(Tab. 1)*. Representatives of engineering sciences occupied only the fourth position.

We should note that the increase in the number of foreign scientists representing the natural sciences is partially explained by the fact that the Joint Institute for Nuclear Research (JINR), a major international intergovernmental organization based in Dubna (Moscow Oblast) that conducts research in physics, took part in the monitoring in addition to the Russian organizations themselves.

The most common formats of interaction between Russian organizations and foreign scientists are international scientific conferences and joint research projects. Thus, more than 40% of all foreign scientists who came to Russia in 2019 participated in international scientific conferences, panel discussions, symposia and scientific schools (as organizers or invited speakers). Almost one-third of all foreign specialists who came to Russian research organizations and universities participated in joint international research projects with their Russian colleagues *(Fig. 5)*.

Representatives of the humanities are less often involved in joint international research than scientists from other fields. This is due to the specifics of the research process in this field of science. The humanities are not characterized by the formation of large scientific collaborations; research is much more often carried out by individual scientists.

For foreign specialists in the social sciences, giving short lecture series and holding workshops is more common as a format of interaction with Russian research organizations and universities than for representatives of other sciences.

The main interaction form for foreign scientists representing natural and exact sciences is participation in joint international research projects (including all research projects conducted by JINR).

At the same time, such a format of interaction with Russian scientific organizations and universities as joint research projects and long-term

Table 1. Distribution of foreign scientists by field of science (OECD broad classification)

Field of science	2018	2019
Natural and exact sciences	2,635	5,981
Social sciences	1,028	2,302
Humanities	785	2,161
Engineering sciences	1,204	1,985
Medical sciences	247	727
Agricultural sciences	240	265
No field specified	2,868	301
Source: own compilation according to the data of the monitoring of interaction of Russian scientific organizations and institutions of higher education with foreign scientists in 2018 and 2019.		

Figure 5. Directions of interaction realized by foreign scientists with Russian scientific organizations and educational institutions of higher education, units

* Other forms of cooperation include study visits, visits to conduct negotiations on possible cooperation, discuss working issues, etc.

Source: own compilation according to the data of the monitoring of interaction of Russian scientific organizations and institutions of higher education with foreign scientists in 2019.

employment is more typical for foreign specialists representing engineering sciences.

Foreign scientists representing medical sciences came more often to learn about and work at Russian infrastructure facilities or to provide Russian specialists with the access to research infrastructure facilities abroad (e.g., biomedical databases).

Such a form of interaction as long-term employment in Russian research organizations and universities is less typical for foreign scientists representing agricultural sciences. However, since relatively few foreign agricultural scientists visited Russian organizations in 2019, this may be a statistical error.

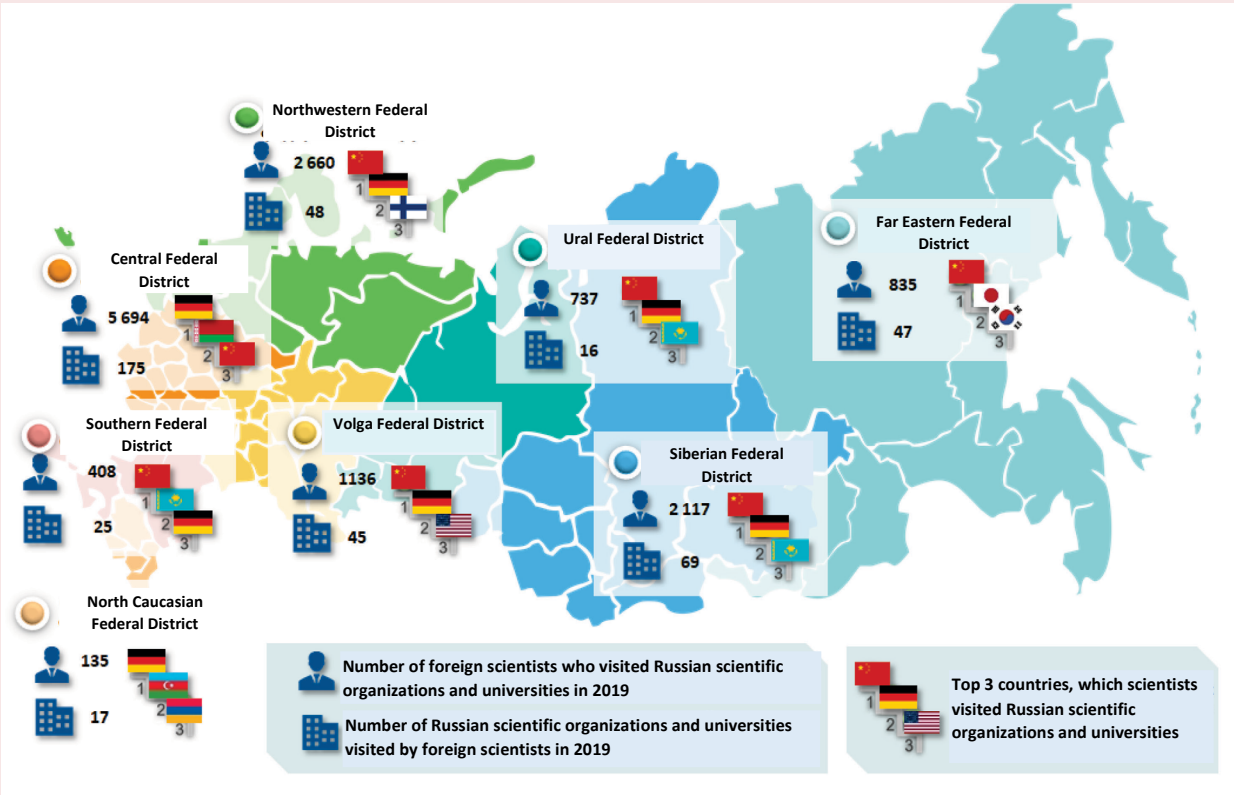
It was revealed that more than 40% of foreign scientists who came to Russia in 2019 interacted with scientific organizations and universities in the Central Federal District, about 20% – with organizations of the Northwestern Federal District.

Geography of interaction between Russian scientific organizations and educational institutions of higher education and foreign scientists

The regional landscape of interaction between Russian organizations and foreign scientists by federal district is shown in *Figure 6*.

Thus, the majority of foreign scientists in all federal districts, except for the North Caucasian and Central districts, were representatives of

Figure 6. Regional landscape of interaction between Russian organizations and foreign scientists in the context of federal districts of the Russian Federation



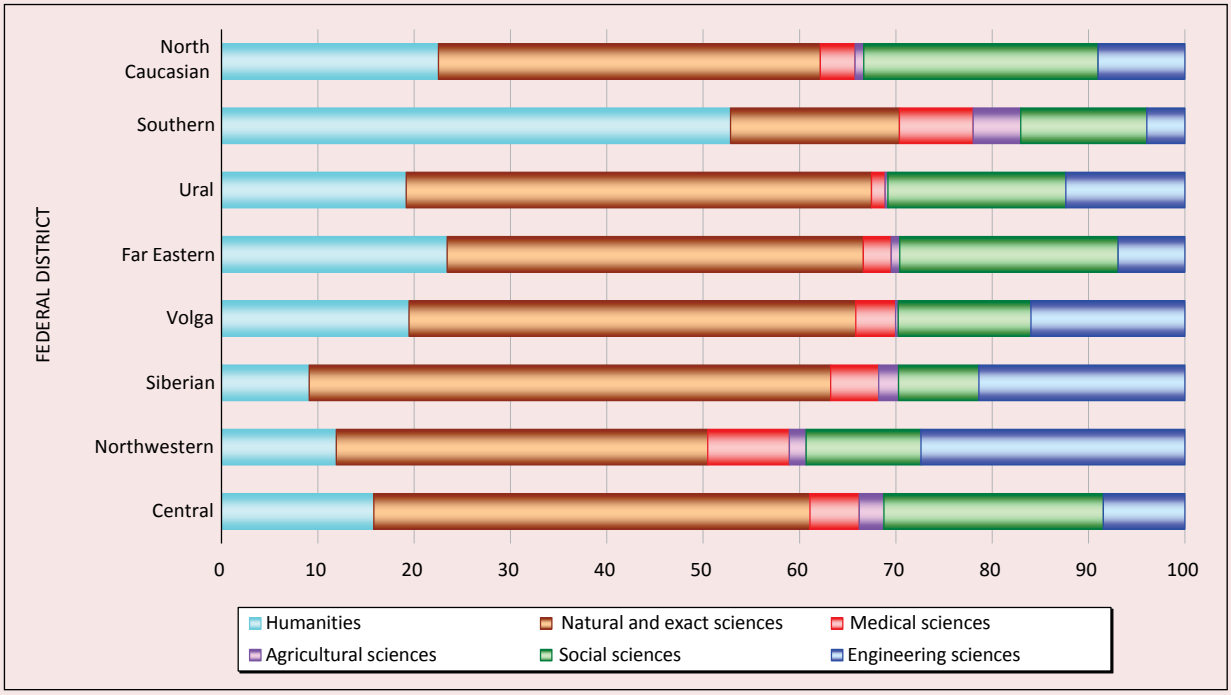
Source: own compilation according to the data of the monitoring of interaction of Russian scientific organizations and institutions of higher education with foreign scientists in 2019.

China, but certain regional specifics can be traced. For example, in the Northwestern Federal District the top three include representatives of Finland, in the North Caucasus – Armenia and Azerbaijan, and in the Far East – Japan and South Korea. In total, scientists representing 133 countries visited Russian scientific organizations and universities in 2019.

Primarily, those foreign scientists who interacted in 2019 with scientific organizations and universities in the corresponding federal districts specialized in the natural sciences *(Fig. 7)*. The exception is the Southern Federal District, where more than 50% of the visiting foreign scientists turned out to be representatives of the humanities (mostly philologists). Representatives of engineering sciences more often chose to visit organizations in the Northwestern and Siberian federal districts, while those dealing with social sciences chose the North Caucasian, Far Eastern, and Central federal districts.

A comparison of the data from the 2019 and 2020 surveys shows that there are strong scientific ties with the EU and Asian countries: the number of scientists who visited Russian scientific organizations and universities remains consistently high, despite the difficult situation with Russia's international relations. At the same time, scientific

Figure 7. Scientific specialization of federal districts of the Russian Federation according to the 2019 monitoring, %



Source: own compilation.

contacts with the countries of North and South America do not cease, but remain limited *(Tab. 2)*.

Table 2. Number of foreign scientists who came to Russia in 2018–2019, people

Region	2018	2019
EU	3,864	**5,732**
Asia	2,962	**4,957**
North and South America	717	**1,086**
Countries of other regions and unions	1,464	1,947
Total	9,007	13,722
Source: own compilation.		

In 2019, China ranked first in the rating of countries by the number of scientists coming to Russia *(Tab. 3)*. This may be due to the geographical proximity of Russia and China, as well as their extensive scientific and technological cooperation, including within BRICS.

Table 3. Top 10 countries from which foreign scientists came in 2019

Country	Number of scientists
China*	1,903
Germany	1,512
USA	794
France	709
Kazakhstan	698
Belarus	680
Italy	515
Poland	476
Japan	472
UK	448
Other countries	5,515
Total	13,722
* Hereinafter the data are for China excluding Taiwan. Source: own compilation.	

Young Chinese scientists under 39 years old were particularly active in interacting with

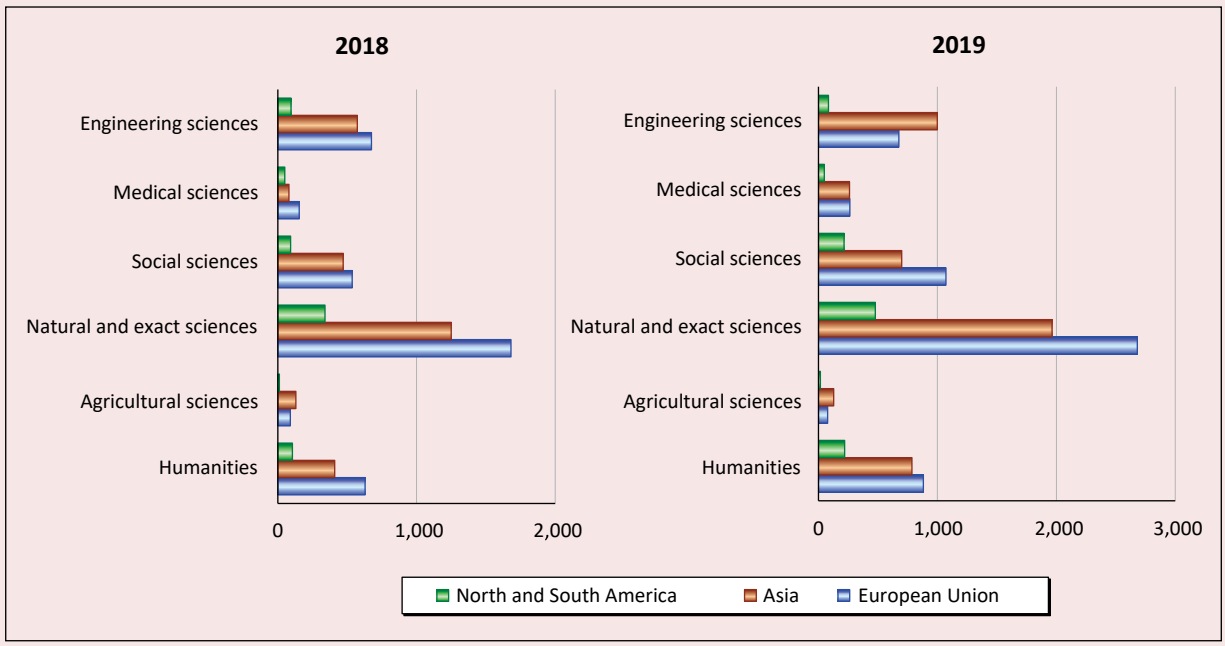
Russian scientific institutions and universities. Among middle-aged foreign scientists, Chinese researchers also ranked first, while among the elderly, researchers from Europe and the United States dominated, including in the age group over 60, the majority of visiting specialists were from Germany.

Active interaction with scientists from China and Germany develops within the framework of joint years of scientific and technical cooperation. Thus, the Russian-German year of scientific and educational partnerships (2018–2020) was opened in 2018. In 2020, the years of Russian-Chinese science and technology and innovation cooperation were opened (2020–2021).

Comparison of the data of the two surveys allows identifying features related to the scientific specialization of the foreign scientists who visited Russia. For example, many scientists from EU countries were representatives of the social sciences and humanities, from Asia – engineering sciences, and from North and South America – humanities *(Fig. 8)*.

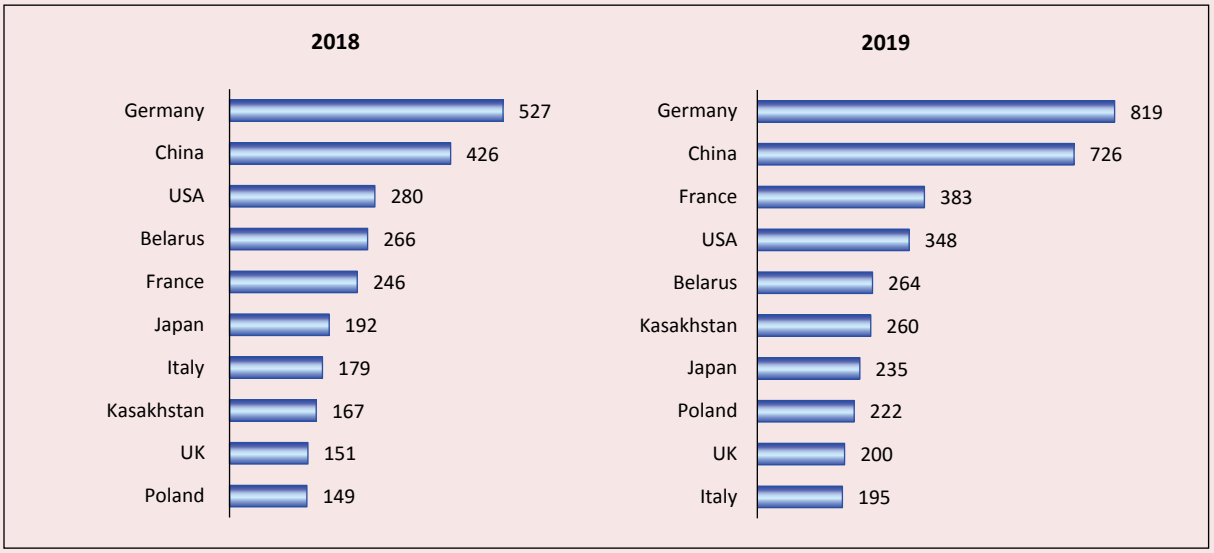
The natural sciences are one of the few scientific fields in which Germany retained the leading position in the number of foreign scientists coming to Russia in 2019 *(Fig. 9)*. In the social sciences and humanities, the large proportion of specialists come from the United States. At the same time, there was a noticeable decrease in the number of scientists from Ukraine.

Figure 8. Foreign scientists who visited Russia, by field of science, people



Source: own compilation according to the data of the monitoring of interaction of Russian scientific organizations and institutions of higher education with foreign scientists in 2018 and 2019.

Figure 9. Leading countries in the number of foreign scientists who came to Russia, representatives of the natural and exact sciences, people



Source: own compilation according to the data of the monitoring of interaction of Russian scientific organizations and institutions of higher education with foreign scientists in 2018 and 2019.

Distribution of foreign scientists by priority directions of scientific and technological development of the Russian Federation

Most foreign scientists whose areas of research interest fall within Priority A of the STD Strategy of Russia mostly came in 2019 to participate in international scientific conferences. Thus, one of the largest events that attracted a significant number of foreign specialists in this area was the international conference "Mechanisms and Nonlinear Problems of Nucleation and Growth of Crystals and Thin Films" (MGCTF'19) organized by Institute for Problems in Mechanical Engineering RAS in Saint Petersburg in July 2019, which was attended by over 70 foreign scientists.

The leaders in attracting foreign researchers in this area in 2019 were SPbPU (330 people), HSE University (308 people), and ETU "LETI" (108 people).

Most foreign scientists whose areas of research interest fall within Priority B came to Russia in 2019 to participate in international scientific conferences. Thus, the 5th International Workshop on Heat/Mass Transfer Advances for Energy Conservation and Pollution Control (IWHT2019) was held in Novosibirsk on August 13–16, 2019 with more than 100 foreign experts, including 98 representatives of Chinese universities and scientific organizations.

The leaders in attracting foreign scientists in this area in 2019 were IT SB RAS (149 people), Perm State University (138 people) and the Karelian Research Center RAS (106 people).

In 2019, more than 220 foreign specialists came to Russia to conduct medical research (Priority B) in various areas. Russian medical scientists from Sechenov University, Almazov National Medical Research Centre, and the Northern State Medical University cooperated especially actively with their foreign colleagues. Sechenov University and Almazov National Medical Research Centre are

the initiators of the creation of world-class scientific centers performing research and development on the priority of scientific and technological development (WCRC Digital biodesign and personalized healthcare and WCRC for Personalized Medicine).

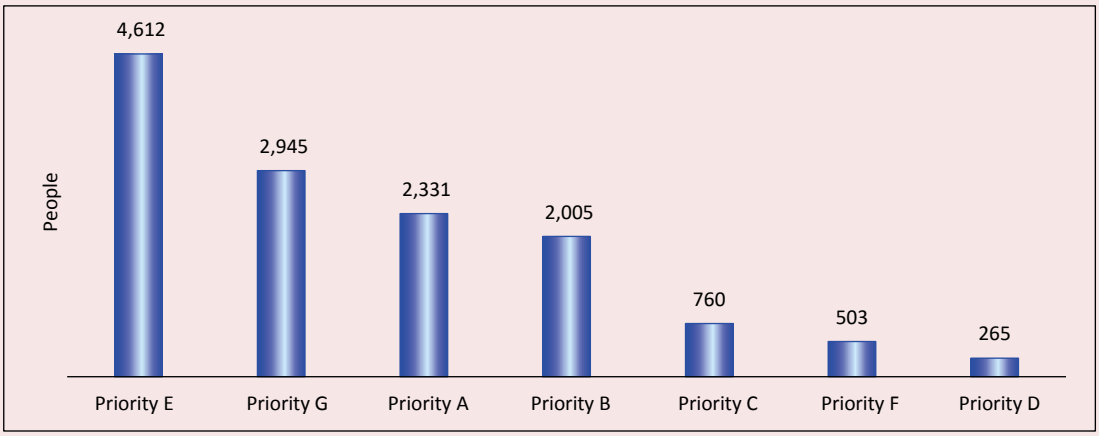
According to Priority C, cooperation with Russia's closest partners in the Eurasian Union, the republics of Belarus and Kazakhstan, is actively developing. Among the main formats of interaction are participation in international conferences and exchange of experience (including mastering skills in advanced research: microbial technology systems, development of microbial fertilizer production). In 2019, a large group consisted of representatives of such organizations as the Institute of Economic Geography (China), L.N. Gumilyov Eurasian National University (Kazakhstan), and SPC NAS of Belarus for Agricultural Mechanization (Belarus).

Priority D includes many diverse disciplines: physics, economics, biology, etc., so the formats of interaction within it were very diverse. Most of the foreign physicists who came to Russia in 2019 worked at JINR or participated in conferences organized at the Budker Institute of Nuclear Physics SB RAS. The main partners of the Russian organizations in this area were German researchers GSI Helmholtz Centre for Heavy Ion Research.

Representatives of economic disciplines most often came to Russia to participate in scientific conferences. The leading organizations in attracting foreign scientists in this area were the HSE University (218 people) and the Financial University under the Government of the Russian Federation (98 people).

The main format of cooperation between Russian scientific organizations and universities with foreign scientists within the framework of Priority F are international research projects. For example, Peter the Great Saint Petersburg Polytechnic University in 2019 was visited by 50 scientists representing the Aero Engine Corporation of China for the purpose of conducting joint research. The leaders in attracting foreign scientists

Figure 10. Interaction of Russian organizations with foreign scientists broken down by priorities of the STD Strategy of Russia



Source: own compilation according to the data of the monitoring of interaction of Russian scientific organizations and institutions of higher education with foreign scientists in 2019.

in this area were SPbPU (144 people), Kant Baltic Federal University (33 people), and Central Aerohydrodynamic Institute (26 people).

Most of the foreign scientists who interacted with Russian research organizations and universities in 2019 under Priority G were from the philological, historical, or pedagogical sciences. The main format of interaction is participation, organization and holding of scientific conferences, workshops and schools in Russia. For example, in November 2019 Kalmyk State University hosted a major international conference on topical issues of Mongolian and Altai studies, which brought together over a hundred leading scientists, including those from Kazakhstan, Mongolia, China, Azerbaijan, and Germany. The leading organizations in attracting foreign specialists in this area were the HSE University (242 people), the Moscow Pedagogical State University (149 people), Kalmyk State University (138 people), and Russian State University for the Humanities (136 people).

Overall, in 2019, the sphere of interest of about a third of all foreign scientists who came to Russia and interacted with scientific organizations and universities belonged to priority E, followed by priorities G and A, with priority D represented the least *(Fig. 10)*.

Russian scientific organizations and universities interacting with foreign scientists and providing access to research infrastructure

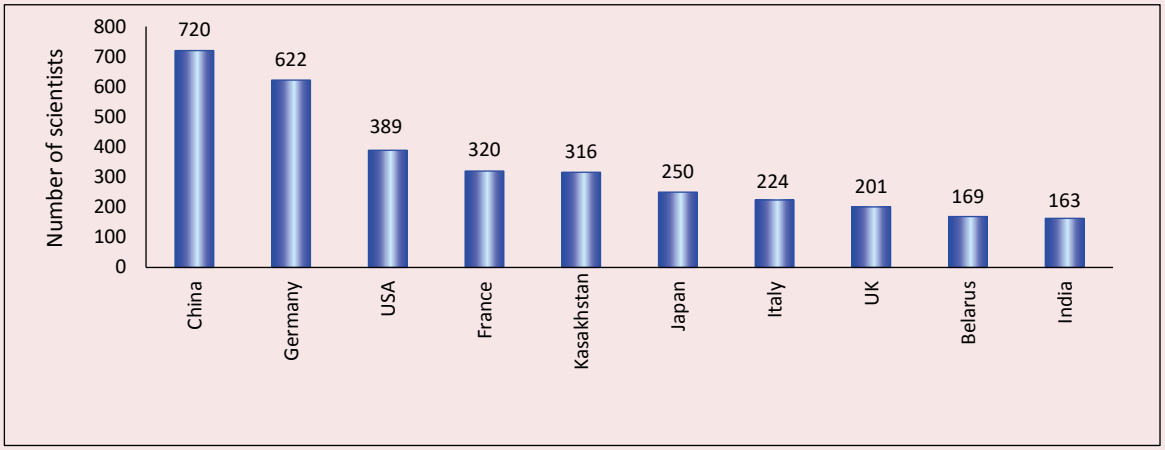
The majority of foreign specialists (1,036 people or 7.5% of the total number of foreign scientists from all organizations) cooperated with the international intergovernmental organization JINR (Central Federal District), the second place was taken by the HSE University (798 people or 5.8%; Central Federal District), the third place – Peter the Great Saint Petersburg Polytechnic University (758 people or 5.5%; Northwestern Federal District). In the top organizations that interacted with foreign scientists by field of science, about a third of the organizations are part of one of the world-class research centers (WCRC).

Most of the foreign specialists who came in 2019 to work at Russian research infrastructure facilities (research equipment sharing centers, unique scientific installations, scientific collections, the research fleet, and megascience facilities) were from the natural and exact sciences. An important area of cooperation for Russian organizations with foreign scientists (primarily representatives of the near abroad) was the provision of research infrastructure in the field of agricultural and medical sciences. The leaders in the number of scientists who used Russia's scientific infrastructure were China, Germany, and the United States: these countries accounted for almost 1/3 of all foreign researchers arriving in 2019 *(Fig. 11)*.

Thus, both European and Asian countries are represented in the top 10, from which we can conclude that the Russian research infrastructure is in demand in the world.

In order to work on the Russian research infrastructure, most scientists come to Russia for a short period of time – up to 1 month (78%). The distribution of other foreign specialists who used the Russian research infrastructure in 2019 by duration of stay is as follows: from 1 to 6 months – 12%, more than 6 months – 10%. A small difference between those coming for medium and long periods may mean that foreign researchers who plan to work on the Russian research infrastructure for 1 to 6 months are open to longer stays as well. Provided that the goals of interaction cannot be achieved in a short period, it is worthwhile for organizations to offer foreign scientists forms of interaction involving a longer (more than 6 months) stay.

Figure 11. Top 10 countries in terms of the number of scientists who took advantage of Russian research infrastructure in 2019



Source: own compilation according to the data of the monitoring of interaction of Russian scientific organizations and institutions of higher education with foreign scientists in 2019.

Many organizations create their own brand to attract foreign scientists to research infrastructure facilities and increase their visibility in the world through traditional scientific activities. They hold public scientific events, work with foreign scientists as part of grants, and prepare joint publications. One-fifth of the organizations monitored actively use modern means of communication to disseminate information about the availability of infrastructure. For example, they publish information about themselves and open vacancies, as well as future projects on their sites and partner sites, international job search resources, maintain Internet channels, etc.

The majority of foreign scientists who came to work at Russian research infrastructure facilities in 2019 were representatives of the natural and exact sciences (38 and 20%, respectively). An important area of cooperation between Russian organizations and foreign scientists (primarily representatives of the near abroad) was the provision of research infrastructure for cooperation in agricultural and medical sciences (a little over 20% of all organizations). On the contrary, foreign scientists provided Russian researchers with access to internships and infrastructure-assisted work in international scientific projects in the natural sciences.

Conclusion

Scientific novelty in the context of the problem posed consists in the authors' developed and tested methodology for monitoring the interaction of Russian organizations with foreign scientists, which allows systematizing the data reflecting the state and performance of science in the field of international scientific and technical cooperation (ISTC), and identifying gaps in scientific knowledge associated with academic mobility.

On the basis of the study the authors identified the parameters for assessing the activities of educational and scientific organizations, the need to take into account the priorities of the STD Strategy of Russia for monitoring and assessing the level of cooperative relationships between Russian and foreign scientists, the methodological framework for monitoring such data.

As a result of approbation of the methodology, we received a significant structured array of data on interaction between Russian organizations and foreign scientists. We identified the following specifics of interaction: age groups of visitors, their scientific specialization, and the main formats of interaction. In addition, we named the countries from which researchers come most often, including broken down by age and scientific specialization. We showed the regional features of interaction with foreign scientists and the specialization of the federal districts. We highlighted the main research interests of foreign scientists who came to Russia in the context of the priorities of the STD Strategy of Russia. We also identified leaders in attracting foreign scientists among Russian organizations. In the analyzed period these are mainly the leading scientific organizations specializing in physics, educational organizations – participants of the Project 5-100. We looked at the specifics of attracting foreign researchers to Russian research infrastructure facilities, including scientific specialization, period of stay, tools of attraction, etc. This information can be used both at the state level for the purposes of strategic planning in the field of ISTC, and at the level of organizations in the formation of ratings and indicators of their performance.

The analysis revealed that the most promising form of interaction with foreign scientists was to invite them to work in Russian research equipment sharing centers at unique Russian scientific facilities, megascience facilities, using scientific collections and the research fleet. Accordingly, Russian scientists could work just as effectively at similar sites abroad.

In the current context of actual ban on movement between countries for the purpose of organizing the survey the following year, the questionnaire was amended to identify online formats for interaction with foreign scientists and the platforms used by Russian organizations as part of such interaction. We have also added information on international classification codes to better identify the direction of the scientist. We supplemented the questionnaire with information about a foreign researcher's diaspora affiliation, since some foreign scientists are representatives of the Russian-speaking diaspora who maintain close contacts with colleagues from Russia and Russian organizations, where they often were in training. Of great importance in the realization of international scientific contacts are the legislative norms that hinder (favor) effective international cooperation on the territory of Russia. For such an assessment, the questionnaire includes questions related to the need to make changes aimed at regulating the international activity of organizations on the territory of the Russian Federation.

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Agent-Based Modeling of Regional Healthcare: Addressing the Task of Formalizing Residents' Medical Activity

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Abstract. The article addresses the task concerning the development of techniques for formalizing the behavior of agents-users of medical services in agent-based models designed to support decision-making on the spatial layout of health infrastructure facilities in the region. We analyze approaches to determining the behavior patterns of consumers of medical services and, on this basis, develop the structure of agents' behavior model. We consider the implementation of the proposed model with the help of fuzzy neural networks. While forming the network, we use the results of a sociological survey conducted by Vologda Research Center in the territory of the Vologda Oblast in 2020. Practical implementation of the network is carried out in the Microsoft Access environment. Using this tool, we conduct a number of experiments to determine residents' medical activity based on the initial data of the sociological survey. We use general scientific methods of formalization, abstraction, generalization, methods of system analysis, mathematical statistics, and fuzzy logic. The results of our work consist in designing the structure of behavior model for agents-consumers of medical services and methods for its implementation. Scientific novelty of our findings consists in the proposed structure of behavior model of agents-consumers of medical services and its practical implementation with the use of fuzzy neural networks in relation to the manifestation of medical activity. Practical significance of the results lies in the fact that the instrumental approaches proposed and partially tested in it will allow us to develop agent-based models of regional healthcare adequate to objective environmental conditions, taking into account citizens' attitudes and behavior motives in interaction with medical services. In the future, this will help us to put forward and adjust measures to improve the efficiency of spatial layout and functioning of networks. Further work will be related to the improvement of the proposed methods in the following areas: determining ways to train the developed fuzzy neural network and finding ways to implement the remaining elements of the developed model for agent behavior.

Key words: healthcare infrastructure facilities, medical services, medical activity, agent-based modeling, fuzzy neural networks.

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Introduction

In the context of development of technological capabilities of modern medicine and amid an increased interest of citizens in obtaining medical services, regions are faced with an important socio-economic task to form an effective spatial health infrastructure that ensures an accessible environment for the provision of services. In modern conditions, this problem cannot be solved without the use of simulation tools. We are implementing a project to develop scenarios for an optimal spatial layout and functioning of regional healthcare infrastructure with the use of agent-based simulation models. The main idea of the project is to form an architecture of agent-based models for the spatial network of regional healthcare, taking into account fundamental parameters of the sector's institutional environment, including the blurring of the boundaries between the public and commercial sectors, as well as features of residents' behavior in interaction with medical organizations, which in modern conditions assume a specific character. The novelty of the project lies in the fact that the object of simulation is the healthcare system, including not only basic government structures, but also the

profit sector and the "third" sector. In addition, the constructed simulation models will be based on a set of reliable data combining official statistical reports, geo-information systems and sociological surveys conducted with our direct participation. The study and formalization of residents' motives and behavioral attitudes in relation to their medical activity and their choice of strategies for seeking medical care at medical institutions, including commercial ones, will allow taking into account the criterion of accessibility of medical care for citizens in simulating and further elaborating on management measures. Thus, the model will be based on objective prerequisites, actual needs, motives and behavior of agents; consequently, it can used in management practice and testing alternative scenarios for decision-making and implementation of regional policy.

The essence of the project is to apply agent-based modeling so as to solve the problems of spatial layout of networks of the regional health system (in the case of the Vologda Oblast), ensuring its effective functioning in the interests of the population.

The main purpose of the study is to develop methods for formalizing the behavior of agent users of medical services in an agent-based model of optimal spatial layout and functioning of the health infrastructure in the region. To achieve this goal, the following tasks were addressed:

– developing a general concept of an agent-based model, which defines its structural and functional components;

– analyzing behavioral patterns of consumers of medical services;

– implementing a mechanism of manifestation of medical activity in the behavior of agents-users of medical services.

The novelty of our research results consists in the proposed structure of the behavior model of consumer agents of medical services and its practical implementation using fuzzy neural networks in relation to the manifestation of medical activity.

Practical significance of the results obtained consists in ensuring the possibility of implementing agent-based models designed to support decision-making related to the management of the healthcare system at the regional level. The results can be useful for administrative structures at the regional and municipal levels of government.

Materials and methods

Initial data

It is almost impossible to get a real picture regarding the health status of population in a particular region because of the extreme dynamism of this category and also due to limited technical capabilities of modern medicine. Anyway, there is no need to get such a picture. It is sufficient to use a system that includes the study of people's well-being on the basis of representative surveys. Our study used data from the sociological survey "Studying the health of the population and its determining factors", which is regularly conducted by VolRC RAS among Vologda Oblast residents; 1,500 people living in cities, towns and rural settlements of the Vologda Oblast participate in the survey. The sample of respondents is representative and quota-based. Sampling error does not exceed 3%. The article analyzes survey data for 2020 in order to identify residents' medical activity in the context of gender, age, education, place of residence and social status. Respondents' medical activity is assessed on the basis of questionnaires they filled in. Answers to the following questions: "What do you usually do when you are feeling unwell?" (answer options: "I try to put up with it, I don't consult a doctor and I don't try to find treatment on my own; it will pass, somehow") and "What do you do to preserve and strengthen your health?" (answer option: "I go to the doctor at the first signs of illness, I regularly undergo medical examination") help us to differentiate agents by the extent of medical activity. The proportion of positive answers to these questions is the source of determining the parameters of membership functions.

The task to define optimal spatial layout of health resources

Health consistently ranks first in the priorities of Russians; in contrast, their satisfaction with the availability of medical care is the lowest among life satisfaction parameters[1]. The main obstacles to an adequate response of Russian healthcare to the expectations of citizens include the lack of resource provision combined with the underutilization of numerous reserves to increase the efficiency of the use of available material, labor, and financial resources[2].

The current concept for development of Russian healthcare is based on an approach according to which the priority task in the implementation of the program of state guarantees is to ensure the availability and quality of medical care that satisfies people's needs and uses state resources effectively[3]. Rationing of resource consumption by the healthcare system involves comparing the costs of medical services and, in general, the amount of medical care provided, with the results identified during their provision. The best result obtained at lower costs indicates the optimal use of resources in the production of a unit of production. Medical and social effectiveness is considered from the standpoint of reducing morbidity, disability, mortality, increasing life expectancy and its quality.

A picture of what is happening can be formed by studying the situation on the basis of statistical data, i.e. on information that claims to be scientific, accurate and reliable. This approach underlies the development of management decisions in the field of healthcare and the state discourse on medicine (Mikhailova et al., 2007). Healthcare planning in the Russian Federation is carried out at three levels: federal, regional and municipal. The federal level is mainly responsible for the formation of a general strategy. At the regional and municipal levels, the planning of volumes and types of medical care is carried out, taking into account the capacity and structure of the institution, and the number of the population registered with the institution.

Healthcare planning uses various methods: analytical, balance, regulatory, etc. All these methods are almost fully used in the experimental method; any innovation is necessarily tested and evaluated during an experiment. In this regard, of great importance is the task performed by computer models to construct a socio-economic context with further "rehearsal" verification and approbation on the proposed simulation model of management decisions. Agent-based models belonging to the class of models based on the individual behavior of agents and created for computer simulations are especially promising in the economy and social sphere. Designing an agent-based model as close to reality as possible, which would reflect the set of basic and fundamental transactions between agents within the regional healthcare system, will help to adopt adequate management decisions regarding the allocation of resources and a rational spatial layout of infrastructure facilities in the sector.

In our opinion, agent-based modeling is a particularly appropriate way to design realistic scenarios for spatial location of social infrastructure objects and organize effective routing algorithms for citizens in the context of the regional spatial system. The use of agent-based modeling in addressing applied issues of public administration is to a certain extent universal. In other words, there are no instrumental differences in the application of an agent-based approach to urban economy, education or healthcare. According to some foreign studies, it is a powerful and flexible tool for developing optimal management decisions at various levels (Gaffard, Napoletano, 2012; Dawid, Neugart, 2011; Mendritzki, 2010; Mendritzki, 2010; Badham et al., 2018; Silverman, 2014). However, the very characteristics fed into the model should

[1] VCIOM survey, October 2017. Available at: https://wciom.ru/index.php?id=236&uid=116472

[2] Ibidem.

[3] Strategy for development of healthcare in the Russian Federation for the long-term period 2015–2030.

be extremely specific and correspond as much as possible to the actual practice of management and activity in a particular area. The experience of agent-based modeling in Russia is contained mainly in the works of scientists from the Central Economics and Mathematics Institute, RAS (CEMI RAS) under the leadership of Academician V.L. Makarov (Makarov, Bakhtizin, Sushko, 2016, 2019; Bakhtizin, 2008).

Agent-based modeling (ABM) is becoming increasingly widespread in the healthcare sector. Formerly, scientists used it only to model epidemiological diseases and their spread among populations, while nowadays the scope of application of ABM has become wider (Tracy, Cerdá, Keyes, 2018). In comparison with traditional analytical approaches, ABM helps to solve a wider range of problems, so that it can shed new light on public health issues. In fact, the two main goals of ABM related to public health are to explain and predict the outcomes regarding people's health, taking into account aspects of a complex system in which public health exists. From these goals proceed the main advantages of ABM for research, practice, and policy in the sphere of public health: these models provide insight into the underlying mechanisms that determine health behaviors and outcomes (as well as inequalities in these behaviors and outcomes), and they can be used to conduct virtual experiments on interventions aimed at reducing the burden of disease among people.

Thus, there is significant and important global experience of methodological elaboration and practical implementation of agent-based modeling in the practice of public administration in general and in healthcare in particular; but still insufficient attention is paid to aspects of spatial layout of health infrastructure facilities, which, in addition, rarely rely on people's actual needs and behavioral attitudes of various social groups.

The conceptual basis of the models will include agents and their functioning environment. Population of the region and some elements of the resource provision of the regional healthcare system will be considered as agents. Population agents are identified with certain social groups that have similar behavior in terms of needs for medical services. The main purpose of their functioning is the most complete satisfaction of these needs. To achieve these goals, they interact with medical resources agents. We propose to create an interactive system for the formation of the structure of population agents within the framework of the models, taking into account changes in the parameters of the environment of the functioning of agents and the structure of medical resources agents. Medical resources agents act as service providers for population agents. They can be passive, which means they wait for resident agents to seek medical care from them, or they can be active, which means they search for possible clients of the services they provide. The environment of the agents' functioning consists of elements that influence the structure and behavior of agents within the model. Such elements will include, in particular, elements of transport infrastructure, communication infrastructure, industrial infrastructure, natural and climatic features of territories, etc. The model elements have a spatial reference, according to which the nature and degree of their interaction is formed. At the same time, the agents will be able to move spatially. The proposed approaches will provide the most optimal solution to the problem of efficient use of health resources at the regional level due to the possibility of taking into account elements of the lower level of the system when making decisions, as well as the possibility of operational reconfiguration of the model in the conditions of dynamic changes in the subject area of simulation. For the successful use of the model in making managerial decisions and in comparing resource allocation options, we think that its architecture should be constructed with the use of objective data that accurately describe the demographic,

institutional and economic context (the nature of settlement, the number and age structure of the population, the provision of health infrastructure facilities, medical personnel and financial resources, the development of the commercial sector of medical services). Integration with geo-information systems and reliance on data from sociological surveys that describe the actual specifics of citizens' interaction with medical institutions will add special functionality to the model.

When building the models, we plan to focus on optimizing the spatial layout of the network of medical institutions, taking into account the levels, stages and routing of patients (rural health clinics (FAPs) – central district hospitals – regional healthcare institutions, etc.), as well as the growing influence of commercial sector services on what the patients will choose. At the same time, the main emphasis will be placed on the disparities in the availability of medical care between different categories of the population (they will be grouped into homogeneous communities and act as agents in the models). The practical significance of the model lies in the fact that it will be used as a tool for testing regional governance mechanisms. The development and testing of various scenarios for spatial placement of health infrastructure networks and agent interaction (conducting computer experiments on an artificial society) with the use of the model will helps us avoid the trial-and-error practice in the implementation of regional public health policy. Ultimately, the model should help to work out measures to improve the spatial layout of the network of medical institutions based on the behavior of agents (patients) and also depending on the influence of the designated group of factors, which will help to increase the efficiency of the system and the accessibility of medical care for citizens.

We believe that the scenarios we are going to design for the spatial placement of health infrastructure facilities should be based on objective imperatives in the behavior of residents of territories in their interaction with medical services; they should also be based on migration attitudes and a set of internal factors, including gender and age, education, welfare, place of residence, etc. Thus, when implementing the project, it is of particular importance to determine methods for formalizing the behavior of users of medical services in an agent-based model of optimal spatial layout and functioning of regional health infrastructure.

Formalization of the task

The task of simulation is based on three pillars: services, service mobility and user agents. User agents have mobility, can move freely in space, reach points of interest – services. The latter, in turn, are characterized by various mobility opportunities. A number of services have the function of moving and transporting an agent from a place of residence or an incident that caused the need for medical care (ambulance, doctor's home visit, mobile medical services). Other services are in-patient (for example, medical appointment, pre-arranged hospital care). In general, the interactions of user agents and services are to a certain extent regulated by legislative documents, resolutions and protocols; this fact provides ample opportunities for the precise structuring of their points of contact, distribution of user placement nodes and points of interest within the agent-based model. A significant problem consists in the formalization of user behavior, since it depends on behavioral factors, habits and cultural attitudes of the population. In the simplest version, the user within the framework of the model exists in two alternative modes – the presence, the feeling of the need for services and assistance, and the absence of such a need. In some cases, primarily in emergency situations, the need becomes more objective and obvious when the fact of the agent's need for help can be registered by other agents (a traffic accident, a violent act, a serious health

deterioration causing a blackout), however, in most cases, the assessment of the need to go to the hospital is dictated solely by the free choice of the person themselves.

The task of optimal placement of health services is related to the search for options that provide the best characteristics of the system, taking into account the selected criteria. To date, there are no unambiguously defined optimality criteria. As a rule, they are formulated at the level of public administration on the basis of accepted priorities and existing opportunities. In most cases, they are associated with time restrictions on the possibility of receiving a particular service.

In general, the model is presented as follows (Dianov, 2020):

$$M = \langle U, R, S, C \rangle, \quad (1)$$

where U denotes the nodes where services and clients are located,

R denotes the connections between the nodes,

S denotes services, C – users.

Services and users can be located in a limited number of places. Based on this, the model M can have a certain number of nodes where services and users are located:

$$U = \{U_1, \dots, U_{UN}\}. \quad (2)$$

Between the nodes there may be many connections – ways of moving services and users:

$$R = \{R_1, \dots, R_{RN}\}. \quad (3)$$

The nodes and connections have a set of different attributes:

$$\begin{aligned} U: A^U &= \{A_1^U, \dots, A_{AUN}^U\}, \\ R: A^R &= \{A_1^R, \dots, A_{ARN}^R\}. \end{aligned} \quad (4)$$

The model contains many services and users:

$$S = \{S_1, \dots, S_{SN}\}, \quad (5)$$

$$C = \{C_1, \dots, C_{CN}\}. \quad (6)$$

In relation to the task we are addressing, they possess active behavior and belong to the category of agents.

The Service agent can be described as follows:

$$S = \langle U_i, A^S, Bh^S \rangle, \quad (7)$$

where U_i is the node of the permanent location of the service,

A^S is a set of attributes of the service ($A^S = \{A_1^S, \dots, A_{ASN}^S\}$),

Bh^S is a behavior pattern of the service.

The User agent has a similar description:

$$C = \langle U_i, A^C, Bh^C \rangle, \quad (8)$$

where U_i is the node of the user's permanent location,

A^C is the set of the user's attributes ($A^C = \{A_1^C, \dots, A_{ACN}^C\}$),

Bh^C is the user's behavior model.

Behavior models contain modules in which agents' behavior scenarios are defined. Modules consist of a set of rules that allow the agent to select a particular scenario depending on the current values of parameters of the model's elements.

Two modules are defined in the Service agent's behavior model:

$$Bh^S = \{Md_s^S, Md_d^S\}, \quad (9)$$

where Md_s^S is a module of service provision scenarios,

Md_d^S is a module of movement scenarios.

Services agents can be of two types: stationary, rigidly tied to a specific node, and movable. For stationary agents, the module of movement scenarios is not defined: $Md_d^S = \emptyset$.

At the level of the module of service provision scenarios, the possibility of and the procedure for providing a service to a specific user is determined. Based on this, the rules use the values of the user and service attributes:

$$\begin{aligned} Md_s^S = \{ & Pr_1^{MdSs}(A^S, A^C), \dots, \\ & , \dots, Pr_{PrMdSsN}^{MdSs}(A^S, A^C) \} \end{aligned}, \quad (10)$$

where $Pr_i^{Md\dots}(X_1, \dots, X_{XN})$ is the i-th rule of the module, containing the parameters $X_1, \dots, X_{XN}$.

At the level of the movement scenarios module, we determine the necessity, possibility, parameters and route of the agent's movement:

$$Md_d^S = \{Pr_1^{MdSd}(A^S, A^C, A^U, A^R), \dots, , \dots, Pr_{PrMdSdN}^{MdSd}(A^S, A^C, A^U, A^R)\}. \quad (11)$$

Two modules are also defined in the User agent behavior model:

$$Bh^C = \{Md_{gu}^C, Md_{pu}^C\}, \quad (12)$$

where Md_{gu}^C is the module of scenarios for generating the need for a service,

Md_{pu}^C is the module of scenarios for receiving the service.

The module of scenarios for generating the need for a service provides the ability of the User agent to initiate the emergence of the need and desire to receive a specific service. It depends on the personal features of an agent and environmental factors of the agent's existence:

$$Md_{gu}^C = \{Pr_1^{MdCgu}(A^C, A^U), \dots, , \dots, Pr_{PrMdCguN}^{MdCgu}(A^C, A^U)\}. \quad (13)$$

Using the rules of the module of scenarios for receiving the service, the User agent decides upon the possibility and method of receiving the service and determines its own actions:

$$Md_{pu}^C = \{Pr_1^{MdCpu}(A^S, A^C, A^U, A^R), \dots, , \dots, Pr_{PrMdCpuN}^{MdCpu}(A^S, A^C, A^U, A^R)\}. \quad (14)$$

The mode should have an optimality criterion. It is related to the assessment of the dynamics of changes in the properties of Services agents and User agents:

$$K = f\big(d(A^S), d(A^C)\big), \quad (15)$$

where $f(\ )$ is the function for determining the optimality criterion,

$d(X)$ is the function characterizing the dynamics of the change in parameter X.

The solution of the problem is connected with multiple simulation of situations with different combinations of the location of Services agents in the nodes. Based on the results of each iteration, the value of the optimality criterion is calculated. The obtained values of the criteria are compared. Based on the results of the comparison, the model with the best, in a certain sense, criterion value is selected.

Models of activity of agents of consumers of medical services

One of the tasks that needs to be solved in relation to the proposed model is to implement the rules of the module of scenarios for generating the User agent's need for a service.

Ronald M. Andersen's behavioral model (Andersen, 1968) is the basis of most modern concepts describing the behavior of users of medical services. The use of health services is considered as a result of the action of three groups of factors:

– factors characterizing users of health services. Demographic characteristics (gender, age) are considered as biological grounds for the use of certain types and volumes of medical care. Socio-structural parameters (education, profession) determine people's ability to cope with emerging health-related problems and their ability to manage the available resources. The system of people's ideas about health, i.e. their values, attitudes, as well as knowledge about the possibilities of medicine and modern healthcare can affect their awareness of the need for medical care and the very process of using medical services.

– enabling factors. They determine the conditions under which it becomes possible to use the services. These factors may include access to health insurance, the ability to pay for services from one's own resources, and the time spent on receiving medical services.

– need. This group of factors determines the urgency of the need for medical care, measured, as a rule, with the help of a professional medical assessment of health and variables characterizing the perception and awareness of the need for medical

care by an individual. The indicators reflecting the feelings of an individual are usually as follows: self-reported health status, ability to function in key types of activities, the level of anxiety concerning various painful symptoms. Their role in the use of medical services largely depends on the social and status-related features of the consumer and their general views concerning health.

Analyzing the relationship between the features that reflect the attitude toward health and illness with the use of medical care makes it possible to better understand in which situations a person considers it necessary to seek medical care and turns to the healthcare system (Rusinova, Panova, 2002).

In addition to the above parameters, the behavioral model also includes the following (Pottick, Hansell, Gutterman, White, 1994; Mirowsky, Ross, 1983; Nichol, Stimmel, Lange, 1995; Katz, 1996; Wennberg, Barnes, Zubkoff, 1982; Lurie, 1993):

– features of the environment in which medical services were received;

– features of the healthcare system (health policy, system resources, organization of medical care);

– features of the use of medical services (type and place of the service received, reasons for and frequency of consulting a doctor);

– characteristics of the environment external to the healthcare system (economic, political and social factors that determine the functioning of the healthcare system and affect the behavior of users of health services). The most important parameters of the external environment, which, as it is generally assumed, can influence the behavior of users of health services and medical professionals, are as follows: economic climate, welfare of population and its individual groups, priority development goals, the severity of stress and violence, and dominant norms in society;

– features of medical professionals and parameters of their interaction with patients.

Not everyone has a proactive attitude toward health preservation; this is due to various factors that affect people's activity. It often turns out that an individual understands what measures are necessary to maintain good health, but does not take these measures due to certain factors. These factors act as an obstacle to health protection.

Human health depends a lot on the lifestyle, which to a large extent is individual and is determined by historical and national traditions and personal inclinations.

Usually, when studying medical activity, one assesses the completeness and timeliness of seeking medical help and the implementation of medical recommendations, the habit of resorting to self-treatment and receiving help outside the field of official medicine. Confidence in the importance of one's own efforts to maintain health correlates with the level of education, professional status and self-assessment of income. However, the results of sociological surveys indicate that despite the awareness of the importance of prevention and early diagnosis of diseases, the majority of respondents seek medical help only if there emerge pronounced symptoms of the disease (Pokrovskaya, 2012).

In general, there are three main patterns of citizens' behavior when they fall ill[4]:

1) favorable (seeking medical attention as soon as possible and fulfilling all the recommendations of the doctor);

2) unfavorable (going to a doctor when it is already late, or seeking medical care in emergency cases, fulfillment the recommendations with negligence);

3) intermediate (a combination of the above patterns).

[4] Features of medical activity of citizens during the period of illness. *Evraziiskii Soyuz Uchenykh. Meditsinskie nauki.* Available at: https://euroasia-science.ru/medicinskie-nauki/%D0%BE%D1%81%D0%BE%D0%B1%D0%B5%D0%BD%D0%BD%D0%BE%D1%81%D1%82%D0%B8-%D0%BC%D0%B5%D0%B4%D0%B8%D1%86%D0%B8%D0%BD%D1%81%D0%BA%D0%BE%D0%B9-%D0%B0%D0%BA%D1%82%D0%B8%D0%B2%D0%BD%D0%BE%D1%81%D1%82%D0%B8/

Table 1. Classification of patients in medical institutions in the healthcare sector of the Russian Federation

Patient's health status	Patient's attitude toward healthy living and their medical activity	
	High	Low
A. Healthy	Patients with a high level of health indicators, pursuing a healthy living, taking responsibility for their own health and the health of others. Such patients regularly visit medical institutions and undergo medical checkup.	Patients with a high level of health indicators, who do not pursue a healthy living, and neglect medical checkup. This significantly increases the risks of various diseases in such patients, reduces the internal potential of their body
B. With the risk of a disease	Patients who lead a healthy lifestyle, have high rates of medical activity, but also a high risk of falling ill. Such patients are less likely to develop a disease or experience its transition to a chronic form	Patients who have a risk of developing a disease, but who do not adhere to a healthy lifestyle, rarely go to a doctor; all this increases the likelihood of deterioration of their health
C. With an acute form of the disease	Patients with high medical activity and leading a healthy lifestyle. In such patients, an acute form of the disease is less likely to evolve into a chronic one	Patients who neglect their health. They have an increased likelihood of complications and the transition of an acute form of the disease into a chronic one
D. With a chronic form of the disease	Patients with a long period of remission of a chronic disease and with higher living standards	Patients included in the group of unfavorable prognosis for the disease. Their quality of life is gradually decreasing
E. Persons with disabilities		
Compiled according to: Kulikova O.M., Boush G.D. (2016). Ontological model of process management of medical services in the health of Russian Federation. *Nauka o cheloveke: gumanitarnye issledovaniya,* 1(23), 215–220. DOI: 10.17238/issn1998-5320.2016.23.215		

Table 1 shows one of the possible options for classifying patients in medical institutions according to two types of activity – high and low. The possible variants of forecasts are also indicated here, depending on the current health status and medical activity.

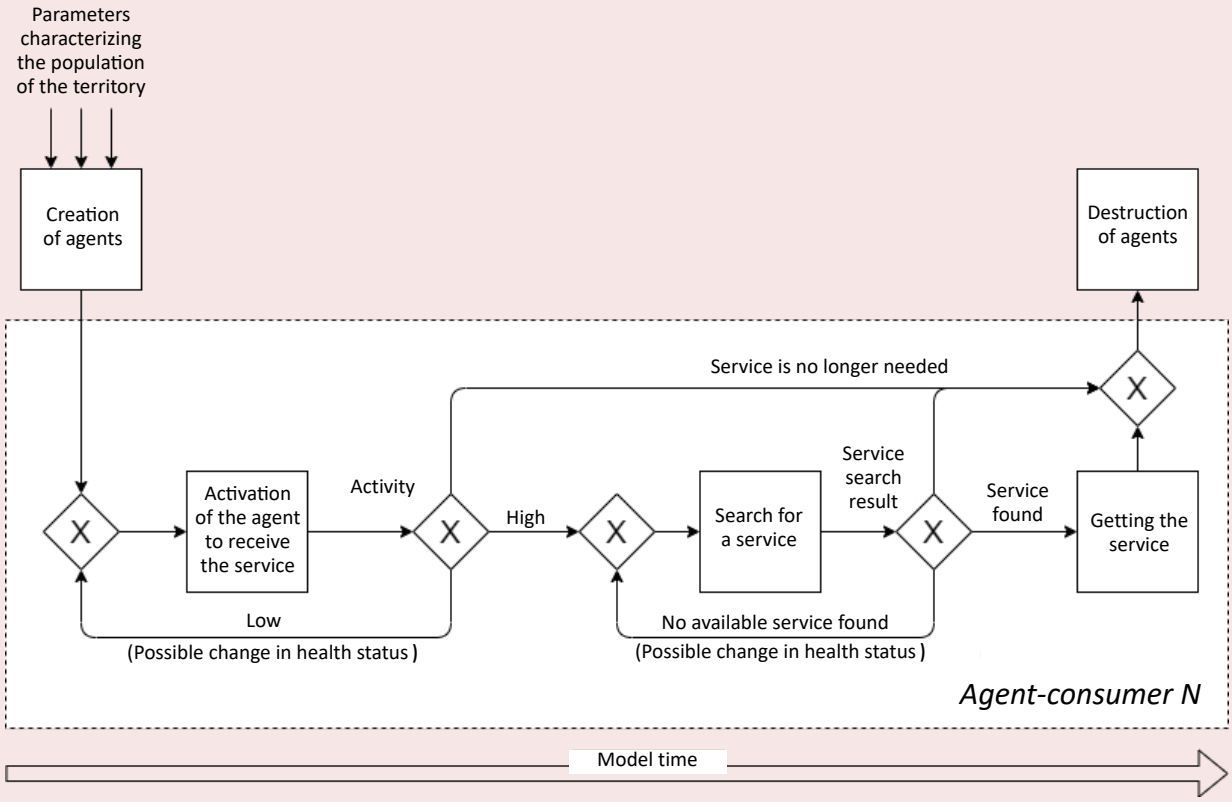
Health status is the basis for seeking medical help. The frequency of visits to doctors correlates to a certain extent with the data on health perceptions. One of the indicators of medical activity is the behavior of patients when they fall ill. Manifestations of medical activity depend on many factors. Personal factors like gender, age, place of residence, education, and social status are mainly distinguished as significant.

Results and discussion

We have developed a general scheme of the states of the agent-consumer of medical services *(Fig. 1)*.

Due to the objective difficulties arising when obtaining real data on the region's population and the need to use large computing resources in simulation, it is almost impossible to consider every person living in the region as an agent-consumer of medical services. Therefore, we propose an approach, according to which, on the basis of a qualitative and quantitative analysis of the composition of the population of the territory and its spatial location, agents are generated with some frequency throughout the modelling time, and the features of the agents reflect the dynamics of emergence of citizens in need of medical care. The agent being created does not characterize a specific person with a set of inherent health characteristics, but a person who needs a specific medical service at a given time, located in a certain place. In this case, the agent is endowed with a specific set of features (diagnosis, health status, age, gender, social status, etc.), on the basis of which its further behavior is determined. The agent's state changes throughout its lifetime in the model. To ensure objectivity of what is happening in reality, the model must take into account the changes in the extent of the need for medical services. The state of human health can change both for the better and for the worse. As a result, the need for medical intervention in both

Figure 1. Scheme of the states of the agent-consumer of medical services



Source: own compilation.

cases may disappear. Agents whose health status parameters have changed to a critical level, as well as agents to whom the service has been provided, are removed from the model. The general sequence of changing agent states is defined as follows. After the agent is generated, it goes into the "Activating the agent to receive a service" state, where the level of its medical activity is determined. When the activity is high, the agent switches to the "Searching for a service" state. If the activity is low, then after a certain interval of the model time, during which the agent's health status may change, the level of its activity, as well as its health status, is assessed once again. Depending on the results, the agent remains in the current state, switches to the "Searching for a service" state, or is removed from the model. In the "Searching for a service" state, during one simulation step, the agent determines the current availability of the service it requires. If the service is found, the agent switches to the "Receiving the service" state. Otherwise, after a certain interval of the simulation time, during which the agent's health status may change, the availability of the service and the state of health is determined once again. Depending on the results, the agent remains in the current state, shifts to the "Receiving the service" state, or is removed from the model. The agent stays in the "Receiving the service" state for a certain simulation time for the corresponding type of service, and then is removed from the model.

Next, we present a mechanism we have developed for determining the medical activity of an agent-consumer of medical services who is in the "Activating the agent to receive a service" state. The mechanism is associated with predicting the manifestation of active behavior by a person in their

daily life in relation to their health, regardless of the current health status, as a representative of a certain category of citizens with similar behavioral patterns. The most important criterion for the manifestation of medical activity associated with the current stage of the disease will be used in integration with the criterion considered here based on the specifics of the medical services presented in the models. This is due to the fact that a person's feeling and health perceptions in relation to different diagnoses may differ.

The type of agent activity (high, low) is determined in the "Block for activating the agent to receive a service" on the basis of the generated agent's parameters *(Tab. 2)*.

Since it is impossible to determine the agent's medical activity unambiguously, we use fuzzy neural networks in this case (Gupta, 1994; Shvetsov, Dianov, 2018; Dianov, Shvetsov, 2018). The network implements a zero-order Sugeno fuzzy inference system, has a set of input variables P corresponding to the values of the agent's parameters. The network output is a variable that determines the activity of an agent with a set of values [0..1], where a value close to 1 determines a high degree of activity.

The network consists of five layers. Layer 1 defines fuzzy terms of input parameters. The outputs of the nodes of this layer represent the values of the membership function at specific values of the inputs. Each node of the layer is adaptive with a membership function $\mu_{A_i}(P_j)$, where A_i is a fuzzy term used for linguistic evaluation of the variable P_j. The membership function can be determined on the basis of statistical data analysis and the results of surveys. Thus, it is possible to form various groups of the population that have, in a certain sense, typical behavioral parameters associated with their manifestation of medical activity *(Tab. 3)*.

In the analyzed survey, activity can be viewed through the prism of two mutually opposite answers to the following questions:

– "What do you usually do when you are feeling unwell?" (answer option: "I try to put up with it, I don't consult a doctor and I don't try to find treatment on my own; it will pass, somehow") – passive.

– "What do you do to preserve and strengthen your health?" (answer option: "I go to the doctor at the first signs of illness, I regularly undergo medical checkup") – active.

Table 2. Factors related to the manifestation of medical activity

Factor	Dependence
Gender	Women are much more likely to seek medical attention than men.
Age	The frequency of visits to a doctor increases in proportion to age, the "leap" occurs after 50 years of age.
Place of residence	Place of residence affects the frequency of visits, but the dependence here is not related to the size of the settlement and the provision of medical and preventive institutions, as one might assume. The first place in terms of frequency and regularity of seeking medical care belongs to the population of the towns under the district jurisdiction and workers' settlements, second – to the residents of the regional center, third – to the rural population, fourth – to the population of the cities and towns under the oblast jurisdiction.
Education	Persons with higher education prefer to visit a doctor once or twice a year, persons with secondary and secondary vocational education visit medical institutions somewhat less often, almost a third of them less than once a year; citizens with incomplete secondary and primary education – monthly or semi-annually.
Social status	Pensioners rank first in terms of frequency and regularity of visits to medical institutions; public sector workers rank second; engineering and technical workers and employees rank third; workers rank fourth; the unemployed rank fifth; entrepreneurs and merchants rank sixth.
Compiled according to: Reshetnikov A.V. (2000). Social portrait of the consumer of medical services. *Ekonomika zdravookhraneniya*, 12, 5–19.	

Table 3. Population groups with typical behavioral parameters associated with their manifestation of medical activity

Parameter	Groups
Gender	- Men; - Women
Age	- 18–30 years old (inclusive); - 31–50 years old (inclusive); - from 51 years old
Place of residence	- City, town; - Rural area
Education	- Incomplete secondary, secondary; - Secondary vocational (vocational school), secondary technical (technical school), incomplete higher; - Higher, postgraduate
Social status	- Students; - Workers; - Engaged in household chores; - Pensioners; - Other
Source: own compilation.	

Table 4. Results of calculation of membership functions' parameters

Parameter	Parameter value	Total	Active		Passive		Undecided	
			Amount	%	Amount	%	Amount	%
Gender	male	670	176	26	169	25	325	49
	female	830	311	37	72	9	447	54
Age (years)	18–30	267	68	25	58	22	141	53
	31–50	582	157	27	110	19	315	54
	51 and more	651	262	40	73	11	316	49
Place of residence	city, town	1079	349	32	160	15	570	53
	rural settlement	421	138	33	81	19	202	48
Education	incomplete secondary, secondary	132	51	39	37	28	44	33
	secondary vocational, secondary technical, incomplete higher	1000	309	31	170	17	521	52
	higher, postgraduate	368	127	35	34	9	207	56
Social status	students	53	12	23	14	26	27	51
	workers	943	286	30	165	17	492	52
	engaged in household chores	47	5	11	13	28	29	62
	pensioners	406	169	42	37	9	200	49
	other	51	15	29	12	24	24	47
Own compilation based on the results of the survey of Vologda Oblast residents "Studying public health and its determining factors" conducted in 2020 by Vologda Research Center of the Russian Academy of Sciences.								

The percentage of positive answers to these questions can be a source for determining the parameters of membership functions *(Tab. 4)*. They are differentiated by the values of the parameters of the population groups.

Some of the respondents have no clear relation to the manifestation of medical activity. We assume that they can, with a certain degree of probability, behave either actively or passively in each particular case (the fuzzy term for determining the possibility of activity includes a set {"Active", May be active"}). Proceeding from this, the corresponding membership functions should be formed *(Tab. 5)*.

Table 5. Membership functions for population group parameters

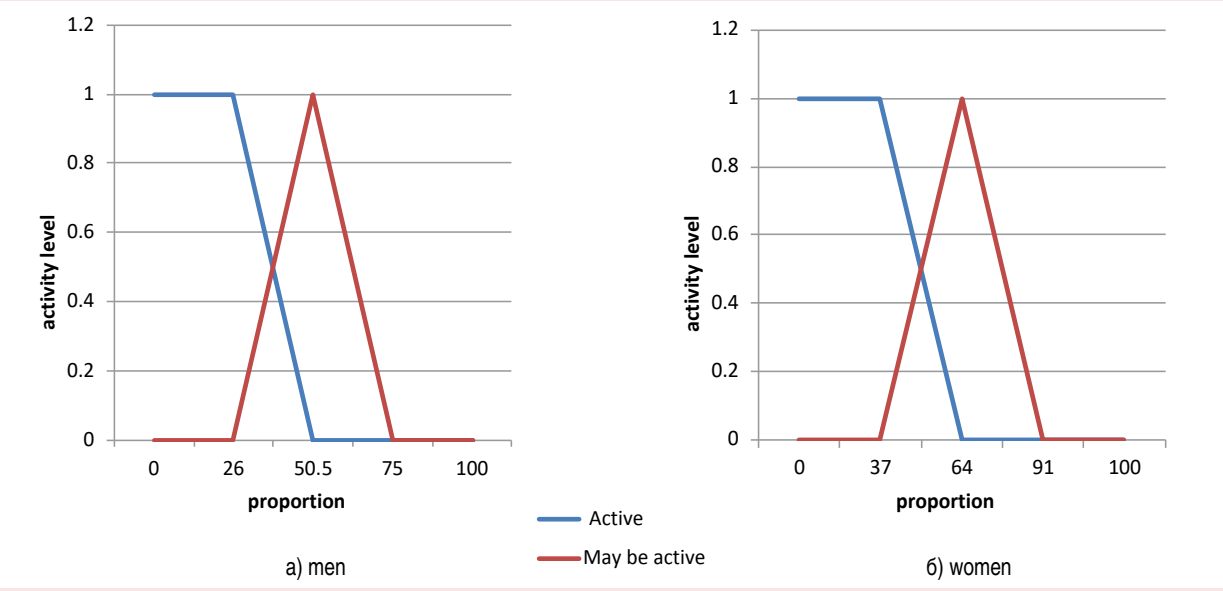
Parameter	Parameter value	Membership function	
		Active	May be active
Gender	male	$\mu_{A_{p1}}(P_j)$	$\mu_{A_{p2}}(P_j)$
	female	$\mu_{A_{p3}}(P_j)$	$\mu_{A_{p4}}(P_j)$
Age (years)	18–30	$\mu_{A_{v1}}(P_j)$	$\mu_{A_{v2}}(P_j)$
	31–50	$\mu_{A_{v3}}(P_j)$	$\mu_{A_{v4}}(P_j)$
	51 and more	$\mu_{A_{v5}}(P_j)$	$\mu_{A_{v6}}(P_j)$
Place of residence	city, town	$\mu_{A_{m1}}(P_j)$	$\mu_{A_{m2}}(P_j)$
	rural settlement	$\mu_{A_{m3}}(P_j)$	$\mu_{A_{m4}}(P_j)$
Education	incomplete secondary, secondary	$\mu_{A_{o1}}(P_j)$	$\mu_{A_{o2}}(P_j)$
	secondary vocational, secondary technical, incomplete higher	$\mu_{A_{o3}}(P_j)$	$\mu_{A_{o4}}(P_j)$
	higher, postgraduate	$\mu_{A_{o5}}(P_j)$	$\mu_{A_{o6}}(P_j)$
Social status	students	$\mu_{A_{s1}}(P_j)$	$\mu_{A_{s2}}(P_j)$
	workers	$\mu_{A_{s3}}(P_j)$	$\mu_{A_{s4}}(P_j)$
	engaged in household chores	$\mu_{A_{s5}}(P_j)$	$\mu_{A_{s6}}(P_j)$
	pensioners	$\mu_{A_{s7}}(P_j)$	$\mu_{A_{s8}}(P_j)$
	other	$\mu_{A_{s9}}(P_j)$	$\mu_{A_{s10}}(P_j)$

Own compilation.

The graphs representing membership functions for the values of the "Gender" parameter are shown in *Figure 2*. They are based on the percentage ratio (the proportion is determined in the range from 0 to 100) associated with the activity of citizens of the territory. Each attribute can have two functions: "active" and "may be active". The points for the graph values are determined based on the following considerations:

– the values at which unconditional activity is manifested are determined (the value of the function is 1). We define it as the percentage of active

Figure 2. Graph of the membership function for the "Gender" parameter



Source: own compilation.

citizens based on the survey results and postpone it from the beginning of the coordinate axis;

– the values at which the unconditional passivity of citizens is manifested are determined (the value of the function is 0). We define it as the percentage of passive citizens based on the survey results and postpone it from the end of the coordinate axis;

– we find the midpoint between the ratio of active and passive citizens.

For the remaining parameters, graphs of membership functions are constructed in the same way. It is worth noting that this order is defined for the initial stage of network construction. In the future, in the process of its training, the membership functions may change.

The membership function is selected depending on the values of the parameters of the person in question (gender, age, place of residence, education, social status):

$$
\begin{aligned}
\mu_{A_{pa}}(P_j) &= \begin{cases} \mu_{A_{p1}}(P_j), \text{if sex} = \text{"male"} \\ \mu_{A_{p3}}(P_j), \text{if sex} = \text{"female"} \end{cases} \\
\mu_{A_{pn}}(P_j) &= \begin{cases} \mu_{A_{p2}}(P_j), \text{if sex} = \text{"male"} \\ \mu_{A_{p4}}(P_j), \text{if sex} = \text{"female"} \end{cases} \\
\mu_{A_{va}}(P_j) &= \begin{cases} \mu_{A_{v1}}(P_j), \text{if age} = \text{"from 18 to 30"} \\ \mu_{A_{v3}}(P_j), \text{if age} = \text{"from 31 to 50"} \\ \mu_{A_{v5}}(P_j), \text{if age} = \text{"from 51"} \end{cases} \\
\mu_{A_{vn}}(P_j) &= \begin{cases} \mu_{A_{v2}}(P_j), \text{if age} = \text{"from 18 to 30"} \\ \mu_{A_{v4}}(P_j), \text{if age} = \text{"from 31 to 50"} \\ \mu_{A_{v6}}(P_j), \text{if age} = \text{"from 51"} \end{cases} \\
\mu_{A_{ma}}(P_j) &= \begin{cases} \mu_{A_{m1}}(P_j), \text{if place of residence} = \text{"city"} \\ \mu_{A_{m3}}(P_j), \text{if place of residence} = \text{"village"} \end{cases} \\
\mu_{A_{mn}}(P_j) &= \begin{cases} \mu_{A_{m2}}(P_j), \text{if place of residence} = \text{"city"} \\ \mu_{A_{m4}}(P_j), \text{if place of residence} = \text{"village"} \end{cases} \\
\mu_{A_{oa}}(P_j) &= \begin{cases} \mu_{A_{o1}}(P_j), \text{if education} = \text{"incomplete secondary, secondary"} \\ \mu_{A_{o3}}(P_j), \text{if education} = \text{"secondary vocational, secondary technical, incomplete higher"} \\ \mu_{A_{o5}}(P_j), \text{if education} = \text{"higher, postgraduate"} \end{cases} \\
\mu_{A_{on}}(P_j) &= \begin{cases} \mu_{A_{o2}}(P_j), \text{if education} = \text{"incomplete secondary, secondary"} \\ \mu_{A_{o4}}(P_j), \text{if education} = \text{"secondary vocational, secondary technical, incomplete higher"} \\ \mu_{A_{o6}}(P_j), \text{if education} = \text{"higher, postgraduate"} \end{cases} \\
\mu_{A_{sa}}(P_j) &= \begin{cases} \mu_{A_{s1}}(P_j), \text{if social status} = \text{"students"} \\ \mu_{A_{s3}}(P_j), \text{if social status} = \text{"workers"} \\ \mu_{A_{s5}}(P_j), \text{if social status} = \text{"engaged in household chores"} \\ \mu_{A_{s7}}(P_j), \text{if social status} = \text{"pensioners"} \\ \mu_{A_{s9}}(P_j), \text{if social status} = \text{"other"} \end{cases} \\
\mu_{A_{sn}}(P_j) &= \begin{cases} \mu_{A_{s2}}(P_j), \text{if social status} = \text{"students"} \\ \mu_{A_{s4}}(P_j), \text{if social status} = \text{"workers"} \\ \mu_{A_{s6}}(P_j), \text{if social status} = \text{"engaged in household chores"} \\ \mu_{A_{s8}}(P_j), \text{if social status} = \text{"pensioners"} \\ \mu_{A_{s10}}(P_j), \text{if social status} = \text{"other"} \end{cases}
\end{aligned}
\tag{16}
$$

The value of the membership function parameter is determined by generating a random number in the range from 0 to 100.

Layer 2 defines the premises of fuzzy rules. This layer is not adaptive, it performs the product of inputs. The output data of this layer are the degrees of truth of the assumptions of the rules (activity and possible activity):

$$w_1 = \mu_{A_{pa}}(P_j) * \mu_{A_{va}}(P_j) * \mu_{A_{ma}}(P_j) * \mu_{A_{oa}}(P_j) * \mu_{A_{sa}}(P_j),$$
$$w_2 = \mu_{A_{pn}}(P_j) * \mu_{A_{vn}}(P_j) * \mu_{A_{mn}}(P_j) * \mu_{A_{on}}(P_j) * \mu_{A_{sn}}(P_j). \quad (17)$$

Each node of non-adaptive layer 3 calculates the relative degree of fulfillment of the fuzzy rule:

$$w_1^* = \frac{w_1}{w_1 + w_2}, \qquad w_2^* = \frac{w_2}{w_1 + w_2}. \quad (18)$$

Adaptive nodes of the fourth layer calculate the contribution of each fuzzy rule to the network output using the formulas:

$$A_1^C = w_1^* \cdot v_{k1}, \qquad A_2^C = w_2^* \cdot v_{k2}. \quad (19)$$

Clear numbers v_{k1}, v_{k2} define the conclusions for each rule.

A single node of layer 5 summarizes the contributions of all rules:

$$A^C = A_1^C + A_2^C. \quad (20)$$

The software implementation of the network is carried out in the Microsoft Access environment. A part of the statistical survey data was imported into the database. Modules were created that implement the algorithm of the fuzzy neural network. An example of the results obtained is shown in *Figure 3*.

Currently, a number of experiments have been conducted to determine medical activity of the population using a fuzzy neural network with different values of the configurable parameters of the fourth layer vk_1, vk_2, as well as with different levels of activity determination. Individual results are presented in *Table 6*.

Figure 3. A fragment of the database with the results determining medical activity of the population

Survey

V805 Active	Age	Sex	Education	Professional field	Professional field	SetActive
0	33	2	5	3	1	0
0	35	2	5	4	1	0
1	24	2	5	4	1	0
1	43	2	5	3	1	1
1	18	2	3	4	1	0
1	20	1	3	5	1	0
1	39	2	3	4	1	1
1	25	1	3	1	1	1
1	19	2	3	12	1	0
0	52	2	5	3	1	0

Leftmost column – activity according to the results of the survey, rightmost column – output results.
Source: own compilation.

Table 6. Results of experiments to determine medical activity of the population using a fuzzy neural network

No.	Level to determine medical activity	v_{k1}	v_{k2}	Number of active citizens
1	0.6	1	0.1	679
2	0.8	1	0.1	670
3	0.8	0.9	0.1	647
4	0.6	0.7	0.1	635
5	0.5	0.6	0.3	653

The results obtained during the experiments in order to verify the accuracy of forecasting can be compared with the results of the sociological survey itself. We considered the option when two values of the activity criterion are used: 1 – active, 0 – inactive. The respondents who chose the option "I go to the doctor at the first signs of illness, I regularly undergo a medical checkup" were determined to be active when answering the question "What do you do to preserve and strengthen your health?" With regard to the results presented in Table 6, the discrepancy with the data of the sociological survey was from 30 to 40% (the number of active users of medical services according to the survey results was 487 out of the total number of 1,500 respondents). When analyzing the data obtained, one should bear in mind that the first layer of the network was not subjected to adaptation. We plan to further refine the presented network in terms of its training and providing an opportunity to take into account the nature, specifics and severity of a medical issue for a person when calculating activity.

Conclusion

Specific features of agent-based modeling determine the prospects of its use for solving a variety of tasks in socio-economic systems. The main difficulty in implementing such models is their conceptualization. The results obtained in the study provide a conceptual basis for the process of constructing agent-based models of the spatial network of infrastructure facilities and resource provision of the regional healthcare system. These models are focused on the search for optimal accommodation options, taking into account the motives, attitudes and behavioral strategies of the residents of the region, as well as the role of the set of external and internal factors determining this choice. It is ensured by the possibility of using the results of sociological surveys. The presented approaches help to interpret survey data for the formation of behavioral models of agents-users of medical services. At the same time, due to the application of fuzzy inference mechanisms, an element of uncertainty in the behavior of agents is simulated, which increases the adequacy of the models in relation to the subject area. Thus, the presented work contributes to the development of theoretical and applied aspects in the creation of agent-based models related to the provision of services for social systems.

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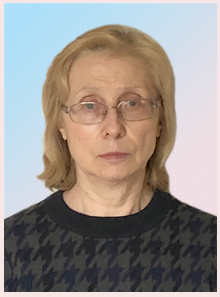
Nowcasting Migration Using Statistics of Online Queries



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Abstract. Due to international migration's growing importance in modern countries' lives, there is an increasing need for reliable and relevant forecasts of this process, especially in today's turbulent world. However, established migration forecasting procedures suffer from a number of limitations, against which innovative approaches based on big data, notably online searches made by potential migrants, offer many advantages. Because of their novelty, such tools have not yet revealed their full explanatory and predictive properties. The work explores the possibility of using these tools to predict the population flows within the post-Soviet space. We hypothesize that there is a statistical relationship between online queries about migration to Russia made by residents of Kyrgyzstan, Tajikistan and Uzbekistan and subsequent human flows from these countries to Russia. The hypothesis was tested using the migration statistics of Rosstat, the Federal State Statistics Service of the Russian Federation, Google Trends data on search intensity, and Yandex Wordstat service of word matching for validation of search images. As a result of correlation

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and regression, we found a moderate dependence of the dynamics of human flows on previous queries, which is most evident at a lag of 6–9 months and at zero lag. Obtaining more accurate results in this and similar studies is hindered by the initial limited predictability of migration behavior due to its contextual, sometimes situational and irrational nature, as well as "noisiness" of statistics of queries and often the flows themselves. The search for universal algorithms of determination of relations between queries and migration flows is seen as the main direction of research in this field.

Key words: migration, forecasting, big data, online queries, search images, modeling, Russia, Central Asia.

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The growing scale[1] and importance of cross-border migration (involving temporary or permanent change of country of habitual residence) in the life of societies increases their need for relevant, reliable and realistic forecasts of people's movements, especially in the context of political and environmental (including epidemic) instability on the planet. Such forecasts are necessary for visionary, proactive, "smart" migration management; for improving the preparedness of rapid response systems to more frequent migration crises and developing effective solutions to emerging problems; and for improving the planning of various spheres and institutions of society, such as health care, education, etc.

At the same time, forecasting migration faces serious difficulties due to the specifics of this behavioral phenomenon, namely the high uncertainty associated with it. Some researchers, in particular J. Bijak and M. Czaika, categorically state that "migration is not predictable in the strict sense" (Bijak, Czaika, 2020, p. 14). Nevertheless, the use of a wider range of statistical sources, the coordination of different types of information, and the development of a methodology appropriate to new types and combinations of data promises progress toward relevant forecast results.

The emergence of innovative, data-driven approaches to the study of migration offers great opportunities in the field of migration forecasting. The emerging trend of migration research, which relies on statistics of online inquiries from potential migrants, is very promising from the point of view of nowcasting and short-term forecasting of human flows.

Such set of tools for analyzing and forecasting migration have not yet been developed in Russia. The purpose of our work is to explore the possibilities of applying the new methodology for anticipating migration flows in the post-Soviet space, on the material of which no such studies have been carried out before. We formulate and test the hypothesis that there is a link between search queries about migration to Russia made on the Internet by residents of Kyrgyzstan, Tajikistan and Uzbekistan, and subsequent migration flows from these countries to Russia. In order to achieve the goal, we used the tools of search pattern validation, correlation, regression and theoretical analysis.

[1] According to the UN data, in 2020 the number of people around the world living outside their country of origin has reached an unprecedented level of 281 million. (International Migrant Stock 2020. UNDESA, PD. POP/DB/MIG/Stock/Rev.2020)

The work focuses on the following tasks: to show the limitations and problems in the application of conventional procedures on the basis of a review of generally accepted forecasting methods and data sources; to analyze foreign experience in the use of different types of big data, including online queries, to study and predict migration, to characterize their advantages and disadvantages; to adapt such a set of tools to the conditions of migration in the post-Soviet space and to test the methodology of anticipating migration from Kyrgyzstan, Tajikistan and Uzbekistan to Russia using the statistical material of online inquiries from the Central Asian population and monthly data from Rosstat on the number of migrants arriving from there to Russia; to present and try to explain the results obtained; to assess the possibilities of their practical use and in general the prospects of this approach to the prediction of migration in Russia.

Limitations of established migration forecasting procedures

The 21st century has seen a dramatic increase in migration foresight activities around the world. A large group of scientists and institutions engaged in migration forecasting has been formed. The number of works, including major ones, devoted to quantitative assessments and foresight of future migration, issues of methodology and forecasting techniques, is growing rapidly (see, for example, (Szczepanikova, Van Criekinge, 2018; Acostamadiedo et al., 2020; Sohst et al., 2020; Carammia, Dumont, 2018; Bijak, 2016; Lifshits, 2016; Tkachenko, Ginoyan, 2018; Malysheva, 2017) et al.[2]).

However, when comparing forecast assessments and actual migration figures, it turns out that a significant part of the forecasts did not come true. Often the dynamics of migration were underestimated. Australian demographer T. Wilson states that large error values have actually become the norm in forecasting both long-term flows and short-term fluctuations (Wilson, 2017).

The main reason for these inaccuracies is the objective difficulties of predicting migration. These include the multiplicity of interacting drivers of migration and the variability of their influence, especially in the context of contemporary societal and environmental (including epidemic) instability, external shocks, deep, time-compressed and multidimensional transformations that make it difficult to recognize future signals[3]; the complex nature of migration behavior, which is often contextual and situational, bears the stamp of place and time in the formation of migration intentions and the decision to move, and is sometimes irrational. Thus, migration forecasting is currently stochastic because of the objective unpredictability of the "black swans" inherent in this process and the large variability of the final outcomes of the modeled object. Limited and incomplete information and the lack of knowledge about migration itself also contribute to the increase in uncertainty (Bijak, Czaika, 2020).

Statistical data traditionally developed and collected by national and international organizations (censuses and sample population surveys, administrative data on entry into and leaving the country, residence and work permits, etc.) have significant drawbacks such as resource intensity, incompleteness, flaws in quality, significant delay in reporting, limitations in accessibility, comparability and disaggregation, etc. Data from sociological services, in particular the results of the Gallup World Poll on the migration intentions of the population, are available and internationally comparable. However, such information is costly to obtain, subject to the risks of unrepresentative sampling,

[2] World Population Prospects (2019). Vol. 1, 2. New York: UN; Tomorrow's World of Migration (2017). Geneva: FES, Global Future, IOM.

[3] For example, a sudden outflow of representatives of wealthy social strata from particular regions may be a harbinger of impending cataclysms and subsequent mass resettlement of the population from the affected territories.

dependence of their predictive power on the timing and location of the survey, question wording (Tjaden et al., 2019), etc.

While the methodology is constantly improving, none of the methods used can be unequivocally preferred in all respects (Sohst, Tjaden, 2020). Scenarios outlining possible options for long-term migration prospects have increased uncertainty. And since the horizons of such projections extend beyond the voting cycle, it is not easy to translate their results into policy decisions. The Delphi method, despite multiple rounds of examination of selected expert groups, is often unable to iron out significant differences in expert judgment (Acostamadiedo et al., 2020).

Econometric methods also have their weaknesses. They are vulnerable to unreliable or incomplete statistics, national differences in data sources and collection methods, they cannot account for the diversity of explanatory factors, they sometimes rely on questionable assumptions, inappropriate historical or country analogies, and they face difficulties in operationalizing drivers that contain elements of uncertainty. In addition, processing and analyzing large amounts of information requires complementing regression set of tools with other more sophisticated machine learning techniques, including neural networks.

The turbulence of the world, which makes the prediction of migration very difficult, encourages the search for non-standard sources of information and innovative methods of its application. Opportunities for this are opening up with the development of digital technologies. In particular, such prospects are possible with the use of big data and corresponding new methodological approaches to nowcasting and migration forecasting.

Foreign experience in the use of big data in migration forecasting

Alternative sources of information, taking the form of big data, and new ways of analyzing it, including machine learning, are increasingly being used in migration forecasting (Sîrbu et al., 2021). This is facilitated by the increasing use of mobile phones and Internet-connected digital devices by migrants in the planning and implementation of migration, etc. The digital footprint left by migrants can be used to identify patterns and trends in migratory behavior.

Big data have a number of undoubted advantages: immediacy and timeliness, relative ease and low cost of obtaining information, relevance of information, the reflection of real, current processes, the coverage of huge arrays of population and territories.

A lot of research has been done based on the use of geolocalized Twitter and Facebook user data, IP logins when accessing websites, email messages sent from Yahoo servers, and call detail records from mobile phones. These works have demonstrated the serious potential of big data for predicting the scale and routes of population movements, identifying typical patterns of movements in emergency situations, changes in the number of migrants, the degree of their assimilation by language, musical and literary preferences of network users, etc. (Zagheni et al., 2017; Zagheni, Weber, 2012; Hawelka et al., 2014). The application of such data has predicted the growth of Venezuelan migrants in Colombia and Spain (Spyratos et al., 2019), and assessed the cultural integration of Mexicans in the USA (Stewart et al., 2019). They have been used to track human flows after natural disasters in Haiti and to anticipate their routes in New Zealand: to places familiar to victims (where many calls had previously come from) and major cities (Bengtsson et al., 2011), and to monitor mobility in epidemics, including COVID-19.

The results were consistent with official statistics and the research findings published much later. At the same time, the application of such big data revealed limitations and posed serious challenges. The level of Internet connectivity and mobile connection significantly influenced the representativeness of the sample and, accordingly,

the accuracy of the results. The intensity of the digital services use by different social groups also varied, depending on their age and gender characteristics, the level of socio-economic development of the territory, the type of settlement, etc. Features such as the young age of Twitter users or the older age of Facebook audiences, for example, limit the ability to generalize such results to identify common migration patterns. The instability of the use of social networks, the unreliability of the information provided by users about themselves, the existence of fake and double accounts also have an impact. Problems arise with accessing data from networks and services and ensuring the constant flow of information. It is difficult to obtain information from the networks about the period of stay of a visitor in the country of destination, which is used in official statistics as a criterion for determining a migrant.

When such data is used to track an individual's whereabouts, there are risks of human rights violations regarding the privacy and security of personal information, as well as ethical standards. In the worst case, this could lead to a possible increase in repression of persecuted people, the creation of obstacles to their refugee status abroad or their expulsion from the country of asylum sought, etc. (Beduschi, 2018).

Studies of migration and other forms of mobility based on online inquiry statistics lack most of these disadvantages. Such studies are becoming increasingly popular. Since Google is the main search engine of the world's population, which is used by more than 1 billion people, the queries in this browser, measured by Google Trends[4], can be considered generally representative of the Internet audience and used as a forecasting tool. The application of this type of big data is based on the notion that the aggregate query intensity of migration-related search words serves as a direct measure of migration intentions (Bohme et al., 2020). As empirical studies show, potential migrants gather information about opportunities to move, including online, so fluctuations in the number of requests can indicate a variation of interest in migration and, all other things being equal, are suitable as a proxy (analogue indicator) of changes in the number of potential migrants and the attractiveness of certain countries for them, which allows using of such data to predict the dynamics of human flows[5].

The prediction of cross-border population movements based on such an approach was initiated by Google analysts in the 2000s. H. Choi and H. Varian, having analyzed the monthly intensity of search queries for the word "Hong Kong" performed in certain countries for 2005–2011 and the number of tourists arriving from these countries to Hong Kong, concluded that Google Trends data reflects the planning of trips and allows anticipating future tourist flows (Choi, Varian, 2012). The use of monthly data, to which this pioneering work was addressed, has become the most common statistical practice of further research.

[4] Google Trends service provides aggregated statistics from a database of queries on Google by geographical areas, time intervals, etc., reflecting collective behavioral patterns. Internet query data from Google Trends is already widely used in various areas of economic and social research: to predict aggregate demand and private consumption, unemployment and inflation rates, sales of specific goods and services, the spread of diseases such as influenza, salmonella, obesity, etc. (Yurevich et al., 2020).

[5] Migration intentions can include abstract desire, concrete planning, and actual preparation for migration. According to a study based on Gallup World Poll data, only 1% of the world's adults would like to move to another country, of which only 10% make plans to leave; only a third of those planning to migrate truly prepare to move and only a third of those actually preparing to leave (Tjaden et al., 2019). Accordingly, the ratio of potential and actual migrants is 1 to 100. Although a 1 p.p. increase in the proportion of residents of a particular country expressing interest in emigrating to a particular country corresponds to a 0.75 p.p. increase in the flow along this route, such links are weaker for residents of developing countries. This is due to major obstacles to their migration: restrictive immigration policies of destination states, lack of resources, long distances, etc. The implementation of migration plans can be hindered by changes in the life situation and situation in the country, health, employment, family status, the emergence of unforeseen expenses in connection with emigration (Carling, 2017).

The study of international migration (the criterion of which is a temporary or permanent change of country of usual residence) in this innovative way began only in the 2010s. In order to better identify migration flows and distinguish them from tourism and business trips, the search images were based on keywords related to work, study, and asylum. Global Pulse[6] and the United Nations Population Fund staff assumed that people interested in migration make inquiries about employment opportunities abroad before they leave. When comparing statistics on foreign arrivals to Australia, including its individual cities, with aggregated requests from different countries for 2008–2013 by the key English-language words "jobs in Melbourne", "jobs in Australia", and "work visa", a link between these indicators was found. The correlation between flows from Italy to Australia and requests for "jobs in Australia" was particularly strong[7].

An important result of subsequent research was the identification of the time lag between the expression and embodiment of intentions. Such a timing effect in migration is due to the need to prepare for the trip. This was shown by a study of Spanish-language query statistics from Peru, Colombia and Argentina in 2005–2010 for the keywords "jobs in Spain", "embassy in Spain" and "Spain". The researchers found a strong correlation between the 7–8-month lag of such requests in Peru and Colombia and the number of migrants from these countries registered as migrants in Spain. For Argentina, whose flows consisted of 40–50% European nationals, the results were mixed (Wladyka, 2017).

Matching the language used in migrants' countries of origin and destination makes it easier to handle search queries. However, linguistic discrepancies are more typical. The study of migration to Switzerland relied on search data in four languages: German, French, Italian, and Spanish. We have processed queries for the keyword "work in Switzerland" from Germany, France, Italy, and Spain, respectively, from 2004–2018. The researchers found that among potential migrants from the four countries in question, natives of Spain and Italy showed the greatest interest in working in Switzerland and showed the strongest correlation between requests and subsequent arrival, which allows predicting in the short term the flows of adult migrants from these states. In contrast, the corresponding indicators for France show a weak relationship, occurring with a lag of two years. This fact can be explained by the predominance of family immigration in movements from France, as well as by fact that the flows contain a large number of migrants who have already worked in Switzerland before, i.e. do not need to seek such information (Wanner, 2021).

The first steps toward short-term forecasting of forced migration based on search queries have been taken. A Pew Center study found a strong correlation between the intensity of requests from Turkey with the word "Greece" in Arabic and fluctuations in the number of Iraqi and Syrian refugees crossing the Aegean Sea toward Greece in 2015–2016 (Connor, 2017).

Compared to all the above-mentioned studies, which were limited to the use of a small number of search words in relation to individual countries, the works of German scientist M. Bohme and his colleagues are distinguished by the scope and a new algorithm of analysis. To build search patterns, the authors selected 67 words related to economics and migration in three languages: English, French and Spanish, and collected statistics on relevant queries made in 101 countries of origin of migrants in relation to 35 host OECD countries. Constructed time series of aggregated annual data for 2004–2015 for each search word from each sending

[6] UN initiative to use big data for real-time forecasting.

[7] Estimating Migration Flows Using Online Search Data (2014). Global Pulse Project Series. No. 4. Available at: http://www.unglobalpulse.org/sites/default/files/UNGP_ProjectSeries_Search_Migration_2014_0.pdf

country allowed judging the level and dynamics of emigration potential of the population, as well as the orientation of emigration intentions towards particular destination countries. The significance of the results increased when the sample was restricted to states with high Internet connectivity and more common languages (Bohme et al., 2020).

These research findings suggest that migration-related query data can be used as a proxy for migration intentions and complement official information, compensating for the lack of relevant and comparable statistics and allowing for new combinations of data that add value to each type of data (Struijs et al., 2014). At the same time, the inclusion of words related to study, asylum, etc. in such search images can highlight intentions with respect to study, humanitarian migration, etc., respectively.

At the same time, the use of such alternative sources of information is subject to certain limitations. The vast amount, complexity, and "noisiness" of the data create methodological and analytical problems (Rango, 2015). There is no single universal approach to the use of queries for forecasting migration. There are differences in the closeness of connection between the statistics of typical queries and subsequent movements of the population, depending on the routes, mass and composition of flows. Perhaps each migration corridor (migration between two particular countries) has a unique query (Tjaden et al., 2021). Query data is often not very informative in cases of small-scale migratory flows, movements from countries with rare languages, limited internet access, etc. (Wladyka, 2017). Distortions can arise because people put different meanings into the same words and use them for different, including non-migration-related, search purposes. In addition, when verifying the accuracy of predictions made on the basis of alternative sources of information by correlating them with official migration statistics, it is necessary to take into account the imperfections of the latter (Tjaden et al., 2021).

Obviously, the as yet poorly understood explanatory and predictive properties of query statistics complicate the correct use of big data for migration prediction, which in turn gives rise to the need for further research in this area.

Research methodology and variable calibration

Migration flows from Kyrgyzstan, Tajikistan, and Uzbekistan to Russia were chosen for study because of the mass and stable routes of such movements generated by the socio-economic differences and migratory interdependence of these countries. The movements are favored by the common historical past, geographic proximity, economic integration, cultural ties, etc.

These Central Asian states are among the main donors of population and labor in the post-Soviet space. In 2020 they accounted for 32% of the inflow of migrants to the RF and 43% of its population growth; in turn, Russia as the main recipient of human flows in 2020 accounted for 76% of all Kyrgyz natives living abroad (in 2000 – 81%), 79% – for Tajikistan (70%) and 57% – for Uzbekistan (58%)[8]. These indicators show that Tajikistan is the only country in this group that clearly demonstrates a long-term, least susceptible to negative external influences, increase in the orientation of migration flows toward Russia.

Two types of data from different sources were considered in determining the most appropriate reference statistical information on migration flows for the study. First, these are quarterly data from the Russian Ministry of Internal Affairs on the number of foreign nationals registered for migration, including those arriving with the purpose of work. While allowing for the clear identification of migrant workers, this information, which is publicly available only for the period since the end of 2016, does not provide sufficient depth in the time series.

[8] Own compilation according to Population size and migration in the Russian Federation in 2020 (2021). Moscow: Rosstat; International Migrant Stock (2020). UNDESA, PD. POP/DB/MIG/Stock/Rev.2020

Second, monthly data from Rosstat, available since 2011, on the number of people arriving from abroad in Russia and registered at the place of residence or stay for a period of 9 months or more. However, these data summarize not only labor migrants (not allowing them to be singled out), but also students, reuniting family members, etc. At the same time, taking into account that modern migration is primarily labor migration and that not only labor migrants but also other categories of migrants are interested in work (looking for information about it online), the mentioned and some other shortcomings (Chudinovskikh, Stepanova, 2020) can be neglected for want of better data.

At the same time, the Rosstat data have undoubted advantages: 1) impressive depth of time series with monthly detailing of data, providing a large number of observations and making it possible to build a more relief trajectory of migration processes compared to quarterly, more smoothed data; 2) compliance with the most common data format used abroad in similar studies; 3) reflection of more stable flows of migrants coming temporarily for longer periods or for permanent residence, in contrast to short-term volatile circulation.

For the subsequent quantitative analysis, we formed a time series of data on migration inflows from these Central Asian states to Russia for the period from January 2015 to December 2020, which included 72 points (observations) for each country (denoted by the indicator of migrant arrivals – *M*).

During the formation of statistics on the queries of potential migrants, a list of possible search words or search images was compiled. When forming the list, the authors took into account the experience of foreign studies, in which search images related to work in specific territories showed the best results.

To check the relevance and accuracy of the match to the object under study of the selected search images, we used the Wordstat service provided by the Russian company Yandex. The Russian web application allows getting information about the absolute number of queries that include a search term, as well as the context of its inclusion (Yurevich, 2021). Whereas the American counterpart Google Trends reveals only the dynamics of queries, but does not show their absolute number, so it is less informative for validating search images – determining the frequency of use of particular terms online and their associative relationships, which makes it difficult to prove true relationships and increases the likelihood of finding false correlations.

At the same time, Yandex service does not allow analyzing queries for a long period of time, limiting it to only two years of available data, so to build models for the analysis of time series in the medium and long term we used Google Trends application, which is much more suitable for this due to the deep retrospective data.

Justification for referring to these two search engines is based on their popularity among Central Asian users, although Yandex is markedly inferior to Google. According to analytical service StatCounter, in 2020 in Kyrgyzstan 89% of the browser market accounted for Google and 10% for Yandex, in Tajikistan – respectively 82% and 15%, in Uzbekistan – 84% and 14%[9]. The geographical binding of the requests was determined by the user's IP address or by using the appropriate browser settings.

According to the Wordstat service, search queries containing the word "job" are very popular *(Tab. 1)*. The term "vacancies" is used somewhat less frequently, but is also quite common. Queries for more specific words like "residence" (e.g., "get a residence permit") and "migration" have a frequency of less than 1,000 per month. The word "patent" is used somewhat more frequently, but the context of its use indicates a strong "noisiness" of the term, which is often associated with a document

[9] Statcounter GlobalStats. Available at: https://gs.statcounter.com

Table 1. Characteristics of the popularity of search terms related to potential labor migration per month

Search query considering morphology	Number of requests per month, units		
	Kyrgyzstan	Tajikistan	Uzbekistan
job	63,945	41,460	67,731
vacancy	11,686	7,599	12,835
job|vacancy	72,387	46,901	77,481
job|vacancy - Bishkek - Kyrgyzstan -homework	59,937		
job|vacancy - Dushanbe - Somon*- Tajikistan		41,379	
job|vacancy - Tashkent - Uzbekistan - Samarkand			62,832
job|vacancy Moscow|Russia	6,842	6,400	4,537
patent	1,118	3,032	1,741

* https://somon.tj – classifieds site, vacancies only in Tajikistan.
Note. The symbol "|" acts as an operator "or"; the symbol "-" excludes the following word from the possible variants of the query. The excluded words are those that obviously do not meet the goals of identifying migratory sentiments.
Source: https://wordstat.yandex.ru/ (accessed: October 19, 2021).

protecting intellectual property. At the same time, queries containing the words "job" or "vacancies" are not suitable for nowcasting or predicting migration flows for a similar reason: first, people often use these words to search for jobs in their own country without being interested in employment opportunities abroad; second, on the Internet there are many references to the word in an educational context, as "homework" and "classwork". The attempt to build a search images using words in the national languages of Central Asian countries is not effective either. Apparently, residents are looking for jobs in local markets with such queries, and their efforts are not very active. For example, in Uzbekistan the query "ish o rinlari" (jobs) has 1.3 thousand mentions per month; in Tajikistan "kor" (work) has 5.5 thousand; in Kyrgyzstan "jumush" (work) has 2.6 thousand.

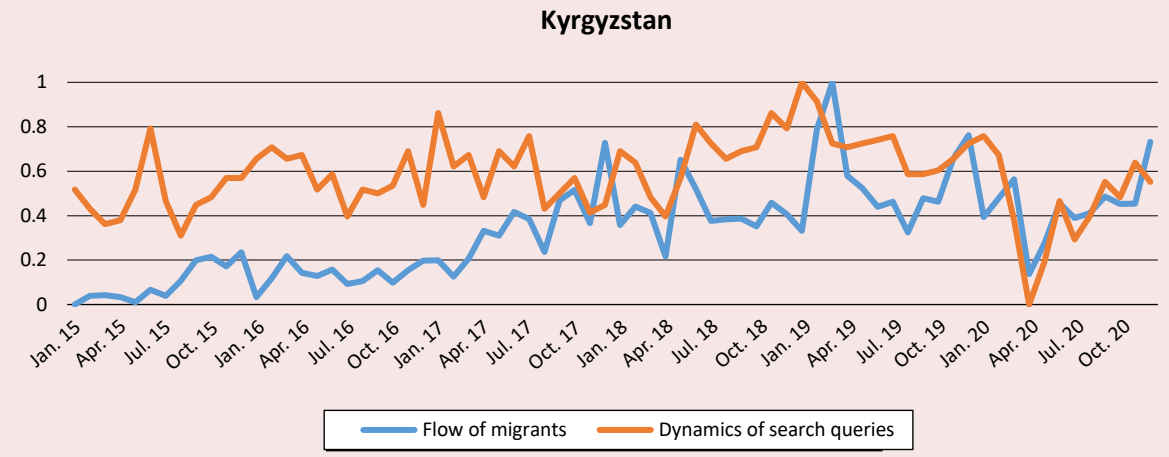
Adding the name of the Central Asian country to the search allows clarifying the search area and characteristics of jobs, but leads to a merging in the overall statistics of queries such as "work in Tajikistan" and "work for citizens of Tajikistan". And vice versa, if you use the names of these countries as stop words, all queries containing the words "Tajikistan", etc. drop out of the field of observation.

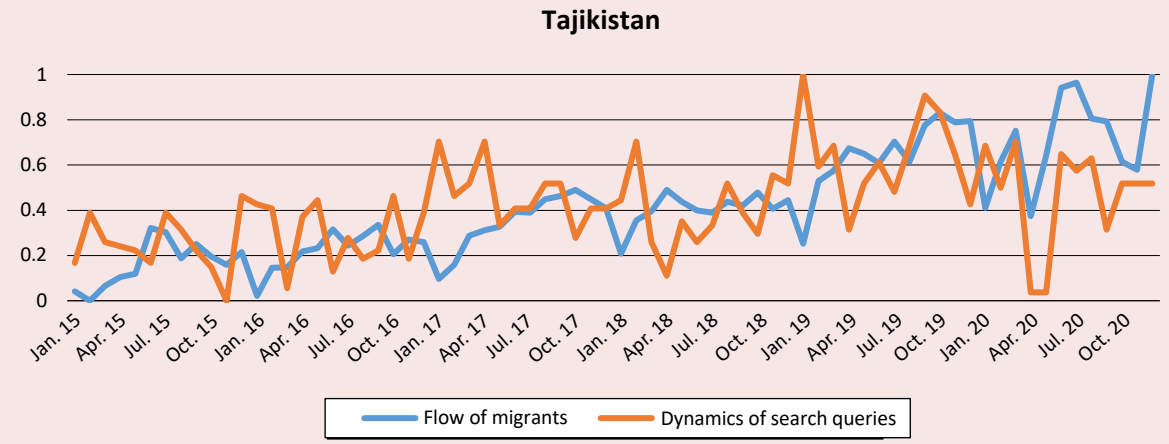
On the contrary, the inclusion of the names of the host country, its cities, etc. in the query is justified. The search image "(job OR vacancies) AND (Moscow OR Russia)" demonstrates a high level of compliance with the task, which is almost noiseless due to the concretization of the geography of the search. At the same time, other cities and constituent entities of the Russian Federation, according to the Wordstat service, attract much less interest from citizens of each of the three countries.

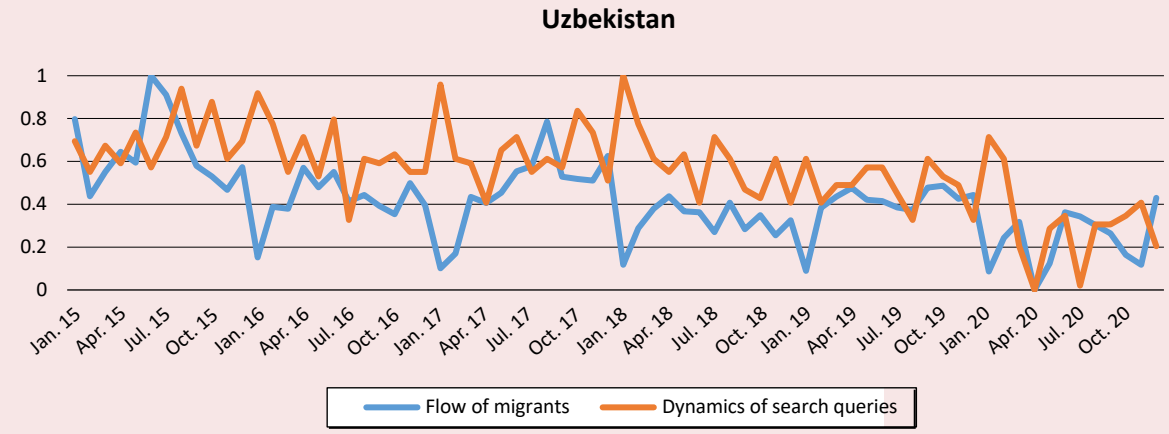
The compiled search query image "(job OR vacancies) AND (Moscow OR Russia)" was entered into the Google Trends service to form a long time series (indicator designation – GT). The resulting statistics are automatically normalized with respect to the maximum value for the period from January 2014 to December 2020, i.e. the indicator has acquired the form of an index. For clarity, the time series were normalized from 0 to 1 using the MIN-MAX procedure ($y = (x - min)/(max - min)$).

The *Figure* shows in favor of the correlation between the variables in question, although not very close. The broken trajectory of the dynamics of flows and especially of queries fluctuating with a large amplitude reflects the instability of the Russian economy in conditions of sanctions of Western states against Russia, pandemics, etc. The similar

Comparison of the dynamics of migrants influx and queries "(job OR vacancies) AND (Moscow OR Russia)" in the Google search engine in 2015–2020







Source: own compilation.

reactions of the variables to significant, especially extraordinary, events and extreme situations are well noticeable. Thus, the increase in queries and flows since late summer 2019 may be connected with the adoption of Law No. 257-FZ, which simplifies the procedure for granting temporary residence permits and permanent residence permits to certain categories of migrants, and the broader psychological effect of this liberalization measure. On the contrary, after Russia adopted a package of strict measures against the spread of the coronavirus epidemic, there was a rapid decline in the influx of migrants and minimization of the number of queries in the spring of 2020. However, when Russian legislation adopted the provision on the possibility of repeatedly extending patents from May 2020, as well as a package of liberal rules for the stay of migrants in the country since June, both queries and flows grew almost in parallel.

Changes in the opposite directions are observed in all three countries from year to year in January, when the flow of migration greatly decreases, but interest in working in the Russian Federation noticeably increases. This suggests the probable presence of seasonality in both variables.

However, the trajectory of queries, in contrast to the movement of flows, does not show a rise in the summer period of the Russian economy's demand for foreign labor, which is explained in typical conditions by the lag between queries and subsequent flows. It is also noticeable that flows from Kyrgyzstan reacted with great lag to the country's accession to the EAEU on January 1, 2015 (membership in which does not seem to affect any explicit features of the network and migration behavior of citizens), while movements from Tajikistan and Uzbekistan similarly reacted to the introduction of patents for migrants from the CIS to work for legal entities on January 1, 2015.

In addition, we can see in the charts, the inflow of migrants from Kyrgyzstan and especially Tajikistan has a pronounced upward trend. The rate of change in queries from these countries also gravitates toward the upward trend. On the contrary, the dynamics of queries, as well as arrivals of migrants from Uzbekistan show a downward trend. Probably due to the inertia of the waning dynamics of flows, the entry into force in December 2017 of the agreement between the governments of Uzbekistan and Russia on the organized recruitment of Uzbekistan citizens for temporary labor activities in Russia, causing a surge in queries, was not reflected in the subsequent rise in migration.

The conducted statistical tests confirmed these hypotheses. The augmented Dickey-Fuller test (ADF) and the Ljung-Box Q-test indicated the non-stationarity of the time series (calculations performed in the RStudio application, package "tseries"). In addition, a comprehensive test for seasonality, including tests for seasonal dummy variables, Friedman tests, Kraskell-Wallis tests, etc.[10], indicates the presence of seasonality in M variable by Uzbekstin and in GT variables for all countries (calculations are performed in RStudio application, package "seastests"). One way to obtain the stationarity of the time series is to take the first differences, i.e. further we will analyze the monthly change in the number of migrants arriving and the change in the demand index (ΔM and ΔGT). Smoothing of seasonal fluctuations in those variables in which seasonality was detected was performed using the X-13ARIMA-SEATS algorithm[11]. After this operation, a correlation analysis with the inclusion of lags from 0 to 12 months was performed for the purpose of primary analysis of the relationship between the variables. At this stage, we found an extremely low degree of correlation between the observed variables for Tajikistan. Somewhat better results were recorded

[10] Package "seastests". Available at: https://www.rdocumentation.org/packages/seastests/versions/0.14.2/topics/isSeasonal

[11] R-interface to X-13ARIMA-SEATS. Available at: http://www.seasonal.website

when the search image was changed by removing the word "vacancies".

Correlation analysis showed a moderate relationship between the variables. The tightest interdependence is observed with a lag of 6–9 months, which is required to make a decision and thoroughly prepare for departure for an extended period, as well as with zero lag, which indicates a search for fresh information about work in Russia just before departure. The results obtained are consistent with similar findings of some foreign works (Wladyka, 2017; Wanner, 2021), by no means refuting the hypotheses of the study.

Modeling results and discussion

The study of correlation coefficients demonstrated approximately identical strength of the relationship between variables with different lags within the same country. But given the rather moderate values of these coefficients and in order to increase the overall stability of the models, the indicator of the monthly inflow of migrants (*M*) was also introduced into the number of explanatory regressors with lags. The search for optimal model specifications for each country was performed using a stepwise regression algorithm, the determining parameters being the value of the Akaike information criterion and the significance of coefficients on explanatory variables (calculations were performed using the RStudio application, the "MASS" package). Additionally, a variable backward elimination algorithm (leapBackward, the "caret" package) has been implemented, which, among other things, takes into account the accuracy of the predictions. The final set of specifications was determined based on theoretical assumptions about the signs at the coefficients; the value of the mean absolute error (MAE), the significance of the coefficients, and other indicators of model quality were also taken into account *(Tab. 2)*.

The resulting models create preconditions for confirming the main hypothesis of the study: the dynamics of migrant arrivals show a positive correlation with changes in the number of requests related to the search of Central Asian residents for

Table 2. Models forecasting the inflow of migrants

Country	Kyrgyzstan		Tajikistan		Uzbekistan
Specification	C1	C2	C3	C4	C5
Constatnt	930.11** (361.96)	885.60** (345.57)	1117.78** (499.29)	181.12 (462.52)	1477.41*** (516.70)
ΔGT (–7)	41.92** (16.99)		19.57[1)] (12.15)	19.55* (10.17)	
ΔGT (–11)		59.71*** (17.08)			18.05** (7.65)
M (–1)	-0.59*** (0.11)	-0.64*** (0.11)	-0.17** (0.08)	-0. 56*** (0.10)	-0.17** (0.07)
M (–6)				0.19* (0.10)	-0.14* (0.07)
M (–9)	0.37*** (0.10)	0.42*** (0.10)		0.41** (0.12)	
Number of observations	59	59	59	59	59
Normalized R-square	0.37	0.43	0.10	0.37	–
R-square	–	–	–	–	0.20
MAE	477.6	446.2	609.4	539.8	–

[1)] P < 0.12
Level of significance according to Student's t-test: *p < 0.10; **p < 0.05; ***p < 0.01; standard error value in parentheses; lag value in the first column for variables in parentheses.
Source: own compilation.

work in the Russian Federation. The relationship is stronger for Uzbekistan and Kyrgyzstan, while in the case of Tajikistan it is the weakest. The magnitude of lags between the dependent and explanatory variables suggests that potential migrants prepare for their move in advance and look for places of employment in advance too.

At the same time, the constructed models have a relatively small percentage of the explained variance and a moderate mean absolute error. This may be due to several circumstances. First, combining data not only on labor but also on other categories of migrants in the dependent variable inherently reduces the accuracy of the model predicting labor migration, because different search images may be relevant to the queries of different categories of migrants.

Second, citizens of Russia and other countries account for a large proportion of migrants from Kyrgyzstan, Tajikistan, and Uzbekistan: about 23%, 33%, and 28%, respectively, of those arriving in 2018 from these countries[12]. These migrants may have different online search behavior patterns, and their higher percentage in the flow from Tajikistan probably weakened the link between specific queries and flows, which is consistent with the results obtained abroad.

Third, as we know from foreign studies, the low level of Internet connectivity can distort the links between requests and flows. According to materials presented on the site DataReportal, at the beginning of 2021, the Internet audience included 50.4% of all residents of Kyrgyzstan, 34.5% of Tajikistan, and 55.2% of Uzbekistan, which is below the global average[13]. Although Central Asian residents aged 20–34 make up an increased share both of those arriving in Russia and of Internet users, a deformation in the representativeness of the latter in relation to potential migrants cannot be ruled out. The lowest level of Internet connectivity in Tajikistan compared to the other two Central Asian countries may be reflected in the least strong connection between the demands and flows of this state's population.

Fourth, given the long history and recurrence of such trips, the need to search for information about migration online is reduced among migrants who have already been to Russia, as well as compatriots who receive information from them.

Fifth, as foreign experience shows, the statistics of requests made by migrants from countries with rare languages show weaker links with the flows from these states. The languages of Central Asia are also not widespread, and the population of the region seeks information about Russia in the Russian language. Considering that Russian is not a native language for migrants and they often speak it superficially with a generally low level of education, it is difficult for researchers to imagine what words a migrant would use to formulate a query. In 2020, only 14% of migrants over 14 years of age from Kyrgyzstan, 18% from Tajikistan, and 25% from Uzbekistan had higher and secondary vocational education[14]. Nevertheless, perhaps a more scrupulous validation of the search image by including stop words could enhance its predictive ability.

Sixth, perhaps using advanced and resource-intensive machine learning algorithms, particularly neural networks (Blazquez and Domenech, 2018), often used for complex analysis of large data sets, could provide more accurate results. Foreign migration authorities already use such methods for prognostic purposes[15]. Nevertheless, advanced

[12] Own compilation according to the Demographic Yearbook of Russia 2019 (2020). Moscow: Rosstat.

[13] Posts Tagged Central Asia. Available at: https://datareportal.com/reports/?tag=Central+Asia

[14] Own compilation according to Population size and migration in the Russian Federation in 2020 (2021). Moscow: Rosstat.

[15] In 2012, the European Asylum Support Office launched an early warning and preparedness system that uses information sharing mechanisms from a variety of sources, including big data processed through machine learning (Albertinelli et al., 2020).

artificial intelligence methods, due to their high technical resource intensity and the need for a significant amount of time for the training and regularization procedure, are sometimes less suitable than regression approaches for identifying the presence and nature of causal relationships that were established in the study.

Moreover, the obtained values of the average absolute error are relatively small in relation to the projected monthly change in flow volume. Thus, if we relate them to the average total number of migrants arriving in a month, the error will be within 10% for Tajikistan and Uzbekistan and 15% for Kyrgyzstan. Taking into account the "noisiness" of the dependent variable, such results seem quite acceptable.

Conclusion

In our study, we found a moderate correlation between changes in the number of online queries about migration to Russia from residents of Kyrgyzstan, Tajikistan, and Uzbekistan, and the dynamics of subsequent migration flows from there to Russia. We identified contextual factors that may have affected the relevance of search images and the accuracy of estimates of the relationship closeness: the composition of migrants by category, citizenship and level of education, their knowledge of the Russian language, the level of Internet connectivity in Central Asian countries. The results show that query statistics can be used as a predictor of migration to Russia from Central Asian countries, especially Tajikistan and Uzbekistan. The advantages of new ways of obtaining information about migrants on the basis of reading their digital footprint open up prospects for the integration of alternative data in the study and forecasting of migration processes and the use of such data in Russian migration policy.

This study can add to the experience of such migration forecasting by applying Yandex capabilities to validate search images, as well as the results obtained on materials previously not studied in this vein in the post-Soviet region.

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Forecasting the Dissemination of Norms and Values in Russia with the Use of an Agent-Based Approach

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Abstract. The paper presents an agent-based model for dissemination of norms and values and the experience of its use for forecasting the dynamics of opinions in Russian society, taking into account the influence of digital media and deterioration of the economic situation in the country. The chosen modeling method helps to predict the dynamics of population, economy and political system, taking into account their mutual influence. Each agent is assigned an appropriate set of norms and values and a model is designed showing how they change under the influence of the agent's standard of living, communication with acquaintances and impact of the media. The model we present differs from its known analogues due to its connection with the model of artificial society, reflecting the population and economy of Russia on the basis of current data. The behavior of agents in the model is based on the concept of a social agent, which includes the principles of dividing agents into clusters of social activity, a way to represent the norms and values of the agent in the form of a set of options with varying frequency and the function of constructing subjective assessments of the standard of living based on the comparison of the agent with its environment. Information content of the model is based on the analysis of the results of the seventh wave of the World Values Survey concerning the relationship between the income level, assessment of the work of the political system and the norms of social responsibility, which showed a significant degree of correlation between incomes, political assessments and the norms of residents. On the basis of the developed model, we carried out scenario calculations so as to build a forecast of the likely dynamics of public sentiment in various economic conditions. The results obtained indicate a rather significant relationship between the economic situation and the satisfaction of residents with the actions of the

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government. In the developed model, the change in a person's beliefs is limited to their inner world; therefore, implementing new aspirations in attempts to change one's own life or society is an important direction for future research.

Key words: agent-based model, norms and values, standard of living, digital media, World Values Survey.

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Introduction

The research subject in the article is the dissemination of norms and values, where values mean what is important for a person in life: love, wealth, sense of security (Poel, Royakkers, 2011), and norms denote behavior standards in society (Fishbein, Azjen, 2011; Mercuur et al., 2019). The dynamics of person's norms and values depends on both the events of their life related to family, education, work, and the influence channel to which they are exposed by acquaintances and the media. In the previous decade, Internet platforms such as YouTube, Twitter, TikTok, aimed at various age and social groups, have taken a leading place among the media. With their help, everyone gets the opportunity to publish their opinions and judgments, which significantly changes the ways of the dissemination of norms and values (Chen, Lan, 2021). Influencers' impact in social networks can be potentially negative, provoke discontent with the current government in order to further destabilize the political situation.

The analysis of the influence channel from the media on norms and values is becoming an increasingly urgent task which is associated with both an increase in the time spent in the digital space (transition of work and entertainment to an online format under the imposed restrictions), and with a decrease in the standard of living and growth in the susceptibility of the most affected categories to the propagandized attitudes. The solution of this problem requires creating special tools that allow taking into account the contribution of a large number of factors including the interest level in socio-political issues and access frequency to the media among different age groups, influence degree of attitudes, promoted by influencers on subscribers' opinion, the importance of economic factors and government actions to change residents' views.

Observation of opinions and moods in society is an important part of sociological and political science research in Russia and abroad. To obtain up-to-date assessments of public opinion, surveys and monitoring are conducted with varying extent of respondents' coverage. At the regional level, Vologda Research Center of RAS carries out regular monitoring. Its results allow considering the dynamics of both assessments of the current government and the economic situation of Vologda Oblast residents[1]. Russia's population is studied within the framework of the longitudinal household survey of the RLMS-HSE[2], VCIOM surveys[3], monitoring of the Institute of Sociology of RAS[4]. The World Values Survey covers almost 100 countries including Russia[5]; its results are published in a detailed form which helps to compare respondents' opinions with their gender, age, income and therefore identify factors influencing the formation of views of various social groups.

[1] VolRC RAS makes information and analytical bulletin "The Effectiveness of State Management in the Estimates of Population".

[2] Russian longitudinal monitoring survey – HSE. Available at: https://www.hse.ru/rlms/

[3] Public opinion poll (VCIOM): March–April 2021. *Monitoring of Public Opinion: Economic and Social Changes Journal,* no. 2, pp. 255–272.

[4] *Russian Society in the Conditions of Crisis Reality (Based on the Results of Sociological Monitoring 2014–2016) (2016).* Informational and analytical summary based on the results of the All-Russian Sociological Research. Moscow.

[5] World Values Survey. Available at: https://www.worldvaluessurvey.org/wvs.jsp (accessed: July 9, 2021).

The data of polls and public opinion monitoring form the basis of analytical studies of the dissemination of norms and values. For example, N.I. Lapin's work suggests an approach to clustering the values of residents of Russian regions, based on the all-Russian monitoring results (Lapin, 2010). S.V. Mareeva analyzes the Russians' value dynamics according to the data of various monitoring waves of the Institute of Sociology of RAS and the World Values Survey (Mareeva, 2013; Mareeva, 2015). Publications of the previous two years pays special attention to the impact of the COVID-19 pandemic on the moods and values of the population, in particular, an increase in the role of digital media (Davydov, 2021) and change in the attitude to power in a crisis (Waigeng et al., 2021; Iliycheva et al., 2021).

The above papers analyze the dynamics and structure of the population's values, based on retrospective data, but forecasting their changes in the future is beyond the scope of research.

The complexity of the task, set in our work, makes it necessary to turn to modern modeling methods that allow predicting the dynamics of the population, economy and political system taking into account their mutual influence. The most suitable method for this purpose is agent-based modeling, which reproduces behavior and interaction of autonomous agents representing individuals in society. Russian groups of authors used this method to predict the development of municipalities (Makarov, Bakhtizin, 2013), dynamics of economic system (Suslov et al., 2016) and social policy (Novikova, Tsyplakov, 2020).

In foreign studies, a well-developed direction is the creation of agent- based models of opinion dynamics. Depending on the way opinions are presented, there are two main classes of models: discrete opinions and continuous opinions. The first class of models is most often used to predict public voting results (Stauffer, 2002; Sznajd-Weron, Sznajd, 2000). Its feature is the tendency to form consensus; thus, the models are not suitable for modeling social processes with a high degree of opinion polarization (Adams et al., 2021).

For this reason, models that represent opinions as continuous values, such as support level for a candidate or a legislative decision, have become more widespread. The most famous of them is the bounded confidence model (Deffuant et al., 2000; Hegselmann, Krause, 2002; Weisbuch et al., 2002). Opinions in this model are characterized by a degree of similarity; agents interact with each other only if their opinions are sufficiently similar. Consensus in the second class models is possible if opinions have a significant degree of similarity, otherwise there is opinion polarization due to the agents' influence with radical initial views (Chen, Lan, 2021).

The two approaches are combined within the framework of the model of continuous opinions and discrete actions (CODA model) (Martins, 2013). The agents' opinions in it can be neutral or change up to radical, which allows reflecting a significant polarization degree in society. In CODA models, consensus is rarely achieved, only if the network of relationships is defined by a fully connected graph, and thus, each pair of agents interacts (Ceragioli, Frasca, 2018). Based on CODA approach, a number of opinion dynamics models have been developed (Ceragioli, Frasca, 2018; Jiao, Li, 2021; Zino et al., 2020). Opinions are formed under the influence of communication channel, and communication is conducted either without a specific purpose (passively) (Ceragioli, Frasca, 2018), or an active approach to interaction is implemented; it means that the agents communicate only with those agents in whom they expect to find allies (Jiao, Li, 2021). In the model described in (Zino et al., 2020), along with communication channel, the influence channel is considered, which allows investigating complex phenomena such as paradigm shifts in society.

The influence of the digital media on the dissemination of norms and opinions is considered in (Hu, Zhu, 2017; Pineda, Buendía, 2015; Zhang et al., 2018). The tasks of this research area include the study of the comparative contribution of the media, social networks and personal interaction to the public opinion dynamics and the possibility of reaching consensus. The influence of the agents' character and their "credulity" is also taken into account, for this purpose "stubborn" agents are created that are not subject to external influence (Hu, Zhu, 2017); agents are endowed with different confidence levels in their opinion (Pineda, Buendía, 2015), agents have a choice: accept, reject or partially consider the messages they receive (Quattrociocchi et al., 2011). The research purpose (Dong et al., 2017) is to study the conditions for achieving consensus and the contribution of online interactions of agents to this process. Experiments, conducted on the basis of the developed online-offline model, have shown that under the influence of interactions on the Internet, the agents' opinions can smoothly change, as a result of which the number of opinion clusters decreases.

The influence of norms and values on the agents' behavior is considered in (Mercuur et al., 2019; Atkinson, Bench-Capon, 2016; Cranefield et al., 2017), moreover (Atkinson, Bench-Capon, 2016; Cranefield et al., 2017) focuses on the creation of agents capable of making decisions, based on their norms and values, and the study (Mercuur et al., 2019) is aimed at comparing empirical data on human behavior with the results of modeling the agents' actions with norms and values.

The purpose of our research is to develop an agent-based model of the dissemination of norms and values and use this model to obtain forecasts of the view dynamics in Russian society taking into account the influence of digital media and the dynamics of the economic situation in the country. The tasks are:

– to present the concept of a social agent with a set of norms and values, able to exchange information with other agents and perceive external influences including messages from the media;

– to develop the structure and algorithms of an agent-based model of the dynamics of the dissemination of norms and values;

– to prepare initial modeling data from available official sources and sociological research;

– to carry out scenario calculations, based on the developed model, aimed at predicting the dynamics of norms and values in various economic conditions.

The scientific novelty of the research is primarily associated with working out an agent-based model that adapts modern approaches to modeling the dissemination of norms and opinions to modern Russian society that allows reflecting the current demographic and socio-economic situation and establishing the relationship between public sentiment and influence channel from various sources. The model combines the features of CODA models and the bounded confidence models; in particular, the principle of setting norms and values of agents by discrete options with variable frequency, as in CODA models, is used. The similarity with the bounded confidence models lies in the fact that for different options of the same norm, the degree of their difference is determined, and communication occurs between agents whose options are not diametrically opposed. An important difference between the presented model and known analogues is its connection with the artificial society model (Mashkova et al., 2020) reflecting the population and Russia's economy on the basis of up-to-date information.

Research methods

The choice of an agent-based approach for predicting the dissemination of norms and values allows working out a model, centered on the resident and their relationships with the environment *(Fig. 1)*. The agent's environment is designed as an artificial society including the economy, educational and budgetary system, as well as mass media and tools for their regulation. The

methodology of modeling the dissemination of norms and values, used in the study, includes the following stages:

1. Reproduction of an artificial society structure. At this stage, the regions' population is recreated, organizations, workplaces, administrative institutions and educational system structure are created, and the initial distribution of opinions in society is set. To do this, large arrays of open data are collected from various sources, they are checked for consistency, brought to the required form for loading into the model; the source objects of the model are created and stored in the database.

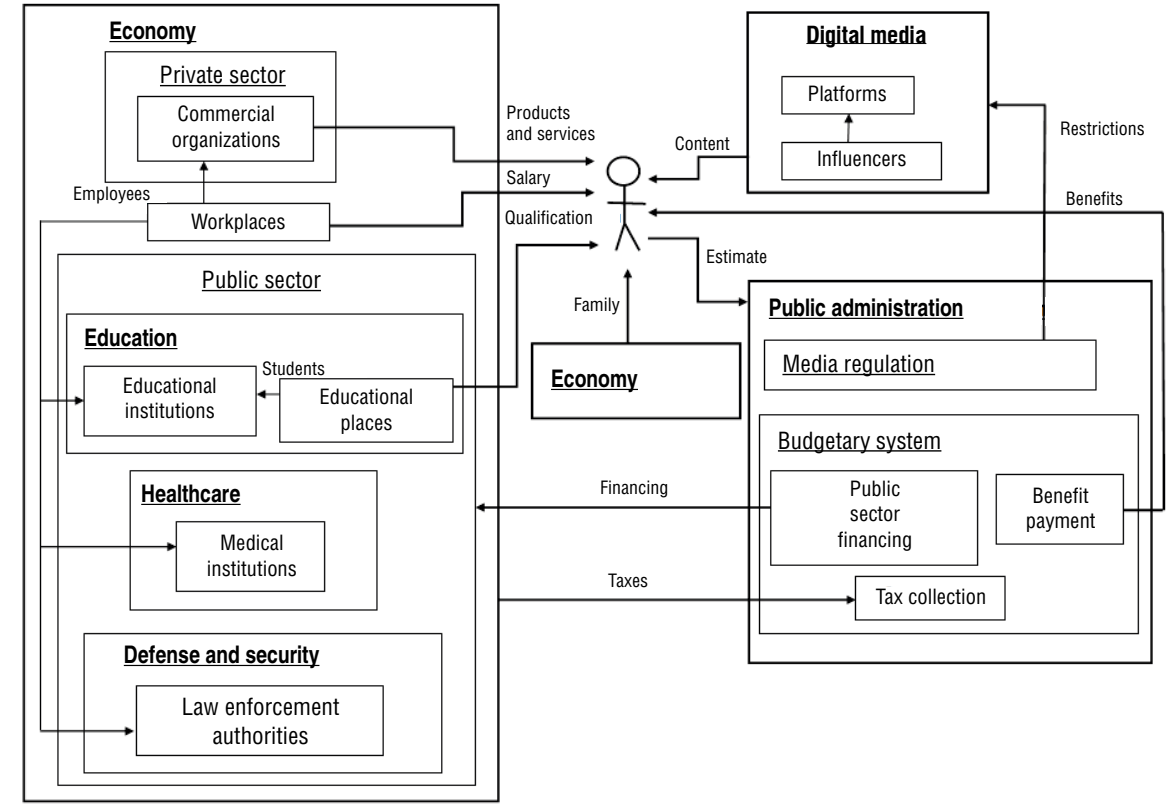
2. Development of basic dynamic functions. The modeling of demographic processes, production and consumption of products, organizations' investment, the work of educational and budgetary systems, contacts between agents and the influence of the media is carried out.

3. Scenario modeling. The purpose of this stage is to conduct a series of scenario calculations in various economic conditions to obtain forecasts of the dynamics of norms and values in society.

Let us consider in detail the components of the developed model.

At the first stage, agents are created in accordance with gender-age structure; families living in the same household are formed. The population dynamics (at the second stage) is reproduced using the functions of growing up, birth, death, marriage and divorce.

Figure 1. Structure of the agent-based model of the dissemination of norms and values



Source: own compilations.

Households have a common budget, which combines the income and expenses of all their members. If a household has a loan, first of all, payment is made on it, the remaining part of the budget is distributed between consumption and accumulation depending on the household's consumption rate. A household purchases final products from a sale agent in its region for a calculated amount, the remaining money is added to the amount of its financial investments. In more detail, the work (Mashkova et al., 2019) considers the modeling of consumption processes in an artificial society.

In the economic system of the model of the dissemination norms and values, the private sector and the public sector are distinguished. The private sector is represented by commercial organizations that sell products and services to the public andto each other. The public sector includes budgetary organizations in the fields of education, healthcare, management, defense and security. Both commercial and budgetary organizations create jobs, occupied by resident-agents. The work brings income to resident-agents, and also forms a social circle to exchange opinions among colleagues.

The educational system in the model is part of the public sector and performs the function of improving the professional qualifications of resident-agents. There are three stages in the educational system of the artificial society model: school, secondary and higher vocational education. During the training, resident-agents make acquaintances with fellow students which can be preserved in the form of friendly relationships throughout life.

Among the functions of public administration in the model of the dissemination of norms and values, the regulation of mass media and the implementation of the functions of the budget system are highlighted. The budgetary system includes revenue (tax collection) and expenditure (financing of public sector organizations, payment of pensions and benefits) parts and is divided into the federal budget, regional budgets and extra-budgetary funds (Mashkova et al., 2020). The regulation of the digital media content is aimed at filtering potentially dangerous content of influencers on various platforms.

The mass media in the model distribute information content available to resident-agents on various platforms, in particular the Internet. To access the content, resident-agents subscribe to influencers and get access to the opinions they broadcast.

The agent architecture in the model includes four groups of characteristics. They are:

1. Biological: gender and age changing under the influence of demographic processes.
2. Socio-economic: education level, specialty, income, formed by the agent's interaction with the educational and economic system.
3. Social: contacts with family, friends and colleagues, and following the influencers.
4. Mental: social activity cluster; subjective assessments and norms that are transformed under the influence of contacts with the environment, the media and changes in standard of living.

The introduced concept of "social activity cluster" is associated with the need to take into account the different propensity of agents to compare with others and their exposure to the effect of environment. Taking into account these characteristics forms the basis for grouping agents into social activity clusters, by analogy with consumers' clusters in the diffusion of innovations (Rogers, 2003). The model of the dissemination of norms and values distinguishes four agents' social activity clusters:

– *Foxes* are professional participants of socio-political processes (in the context of the model – influencers in social networks);

– *Wolves* are social media users with high interest in discussing socio-political issues and high exposure to influence;

– *Dogs* are social media users with moderate exposure to influence;

– *Rabbits* are a neutral-minded part that is involved in socio-political processes only in critical situations when their income becomes extremely low ($ELS = 0$).

Table 1 presents the main characteristics of social activity clusters.

The comparison sample defines the group with which the agent compares themselves when assessing their standard of living. Depending on the agent's cluster, the comparison samples for them can be the richest people in the country, region or among acquaintances, or the average income of all acquaintances (for the cluster *Rabbits*).

Each agent is assigned an appropriate set of norms and values, and the model designed their changes under the influence of the agent's standard of living, their communication with acquaintances and messages from the media. To set norms and values, the model uses the principle of discrete options (variants) that determine the agent's possible views in a certain area. The options are characterized by a frequency that changes under the influence of external actions, as is customary in CODA-type models. The value of a certain agent's norm at a concrete point in time is considered to be the option with the highest frequency. This paper examines three assessments and norms, related to the socio-economic situation in the country:

1. A discrete norm of social responsibility, its options are: "The government should be responsible for providing the population with everything necessary", "People should take responsibility for providing themselves with everything necessary" and an intermediate option "Something in between".

2. A discrete assessment of the work of the political system, its options are: "Rather satisfied", "Completely dissatisfied" and an intermediate option "Something in between".

3. Subjective assessment of the standard of living of *ELS* (estimate of the living standard). It is in the range from 0 to 1, where 0 corresponds to an extremely low standard of living, and 1 is quite satisfactory according to the agent. *ELS* is calculated using the fuzzy logic function; the parameters are the agent's income, living wage in the region and comparison income:

$$ELS = \begin{cases} 0, AI < lw^r \\ \frac{AI - lw^r}{CI - lw^r}, lw^r \le AI < CI \\ 1, AI \ge CI \end{cases}, \quad (1)$$

where ELS – subjective estimate of the living standard; AL – agent's income; CL – comparison income; lw^r – living wage in the region r.

Since the *ELS* estimate is fuzzy, it allows comparing the estimates, obtained for different agents in a normalized range, which is especially convenient when comparing residents' incomes in different regions.

In discrete norms and estimates, the degree of similarity of options is set, communication occurs between agents whose options are not diametrically opposed. This principle is used in the bounded confidence models and makes it possible to reach consensus in society if it has a sufficient number of agents with "intermediate" options.

Table 1. Social activity clusters in the model

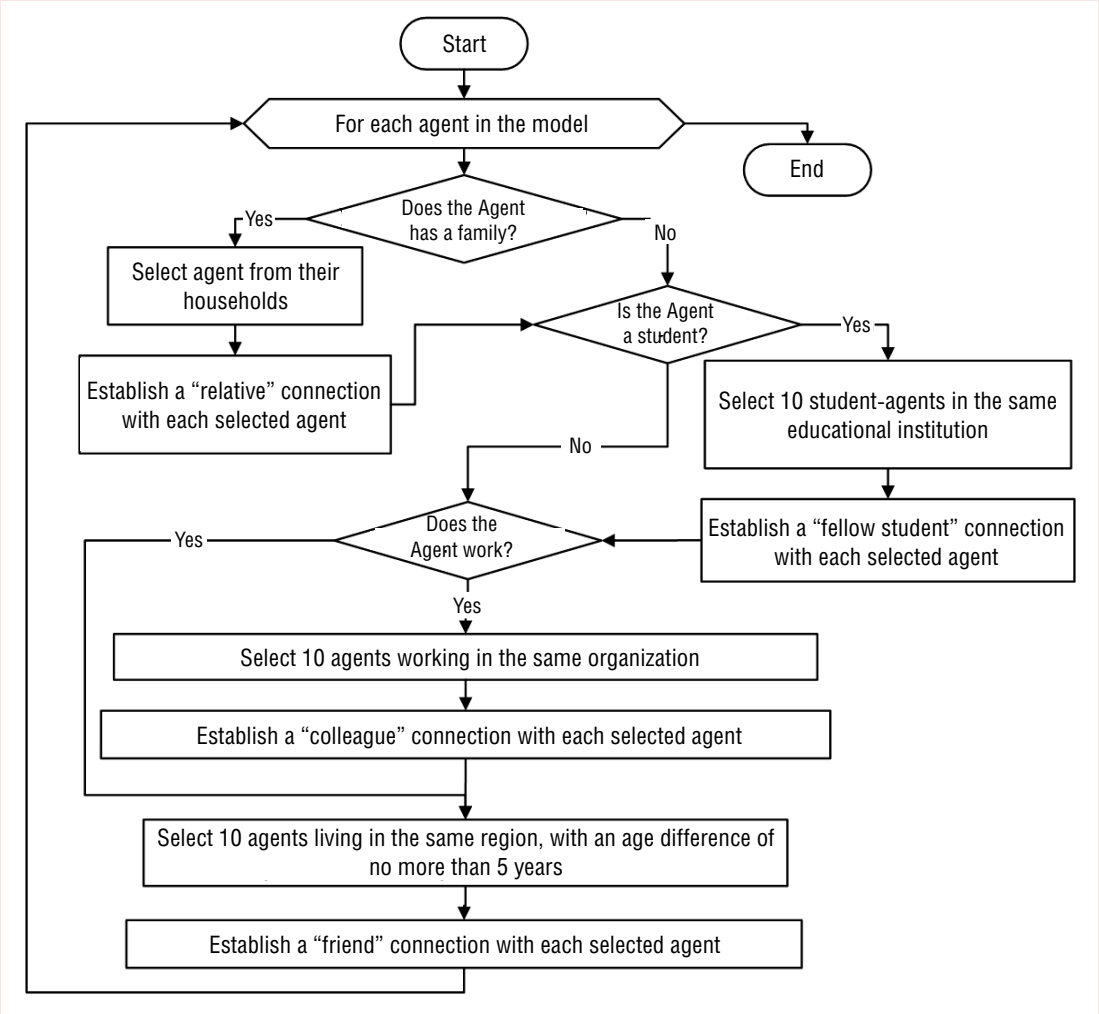
Cluster representative	Role in the model	Comparison sample	Exposure to influence
Fox	Influencer	The 10 richest people in the country	Low
Wolf	Follower	The 10 richest people in the region	High
Dog	Follower	The 10 richest acquaintance	Average
Rabbit	Neutral/follower	All acquaintance	Low
Source: own compilations.			

The frequency of options of norms changes over the course of the model time under the environmental impact, influence channel of the media and the standard of living. A change in the frequency of options entails a change in the norm if some option has gained a higher frequency than the option that determined the norm in the previous time period. The unit of model time is one clock cycle corresponding to one month of real time, that is, the revision of the frequency of norms is carried out 12 times a year.

To exchange the views of resident-agents, a network of contacts is created in the model connecting family members, colleagues and fellow students (*Fig. 2*). Contacts are formed at the stage of creating the socio-economic environment of the model (Mashkova et al., 2020) and are divided into family, work and friends.

In general, if an agent lives with their family, studies and works at the same time, it forms contacts of all kinds. In particular cases, an agent may have one or two types of contacts, at least contacts with friends who are selected from resident-agents of similar age, with a maximum age difference of 5 years.

Figure 2. Algorithm for forming contacts' network in the model



Source: own compilations.

Figure 3 shows an algorithm for calculating estimates of the agents' standard of living, within which agents' selection, included in the sample, is formed to compare purposes for different clusters, the calculation of their average income *CI* and the actual *ELS* estimates.

The agent's norms and values in the model change within the framework of three procedures:

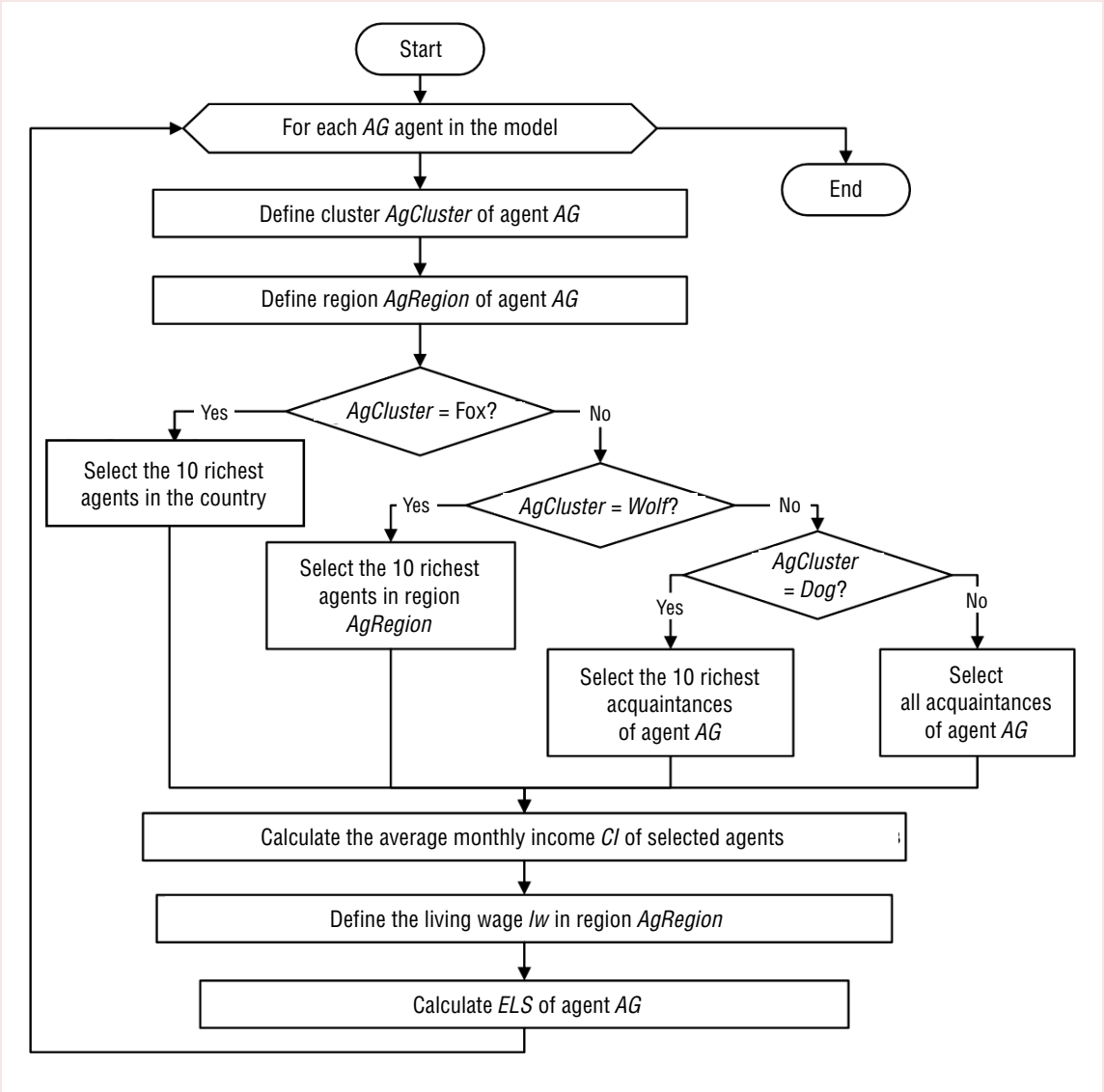
1) revision of the agent's views due to an economic change;

2) the impact of influencer-agents on digital media users;

3) the agent's communication with family, friends and colleagues

The first procedure reflects the correlation between the agent's standard of living and its views

Figure 3. Algorithm for calculating ELS score



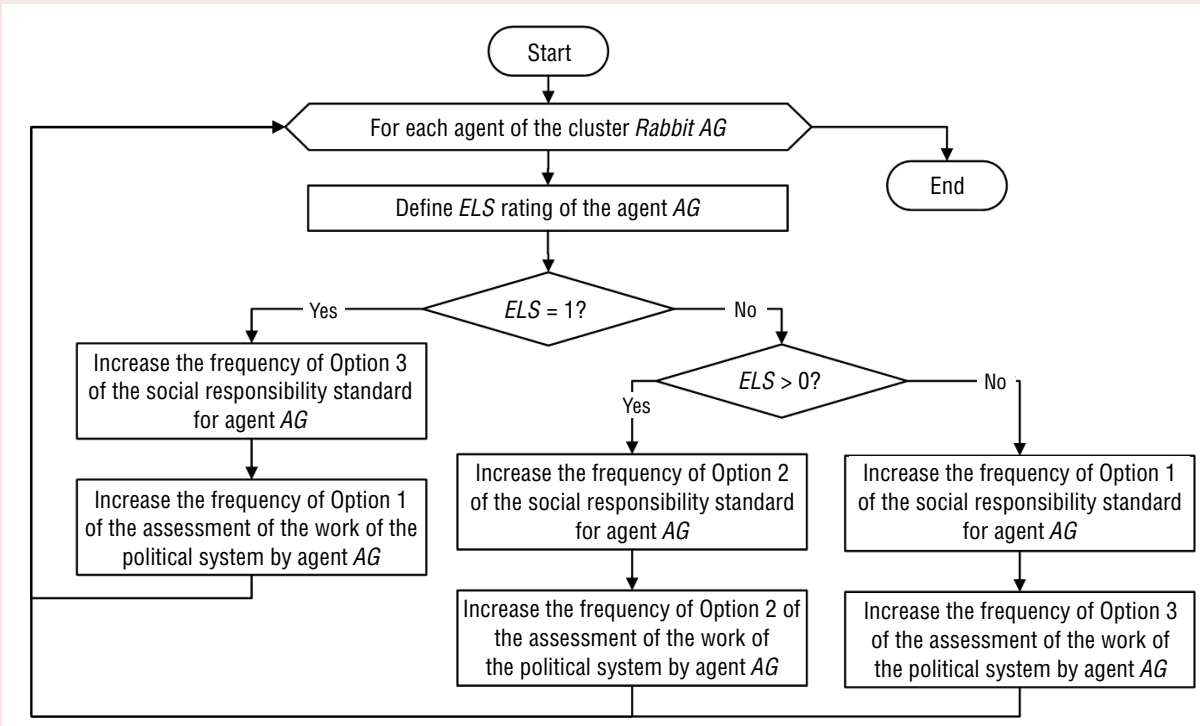
Source: own compilations.

on the effectiveness of government actions and their responsibility to provide population with everything necessary. The empirical data confirms this dependence, as will be shown in the relevant section, and therefore should be reflected in the model of the dissemination of norms and values. In the model, the assessment of the standard of living will have the strongest influence on the agents of the *Rabbits* cluster transferring them from a neutral to an active social state with declining standard of living. *Figure 4* shows the corresponding algorithm for changing the agents' norms.

Depending on the current value of the assessment of the agent's standard of living, the frequency of the corresponding options of its political norms increases. With a high standard of living, the frequency of the options "People should take responsibility for providing themselves with everything necessary" increases for the norm of social responsibility and "Rather satisfied" to evaluate the work of the political system. With declining standard of living, on the contrary, the frequency of options increases: "The government should be responsible for providing population with everything necessary" for the norm of social responsibility and "Completely dissatisfied" for evaluating the work of the political system. The quantitative parameter of the change in the frequency of options is selected in such a way that when the standard of living changes, a change in views can occur in one year.

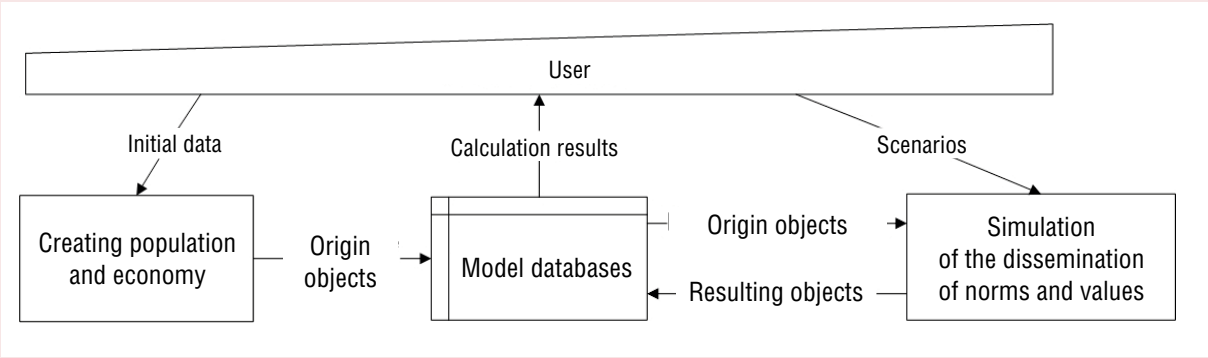
In the procedure of influence channel, the agent increases the frequency of the option, promoted by the influencer, which it follows. The rate of change of an agent's beliefs depends on its susceptibility to persuasion.

Figure 4. Algorithm for changing agents' beliefs due to their economic situation



Source: own compilations.

Figure 5. Model program structure



Source: own compilations.

When interacting familiar agents with each other, the beliefs of a younger cluster agent change, and remain unchanged if the agents belong to the same cluster.

The agent-oriented model of the dissemination of norms and values is programmatically implemented in Microsoft Visual Studio using the C# programming language. To store model objects and the results of scenario calculations, a model database was created using the PostgreSQL DBMS. *Figure 5* presents the model program structure. The model operates in two modes: creating information objects of the model and modeling the dynamics of the dissemination of norms and values.

Within the framework of creating information objects of the model, an artificial society is formed in which the regional and gender-age structure of the Russian population is reproduced, families and households are formed; organizations of various industries are created, their output, supplies and the status of accounts are established; jobs are created and associated with agents of appropriate qualifications; the educational system is initialized, agents of the appropriate age are fixed for educational places in institutions of secondary and vocational education. In more detail, the issues of creating an artificial society reflecting the population and Russia's economy are discussed in (Mashkova et al., 2020). In the created artificial society, contacts are established between agents (see the algorithm in Fig. 2); estimates of the standard of living for agents over the age of 14 are calculated (see the algorithm in Fig. 3); the initial values of norms and values are set in accordance with the data in Table 3. The created objects and relationships are stored in the model database.

In the mode of modeling the dynamics of the dissemination of norms and values, the original objects are changed by implementing procedures for reviewing the agent's views (see the algorithm in Fig. 4), the influencer-agents' impact on the users of digital media and the agent's communication with family, friends and colleagues in the context of the dynamics of the socio-economic environment set by the parameters of scenarios. The scenario calculation results are stored in the model database.

Initial simulation data

We have downloaded the initial data from the official portals of the Federal State Statistics Service[6], the Ministry of Science and Higher Education of the Russian Federation[7], the Unified

[6] Available at: http://www.gks.ru (accessed: September 6, 2021).

[7] Available at: https://minobrnauki.gov.ru/ (accessed: August 21, 2021).

Table 2. Initial simulation data

Modeling object	Variable	Description
Population	M_r^a	Number of men in region *r* in age group *a*
	F_r^a	Number of women in region *r* in age group *a*
	H_r	Number of households in region *r*
	C_r	Number of married couples in region *r*
Production	VA_r^s	Added value of industry *s* in region *r*
	X_{ij}	Intersectoral deliveries
	Exp^s	Product export of industry *s*
	Imp^s	Product import of industry *s*
Employment	E_r^s	Number of employees in region *r* and industry *s*
	AS_r^s	Average salary in region *r* and industry *s*
Finance	OL_r^s	Organizations' loans of industry *s* in region *r*
	OD_r^s	Organizations; deposits of industry *s* in region *r*
	RL_r	Residents' loans in region *r*
	RD_r	Residents' deposits in region *r*
Educational system	$S\_Sec_r^{sp}$	Number of students of secondary vocational education in specialty *sp* in region *r*
	$S\_High_r^{sp}$	Number of students of higher vocational education in specialty *sp* in region *r*
Budgetary system	Tax_t^s	Tax/excise rate of type *t* by industry *s* (if tax/excise has the same rate for all industries, then *s* = 0)
	P_r^c	Benefit rate for population category *c* in region *r*
Source: own compilations.		

Portal of the Budget System[8] and the Central Bank of the Russian Federation[9]. The set of initial data includes information about the population, production, employment, the financial situation of residents and organizations, the budgetary and educational system in various regions. *Table 2* presents the corresponding input variables.

To reflect the dissemination of norms and values among population at the beginning of the simulation, we use the World Values Survey data[10]. As part of the seventh wave of this study in Russia, more than 35 thousand respondents were interviewed about their opinions on various socio-political issues including family, religion, government assessment, migration and tolerance. *Table 3* shows the correlation between the respondents' income and the distribution of the norm options, studied in the paper.

With regard to the norm of social responsibility, we can conclude that the higher the group's income, the smaller part of it believes that the government should take responsibility for providing the population with everything necessary. Assessment of the effectiveness of the political system also correlates with differences in income: the lower the group's income, the more dissatisfied it is with the work of the government.

Results and discussion

Simulation of the dissemination of norms and values in Russia was carried out within the framework of two scenarios taking into account the

[8] Available at: http://budget.gov.ru (accessed: October 9, 2021).

[9] Available at: https://cbr.ru/ (accessed: October 10, 2021).

[10] World Values Survey. Available at: https://www.worldvaluessurvey.org/wvs.jsp (accessed: October 9, 2021).

Table 3. Dissemination of norms and values in different income groups, %

Norm/assessment option	National average	Among low-income population	Among middle-income population	Among high-income population
Social responsibility norm (government/individual responsibility)				
Variant 1. The government should be responsible for providing population with everything necessary	40.9	58.5	34.4	32.0
Variant 2. Something in between	44.1	31.7	49.1	45.7
Variant 3. People should be responsible for providing themselves with everything necessary	15.0	9.8	16.5	22.3
Assessment of work of political system				
Variant 1. Completely dissatisfied	17.9	29.4	14.4	9.2
Variant 2. Something in between	65.3	56.8	69.5	60.8
Variant 3. Rather satisfied	16.8	13.8	16.1	30.0
Source: own compilations based on the results of the 7th wave of the World Values Survey.				

parameters of possible economic changes. In the document "Scenario conditions of the forecast of socio-economic development for 2019–2024", the Ministry of Economic Development of the Russian Federation identifies the following key indicators of scenario conditions: Urals oil price; ruble-dollar exchange rate; GDP dynamics; exports and imports of goods. From the above conditions, within the framework of experimental studies on the developed model of the dissemination of norms and values, it is advisable to take into account external economic factors as scenario parameters (Urals oil price, ruble-dollar exchange rate, exports of goods of various industries), while GDP dynamics and import volumes are calculated, based on the results of simulation as output data.

The COVID-19 pandemic in 2020 made serious adjustments to the formation of scenarios for the dynamics of the external economic environment. Up to this point, such possibilities as the closure of international borders and widespread self-isolation were taken into account as extremely unlikely, but now they have become a fait accompli of unprecedented importance. In addition to external economic factors (for Russia, this is primarily a decline in prices and a drop in demand for energy resources, associated with a slowdown in the global economy), a number of internal economic difficulties have arisen, for example, a decline in trade, tourism services, catering and other industries, caused at the first stage by restrictions imposed, and then by a drop in incomes of a significant part of the population.

Since COVID-19 is still a global threat, epidemiological risks are the basis for developing scenarios for the period 2021–2025, and other factors are considered as derivatives of them. In this context, two scenarios are proposed:

1. Pessimistic, in which waves of coronavirus infection are repeated due to the virus mutation and appearance of new strains. In such a scenario, the continuation of restrictive measures and a reduction in global demand is inevitable, the restoration of which to pre-crisis values in all areas will take several years.

2. Optimistic, assuming the end of the pandemic in 2022 and a rapid subsequent recovery of all economic sectors.

We take into account the following parameters within the considered scenarios:

– ruble-dollar exchange rate (about 60 rubles per dollar in an optimistic scenario and about 80 rubles in a pessimistic one);

– the market price of a barrel of oil (about 80 dollars in an optimistic scenario and about 40 dollars in a pessimistic one);

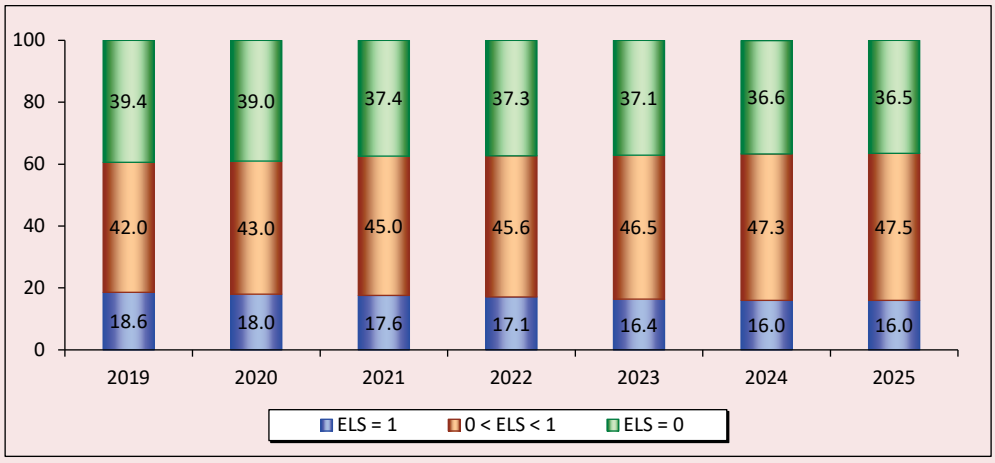
– exports of products from various industries (export growth by 10–15% in various industries annually in an optimistic scenario and by 0–5% in a pessimistic one);

– dynamics of domestic demand by industry groups. The sectors of entertainment and leisure organization, hotels and restaurants are the most affected in the domestic market, since their activities involve the gathering of a large number of people in one place and are strictly regulated in conditions of maintaining epidemiological risks. Trade and provision of personal services will also suffer significantly, and to a somewhat lesser extent, manufacturing industries. Thus, under the conditions of an optimistic scenario, growth in the affected industries is expected by 20–40% in 2022, ensuring their return to pre-crisis values, and then a more moderate growth of 2–5% annually.

In the conducted series of studies, inflation was considered as a target of 4–5% annually, but the latest data from Rosstat indicate a significant excess of this value (8–10% in 2021), therefore, in subsequent calculations it will be necessary to consider it as a scenario parameter in the range of 4–10%. Also, as a scenario, it is necessary to take into account the parameter of the household savings rate, which in the developed version of the model is static, calibrated according to retrospective data. It may change significantly for agents with the dominant option "People should take responsibility for providing themselves with everything necessary" for the norm of social responsibility in the conditions of increasing retirement age.

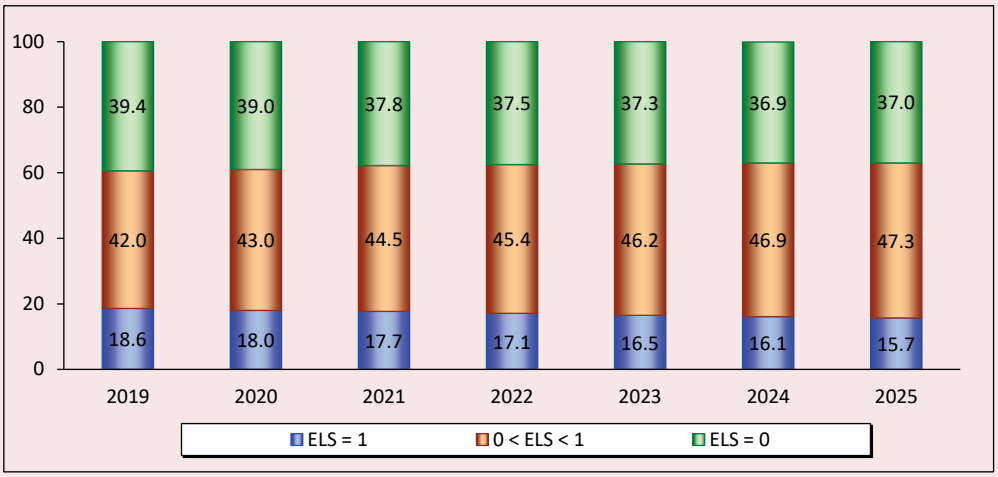
Changes in the socio-economic environment affect organizations: output volumes are decreasing in the affected industries, as a result, agents are losing jobs, household income and standard of living are decreasing, and dissatisfaction with the authorities is growing. In turn, the state can reduce economic and social tensions with the help of subsidies to organizations and benefits to affected categories of citizens. According to the experience of the first two pandemic years, government incentives did not fully compensate for the difficulties faced by residents, which affected the subjective assessments of the agents' standard of living. *Figures 6, 7* show estimate dynamics of the standard of living among Russia's population in a pessimistic and optimistic scenario, respectively. The share of residents who are satisfied with their standard of living is falling from 18.6% in 2019 to 16% in 2025. At the same time, the proportion

Figure 6. Dissemination of the ELS score among the Russian population in a pessimistic scenario, %



Source: own compilations.

Figure 7. Dissemination of the ELS score among the Russian population in an optimistic scenario, %

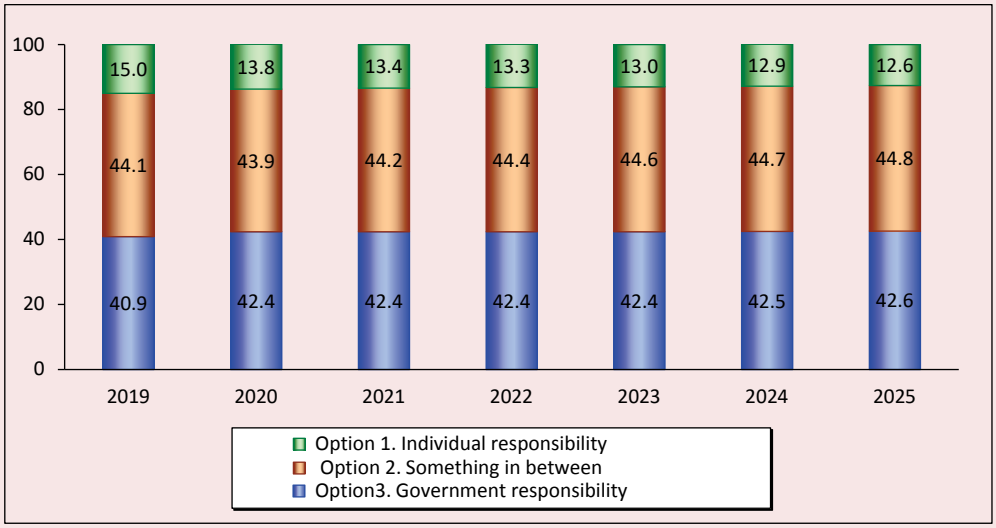


Source: own compilations.

of dissatisfied with $ELS = 0$ decreases and the proportion of relatively satisfied with *ELS* increases in the range from 0 to 1.

The share of satisfied in the optimistic scenario generally exceeds the indicators of the pessimistic scenario, except the previous simulation year corresponding to 2025, where it becomes 0.3% lower. This result is explained by the very principle of making estimates of the standard of living, which involves comparing one's income with the environment. It is likely that the number of wealthy people has grown after a period of high economic activity in an optimistic scenario, but there were even more people whose income has not changed, and the comparative assessment with the environment has fallen.

Figure 8. Dissemination of variants of social responsibility standard in a pessimistic scenario, %



Source: own compilations.

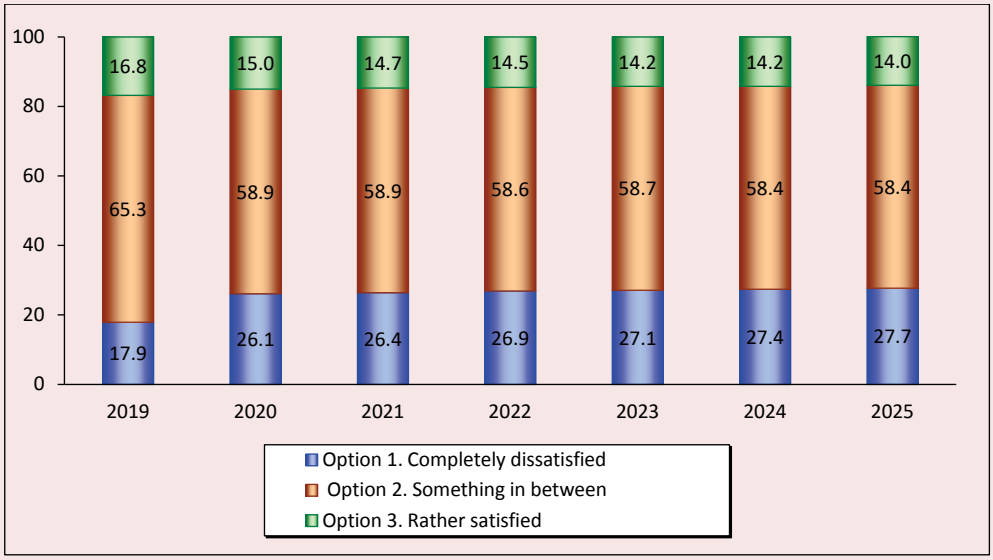
Figure 8 demonstrates changes in the dissemination of the norm of social responsibility in the pessimistic scenario. In comparison with 15% of supporters of individual responsibility for personal well-being in 2019, in 2020 there is a decrease in their share to 13.8%, due to pandemic restrictions affecting, among other things, business representatives. Under the pessimistic scenario, the proportion of supporters of individual responsibility gradually decreases to 12.6%, and the share of supporters of state responsibility increases to 42.6%, compared to 40.9% at the beginning of the simulation. In the optimistic scenario, a similar picture is observed with a slightly smoother decrease in the share of supporters of individual responsibility to 12.8%.

Figure 9 presents changes in the dissemination of the assessment of the work of the political system in the optimistic scenario. At the time of the beginning of the simulation, the share of those satisfied with the work of the political system was 16.8%, which is comparable to the share of dissatisfied (17.9%) at the same time.

Both in the optimistic and pessimistic scenarios, these indicators are moving in opposite directions: a drop in the share of those satisfied with the government to 14% in the optimistic scenario (13.7% in the pessimistic scenario) and an increase in the share of dissatisfied to 27.7% (27.9% in the pessimistic scenario). The largest increase in the number of dissatisfied people was in 2020.

The results confirm the assumption that economic factors influence the dynamics of norms and values in society. Both in the pessimistic and optimistic scenarios, the same involvement of agents in social media and the frequency of their communication with each other remained; only population's incomes and the corresponding estimates of the standard of living changed. At the same time, the resulting dissemination of norms and values in society has differences: in the pessimistic scenario, the proportion of supporters of individual responsibility and those satisfied with the actions of the authorities is smaller, although the difference with the optimistic option is relatively small (from 0.2 to 0.5%).

Figure 9. Dissemination of assessments of the work of the political system in an optimistic scenario, %



Source: own compilations.

Our research is based on a number of assumptions and limitations:

– the article considers a limited set of values, related to the ideas of a fair economic structure of society and the assessment of how the current government corresponds to these ideas;

– we assume that these values are not permanent for a person, but change over time, and not only the person's financial situation plays a significant role in these changes, but also the comparison with the income and standard of living of their environment;

– the forecast of the dissemination of norms and values in the work is based on a medium-term period of 5 years, due to the uncertainty of the epidemiological situation in the world and the risks it creates for the economies of various countries;

– when assessing social responsibility standard (government/individual responsibility), the agents' employment sphere is not taken into account, whereas during the period of severe pandemic restrictions, people employed or owning businesses in the affected industries counted most on financial support from the state: tourism, catering, entertainment and personal services;

– changing a person's beliefs in the presented model is limited to their inner world and is not implemented in attempts to change their life or society.

Conclusion

The aim of the work is to assess the impact of two groups of factors on the dissemination of norms in Russia: on the one hand, social media through popular influencers, on the other – changes in income and standard of living. The former task is directly related to the analysis of the content of social media, their impact on individuals, social groups and society as a whole. The latter task relates to the field of traditional economic forecasting. The integration of these different directions becomes possible through the use of an agent-oriented approach, where an agent is both a carrier and a distributor of a certain set of values, a member of social structures (family, team of colleagues and fellow students) and an economic agent, employed in a certain industry and having a certain income. The dissemination of such integrated models, using up-to-date data on the population and economy, can serve as a new step toward the informatization of management processes and socio-political research. The research results can be divided into four main groups.

1. The implementation of the concept of a social agent, which includes the principles of dividing agents into social activity clusters, a way to represent the agent's norms and values in the form of a set of options with varying frequency and the function of constructing subjective assessments of the standard of living, based on the agent's comparison with its environment.

2. Presentation of various aspects of creating an agent-based model of the dynamics of the dissemination of norms and values including the model structure, its integration with the artificial society model reflecting the population and Russia's economy, algorithms for creating a network of connections between agents and the dynamics of norms depending on current estimates of standard of living.

3. Analysis of empirical data on the dissemination of norms and values in Russia, in particular, the results of the seventh wave of the World Values Survey toward the relationship of income level, assessment of the work of the political system and social responsibility standards. The analysis has shown a significant degree of correlation between residents' incomes, political assessments and norms, which was taken into account when developing the model algorithms.

4. Scenario calculations, based on the developed model, aimed at forecasting the likely dynamics of public sentiment in various economic conditions.

The results obtained indicate a rather serious relationship between the economic situation and the residents' satisfaction with the government's actions. In both scenarios considered, the share of supporters of individual responsibility for providing all the necessary and satisfied with the current government is falling, but in the pessimistic scenario, the drop is more noticeable. Social media also have an impact on the results because even in an optimistic scenario involving the recovery of household incomes to pre-crisis levels, norms and values do not show a return to their original meaning; in other words, the observed dynamics cannot be explained solely by the action of economic factors.

We can choose a number of directions to continue the research. Firstly, the expansion of the list of norms and values studied including the importance of socio-political freedoms and the assessment of their dissemination in society, religious and life values (priority of career or family creation, the desired number of children, attachment to the hometown and country). Secondly, the study of the impact of restrictions on the digital media content on the dissemination of norms and values among various social categories, as well as possible side effects, when the restriction of content and the prohibition of the activities of individual influencers only increases discontent with the authorities, especially among young people. Thirdly, it is simulation of the relationship between internal beliefs and actions in society: voting in elections, organizing and participating in demonstrations and protest acts, and emigration to other countries. The list of scenario parameters of the economic environment also needs to be expanded, in particular taking into account possible deviations of inflation from the target values of the Bank of Russia and adjusting the household savings rate as a reaction to changes in the social policy of the state.

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Modern Development of Small and Medium-Sized Cities: Trends and Drivers

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Abstract. The processes of urbanization occurring in the world and in Russia, in addition to large cities and megacities, also affect small and medium-sized cities. However, while for the former there is a great deal of research on both the inner-city environment and socio-economic development in general, for the latter there is a lack of such studies. The main idea of the article is that an effective policy for the development of a city requires a comprehensive analysis of its place and role in the regional system and an understanding of the factors that ensure economic growth and create attractive conditions for the population. The purpose of the paper is to identify trends in and drivers of socio-economic development of small and medium-sized cities. The study identified problems and "bottlenecks" in the analysis of urban development. They include the weakness of methodological approaches to the assessment of current trends and factors in the development of small and medium-sized cities, taking into account their specifics, as well as the lack of necessary statistical information for a full-fledged analysis. The scientific

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novelty of the study lies in the fact that we propose our own methodology for determining the trends and factors in development of small and medium-sized cities, which differs from traditional approaches by including the analysis of the distribution of cities in the regional system (according to Zipf's law) in the dynamics and constructing a system of econometric models of the influence of factors on social and economic development. Testing the proposed approach in the Belgorod Oblast revealed a trend of divergence of small and medium-sized cities, increasing imbalances in population distribution, and the growth of small urban and rural settlements near Belgorod. The scientific hypothesis of the study is that the socio-economic situation in small and medium-sized cities is primarily positively influenced by investment in fixed capital and only then by such factors as an increase in housing stock, educational development, the work of sports and cultural institutions. The factors contributing to the social and economic development of cities are investments in fixed capital, the total number of residents, especially schoolchildren, the housing supply, and the development of sports and cultural institutions. The research findings are of practical value for the design and implementation of development policies for small and medium-sized cities in Russia.

Key words: economic geography, urbanization, small and medium-sized cities, impact factors, urban planning, urban growth, creative class, Zipf's law, Belgorod Oblast of Russia, regional development.

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Introduction

For more than 100 years, industrialization has stimulated the concentration of population in large cities. Today more than half of the world's population lives in cities (55.715%)[1]. It is not for nothing that Russia is known as a highly urbanized country, with an urban proportion of 74,74%[2]. Researchers face many questions – from the formation of a livable inner-city environment to determining the general trends and drivers of urban development in modern conditions.

Many areas can be distinguished in the research field of urban development. One of the most relevant among them includes the identification and assessment of the factors contributing to socio-economic development of the city in order to form recommendations to improve the welfare and quality of life of the population.

Nationwide and global factors have a greater positive effect in those cities that have developed useful institutional prerequisites and governance practice, established communications and created conditions that attract new resources and trigger cycles of cause and effect aimed at development.

For a long time, only two main criteria were considered as drivers of urban growth: distance to the city center and transportation costs (e.g., Alonso, 1960; Ullman, 1941). Later it became clear that this approach was too narrow even for model building. The number of factors has grown considerably, and works have appeared that single out one group of causes of economic growth. For example, in the aggregate human (labor) potential of a city it is now customary to single out the creative component (for more details see. Florida, 2003; Batabyal, Nijkamp, 2018; Rastortseva, Korbankova, 2021). Many studies are devoted to the emergence and development of agglomeration processes in cities (e.g., Harrison et al., 1996).

[1] According to World Bank for 2019 (data.worldbank.org).

[2] Calculated according to the Federal State Statistics Service as of January 1, 2021 (rosstat.gov.ru).

Questions concerning urban development factors have been raised among urban studies researchers (e.g., Jargowsky, 1997; Massey, Nancy, 1993; Wilson, 1997) and regional studies (e.g., Dreier et al., 2004; Katz, 2000; Pastor et al., 2010). Works that discuss the causes and consequences of concentrated poverty, looking at crime rates, schooling rates, and poor access to labor markets are especially noteworthy. For example, declining schooling in particular cities increases the proportion of students from poor families, middle-class demand for housing declines, wealthy families tend to leave the region, and the subsequent increase in crime further exacerbates the situation (Orfield, 2002). Schooling is an important factor in urban development, but it also becomes a cause of growing spatial inequality.

Thus, we see that research on development drivers is in demand from both scientific and practical points of view. The relevance of our study is also substantiated by the lack of research on the development of small and medium-sized cities (Marais, 2016). Russian publications include, for example, a study of cities in Perm Krai (Meshkov et al., 2013), focusing on the analysis of socio-economic development. It considered such factors as administrative (transfer of settlements to urban or rural settlements, their association with larger cities), natural population movement, migration processes, changes in the sex-age structure, etc. The analysis of the economy was conducted at the level of the region (not cities), which is explained by the incompleteness of municipal statistics.

In the work on the cities of the Bryansk Oblast[3], much attention is given to assessing resource potential, identifying development priorities, and formulating recommendations. There are known works based on small and medium-sized cities in the Perm Oblast, the Komi-Permyak Autonomous Okrug[4], the Kurgan Oblast (Buldakova, 2011), the Vladimir and Tula oblasts and Perm Krai (Oborin et al., 2017), and the Sverdlovsk Oblast (Makarova, 2017). One of the most comprehensive studies can be called (Uskova, Sekushina, 2021), which analyzes small and medium-sized cities of the European North of Russia as a whole and, in more detail, the Vologda Oblast. A number of works identify strategic priorities for urban development and formulate practical recommendations (e.g., Zhikharevich et al., 2017; Popov, Gnatyuk, 2017). At the same time, in our view, the issues of quantitative assessment of development factors often remain undisclosed, and are determined at the regional level or without the use of mathematical tools.

The purpose of the study is to identify trends and drivers of modern socio-economic development of small and medium-sized cities. The scientific novelty of the work consists in the methodological approach to the assessment of development trends through (1) the analysis of cities distribution by the number of population (according to Zipf's law) in dynamics, identification of development trends as well as geographical growth territories, (2) construction of models of factors' influence on economic and (3) social development, (4) interpretation of obtained results. The recommendations of the study will be valuable for local economic policy.

Theoretical and empirical studies of the socio-economic development of small and medium-sized cities

Small and medium-sized cities are the link between large urban agglomerations and rural settlements. However, regional economics and economic geography concentrate more on the

[3] Grachev A.B. (2005). Socio-economic development of small and medium-sized cities (Case study of the Bryansk Oblast): Candidate of Sciences (Economics) dissertation. Moscow.

[4] Medvedeva I.A. (2004). Tendencies and strategies of socio-economic development of small and medium-sized cities of the region (case study of Perm Krai and Komi-Permyak Autonomous Okrug): Candidate of Sciences (Economics) dissertation. Yekaterinburg.

analysis that focuses on large cities[5]. Scientific papers raise issues of urban zoning and social groups (Burgess, 2002), the distribution of functional areas depending on transportation routes and priority economic activities, the formation of a favorable urban environment, ecosystem, satisfaction with urban public space and its impact on the growth of citizens' well-being (Weijs-Perrée et al., 2019), etc. While the development of small and medium-sized cities, for which other issues need to be mainstreamed, is the subject of far fewer and generally insufficient studies (Bell, Jayne, 2009).

Small and medium-sized cities around the world are the fastest-growing settlements. Their population living in them is expected to grow by 32%, or 469 million people, between 2015 and 2030 (for comparison, large metropolitan areas are expected to grow by 26%, or 203 million people, over the same period) (Birkmann et al., 2016). The rate of urban population growth matters more than city size when it comes to how susceptible people are to adverse events (Garschagen, Romero-Lankao, 2015). Indeed, rapid development overloads local administrative capacities, which is reflected in the greater vulnerability of small and medium-sized cities to economic, social, environmental, epidemiological and other shocks.

Small and medium-sized cities have their own specific features. They are different in a number of ways: economic specialization (Hamdouch et al, 2017); closeness to or remoteness from large agglomerations, transport routes and hubs, national land and sea borders; ethnicity make up of the population – its traditions, customs, attitude to labor, power; historical preconditions for development – established science cities, industrial, commercial, cultural, tourist, agricultural, etc.; by the degree of involvement in interregional and international relations – with export-oriented or import substituting economy; development stage – growing or depressed.

We believe that all small and medium-sized cities can be united by the fact that the key resources for their development are the population (human capital), investment and revenues of the local budget (physical capital) and the management resource.

In world practice, small and medium-sized cities are usually distinguished by population size. German and Dutch researchers consider settlements with the population of 5–20 thousand people to be small cities, while medium-sized cities have a population of 20–100 thousand people (Gatzweiler et al. (Gatzweiler et al., 2012; Van Leeuwen and Rietveld, 2011). In the USA small cities are considered to be settlements with a population of 25–50 thousand people, medium-sized cities – with a population of 50–100 thousand people, and large cities – with a population over 100 thousand people (Feeney et al., 2020, p. 825). In China, small and medium-sized cities include settlements with up to 500 thousand inhabitants (Qi et al., 2013). The study on Africa, Asia, and Latin America (Birkmann et al., 2016) refers to settlements with 300–500,000 inhabitants as small cities, and cities with up to 5 million inhabitants as medium-sized cities.

In Russia, medium-sized cities include settlements with a population of 50–100 thousand people, small cities are up to 50 thousand people with three subcategories: up to 10 thousand, 10–20 thousand, over 20 thousand people. Small cities include urban-type settlements[6]. Both in Russia and in many other countries there is a practice of defining the status of cities and rural settlements with regard to functional and administrative aspects.

[5] According to the classification in the Russian Federation, large cities include cities with a population of between 250,000 and 1 million people.

[6] Code of Rules SP 42.13330.2016 "SNiP 2.07.01-89* Urban development. Urban and rural planning and development", approved by Order of the Ministry of Construction and Housing and Communal Services of the Russian Federation dated December 30, 2016, no. 1034/pr, entered into force on July 1, 2017.

Figure 1. Distribution of cities by population in the federal districts of Russia, as of January 1, 2021, units

By columns: 1 – up to 10,000 people, 2 – 10,000–14,999 people, 3 – 15,000–19,999 people, 4 – 20,000–29,999 people, 5 – 30,000–49,999 people, 6 – 50,000–99,999 people, 7 – 100,000–149,999 people, 8 – 150,000–199,999 people, 9 – 200,000–249,999 people, 10 – 250,000–499,999 people, 11 – 500,000–999,999 people, 12 – 1,000,000 people and more.

Source: compiled according to Population of the Russian Federation by municipalities on January 1, 2021. *Rosstat*, Moscow, 2021.

There were 1,115 cities in Russia in 2021[7]. Based on population size, we categorize them as follows:

1) cites with population exceeding one million – 15 cities with a population of 1,004,763 (Volgograd) to 12,655,050 (Moscow) people;

2) largest – 24 cities with a population ranging from 507,216 (Lipetsk) to 948827 (Krasnodar) people;

3) large – 39 cities with a population ranging from 257,757 (Khimki, Moscow Oblast) to 495,810 (Cheboksary) people;

4) big – 93 cities with a population ranging from 10,009 (Zelenodolsk of the Republic of Tatarstan) to 248,269 (Taganrog) people;

5) medium-sized – 151 cities with a population of 50,079 (Kirishi, Leningrad Oblast) to 99,469 (Novokuibyshevsk, Samara Oblast) people;

6) small – 793 cities with populations ranging from 866 (Innopolis) to 4,933 (Cheremkhovo, Irkutsk Oblast) people.

We can see that the number of medium-sized and small cities far exceeds the number of cities in the other categories. They account for 84.66% of the total number of cities. In addition, urbanization also affects urban-type settlements, the number of which, according to Rosstat, on January 1, 2021 amounted to 1,181 settlements.

Rosstat divides cities according to population size into 12 groups *(Fig. 1)*.

According to the Rosstat grouping, small and medium-sized cities include the first six groups. Their share in the total number ranges from 43% in the Southern Federal District to 83% in the Urals Federal District. The proportion of small cities varies from 20% in the North Caucasian Federal District to 74.24% in the Far Eastern Federal District.

The success of cities is largely explained by the ways of forming links with other entities in the urban system of the region. It is the relationship of small and medium-sized cities with their regional context and the performance of functions within a mono- or polycentric system of cities in the region that are key factors contributing to economic development (Meili, Mayer, 2017). The development of regional centers, small and medium-sized cities can be positively influenced by national and international relations carried out through leading companies, international institutions, cultural and scientific events (Meijers et al., 2016; Camagni et al., 2015).

Despite the features of the emergence and development of each settlement, small and medium-sized cities have a common set of problems:

1) natural population decline and migration to larger cities;

2) migration outflow of young and active residents;

3) underfunding of infrastructure;

4) dependence on industrial enterprises, dominance of a single industry in the city economy;

5) environmental problems caused by the development of extractive and manufacturing industries or agriculture in or near the city;

6) low income of a large part of the population;

7) lack of housing and/or unsatisfactory quality of housing stock;

8) insufficient level of health care services, education, cultural and sports institutions, etc.

Review of drivers of socio-economic development of small and medium-sized cities and research hypotheses

We can distinguish two groups of urban development drivers: geographical and non-geographical. The first include the location in relation to major cities, roads and other transport interchanges, access to the sea, natural and climatic conditions, and others. Agglomeration effects are also considered here: the physical closeness of

[7] Cities of Russia. Available at: https://xn----7sbiew6aadnema7p.xn--p1ai/ (accessed: December 1, 2021).

companies to each other and/or a city to other settlements increases overall efficiency by sharing infrastructure, economic intermediaries, a common labor market, and facilitated knowledge and technology transfer (Rastvortseva, Amanalieva, 2021).

Rapid urban growth leads to the emergence of negative agglomeration effects – an increase in factor prices and a decrease in the marginal returns from them, an increase in the burden on the transportation system and the environment, etc. (Henderson, Becker, 2000; Richardson, 1987).

In small and medium-sized cities, agglomeration effects stimulate economic growth, but they are difficult to obtain (Au, Henderson, 2006). Some papers consider the positive effects (diffusion of effects) of large cities on medium-sized and small cities that fall within their agglomerations (e.g., Jianyong Fan, 2006), but in general quantitative empirical studies in this area are insufficient.

Non-geographic factors can be divided into economic and technological factors. These include physical capital, human resources, and technological progress. **An increase in physical capital**, including through investment, contributes to the growth of labor productivity, overall efficiency, leads to an increase in income and improves the quality of life of the city's inhabitants. Cities that offer a high quality of life are attractive to highly educated and creative people with entrepreneurial abilities. Since the problem of housing is urgent, in our opinion, an increase in the housing stock will contribute to the development of the city.

The quality of human capital, which includes knowledge and skills acquired through education and experience, is an important condition for economic growth. Quality human capital is people with a high level of education, capable of creating new knowledge and ideas in different sectors of the economy. Speaking about the quality of human capital, we should note that the creative class of the city's population is of great importance today.

The main conditions that attract members of the creative class are local culture (including an environment of openness and tolerance); local opportunities (they can be assessed, for example, through the proportion of the labor force in health care, public education, cultural and leisure activities); economic situation (employment and wage levels, land prices) (Rikalović et al., 2020, p. 186).

Human capital is significantly influenced by the quality and accessibility of social infrastructure and the comfort of living. These factors provide the formation and accumulation of human capital. Favorable conditions and quality of life in the city are characterized by a high level of development of health care, culture and sports. Urban residents consider the lack of such institutions to be a serious problem, and the development of mass physical culture becomes a benchmark for local governments when conducting social policy (Sekushina, Kozhevnikov, 2018). These areas can be reflected in statistics as social infrastructure facilities (e.g., the number of sports facilities) and by counting the number of employees of relevant organizations.

An important factor contributing to favorable living conditions in a city is the environmental situation. Statistical data on the level of pollution, environmental protection and other indicators are not provided broken down by small and medium-sized cities of Russia. We believe that the analysis of the environmental component should be carried out not only for each settlement separately, but also in their interconnection. Such a study based on data analysis should be supported by monitoring of the situation on the ground.

Factors contributing to technological progress are new technologies, innovations both in the production of goods and services and in management processes, including the development of the urban environment. Cities are engines of economic growth (Lucas, 2001), which can be defined as an increase in income per capita (O'Sullivan, 2011). In

general, the economic development rate (growth[8]) is determined by the rate of capital growth (per worker – labor productivity), the technological progress rate (traditionally estimated by the number of new ideas – patents) and the growth rate of human capital (in terms of quantitative increase and quality improvement).

Innovation plays a significant role in a city. If we compare two cities of equal population size, then even in the absence of migration the utility curve will shift upwards in the innovative city. Further, innovativeness will attract a highly skilled labor force, a highly educated population, and a creative class (O'Sullivan, 2011), it will improve the quality of human capital and stimulate further development of technology.

Undoubtedly, the most important driver of city development is the administrative and managerial resource: the governor, the mayor, the head of the settlement and their teams. The study of the activities of the governing bodies could be the subject of a full-fledged independent study. Here we will rely on the results of activity, expressed in the achieved social and economic indicators.

The scientific hypothesis of the study is that the socio-economic situation in small and medium-sized cities is primarily positively affected by investment in fixed capital and only afterwards by such factors as an increase in housing stock, educational development, the work of sports and cultural institutions.

Research methodology

We propose to analyze the trends and drivers of socio-economic development of small and medium-sized cities according to the following scheme.

1. To evaluate the distribution of cities according to population size using the "rank-size" rule (Zipf's law), and to determine trends in development in dynamics. Zipf's law is used to analyze empirical distribution patterns, in our case cities by population size. The application of this indicator is possible at the level of individual countries, federal districts (see, e.g., Rastortseva and Manaeva, 2020), and regions. In our opinion, the possibility of applying Zipf's law for the constituent entities of the Russian Federation is substantiated by two conditions. First, the region must have a sufficient number of cities to construct the curve. Second, the region must have an established system of urban settlements. The Belgorod Oblast was formed in 1954, and its boundaries have not changed since then. We can assert that the system of cities in the region is quite established, formed in accordance with the development of productive forces in the oblast, the system of health care, school, secondary vocational and higher education, retail trade, etc. A region is an independent system for applying Zipf's law when analyzing the distribution of cities according to population size, especially in dynamics. However, inclusion of the region in larger systems: Central Black Earth Region, Central Federal District, Russia (as a whole or in parts, see, e.g., Kolomak, 2014) is also possible and expedient for obtaining new information. It is important to remember that "...a deviation from Zipf's law cannot be considered a valid basis for practical decisions concerning the management of the urban system's development" (Kolomak, 2016, p. 128).

At this stage, it is advisable that the analysis should include some rural settlements whose population is growing rapidly (often due to their closeness to large agglomerations), sometimes exceeding the indicators of urban-type settlements. Such settlements may not belong to cities for a long time for administrative reasons, but they contribute to the settlement system of the region.

[8] We believe that a city's economic development is a somewhat vague definition, as it may include more than specific changes that are measurable. Economic growth is a well-established concept, subject to evaluation using certain methods.

2. To build a series of econometric models of the factors' influence on the economic development of cities:

$$Y_{econ} = F(K, L, Ed, H, S),$$

where Y_{econ} – dependent variable of economic development,

K – physical capital indicator,

L – labor,

Ed – education,

H – housing supply,

S – sports facilities.

3. To build a similar series of models of the factors' influence on the social development of cities:

$$Y_{soc} = F(K, H, C, S),$$

where Y_{soc} – dependent variable of social development,

C – indicators of the development of cultural facilities.

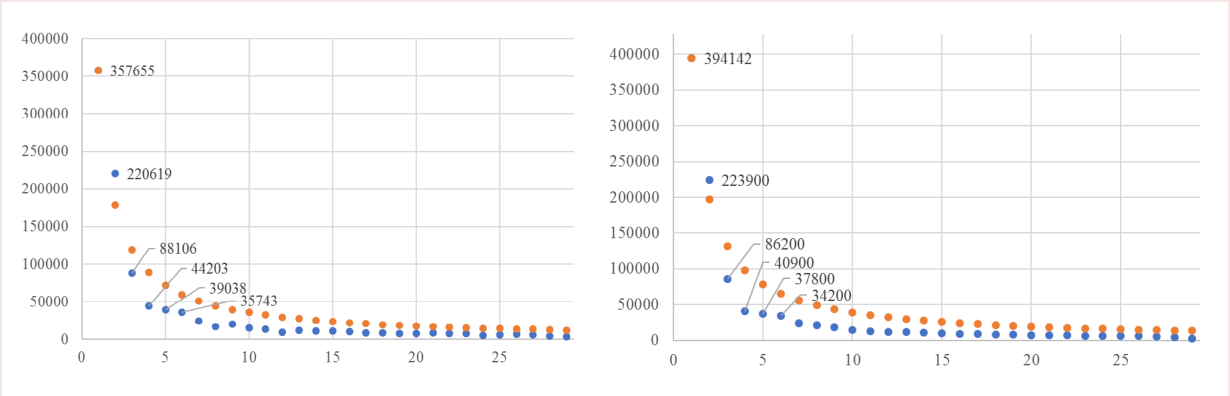
4. To interpret the results obtained.

The analysis (paragraph 2 and 3) will be carried out by the least squares method with the use of panel data. The study period is 2006–2021, the object of the study is 29 small and medium-sized cities of the Belgorod Oblast (in this case, a city is an urban settlement which is a municipal entity). For all cities and urban-type settlements we used data from the "Municipal Statistics" section of the database "Indicators of Municipal Structures" of Belgorodstat. In cases where statistical data is not presented for the entire study period, it is limited automatically[9].

The object of research analysis

As of 2021, there are 11 cities and 18 urban-type settlements in the Belgorod Oblast. The largest city, the administrative center, is Belgorod (population – 394,000 people as of January 1, 2020). Traditionally, the second largest city is Stary Oskol, the center of ferrous metallurgy. Its population is 224,000 people. The third city in the region is

Figure 2. Graph of the distribution of cities in the Belgorod Oblast by population size in 2011 and 2020 (in blue – actual data, in red – the normative value according to the rule "rank-size" / Zipf's law)



a) 2011 b) 2020*

* Data for the urban-type settlements of Urazovo, Tomarovka, Yakovlevo, Troitsky for 2019.

Source: compiled according to the database "Indicators of Municipal Structures" of Belgorodstat.

[9] For example, models 1.2, 2.3 are limited to 2017, as there is no statistical data on the number of students in general education institutions, employees of cultural and leisure organizations in the database of municipalities of the Belgorod region.

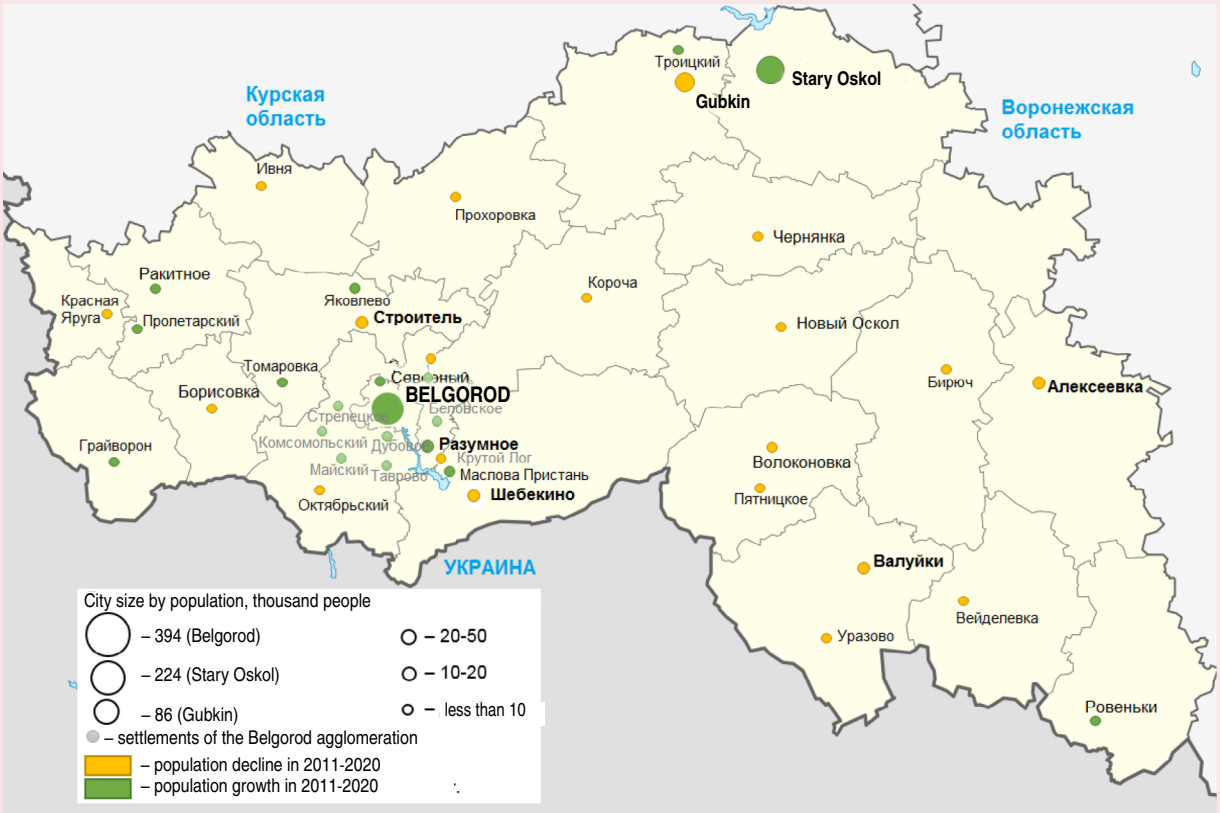
Gubkin – a single-industry town, since 2018 a territory of advanced socio-economic development – with 86,000 people. The category with a population of 20,000–5,000 people includes five cities, 10,000–20,000 people – 7,up to 10, 000 – 14. Maslova Pristan was a rural settlement until 2019, with a population of about 6,000.

Population urbanization processes have been taking place in the Belgorod Oblast for more than 60 years (Chugunova et al., 2013). Today, it has entered a mature stage – the growth rate of large cities is slowing down, the region's inhabitants tend to settle near cities, stimulating the growth of smaller settlements. The distribution within the urban system is changing *(Fig. 2)*.

The first conclusion that can be drawn from the distribution of the number of cities in the Belgorod Oblast is the absence (omission) of a "third" city with a population of 131 thousand. The oblast's second city – Stary Oskol – significantly (by 19.4% in 2020) exceeds the normative value according to the "rank-size" rule. Further, we can note that the number of cities is somewhat lower than the standard, which is set by Belgorod. If in 2011 Gubkin was slightly behind the third place in the ranking of cities, in 2020 it is already behind the fourth place. All this indicates a growing differentiation of cities by the population size.

Divergence trends are confirmed by a simple analysis of growth dynamics *(Fig. 3)*. We can see that the two largest cities are still growing. The population growth rate in Belgorod was 10.2% (since 2011), in Stary Oskol – 1.5%. Slight growth is observed in the west of the oblast – in Rakitiansky

Figure 3. System of cities and urban-type settlements of Belgorod Oblast in 2020



Source: compiled according to the database "Indicators of Municipal Structures" of Belgorodstat.

Table 1. Indicators of some rural settlements near Belgorod

Settlement	Distance to Belgorod, km	Population size in 2021, people	Population growth rate for 2011–2021, %
Dubovoye	8	13,215	43.92
Streletskoe	9.5	9,710	41.42
Novosadovy	11.5	7,089	131.74
Belovskoe	12.3	4,244	1.39
Tavrovo	13.1	6,003	13.91
Maisky	14.7	11,212	14.47
Belomestnoye	14.8	2,318*	-2.19
Komsomolsky	18	2,532	10.28
Krutoy Log	18	1,671	-3.86

* Data for 2019.
Source: compiled according to the database "Indicators of Municipal Structures" of Belgorodstat; mapping services to determine distances.

District (Rakitnoye urban-type settlement by 1.28% and Proletarsky – by 3.68%), in Grayvoron – by 0.74%. In the urban-type settlement of Rovenki, the most distant from the oblast center, the increase was 4.25%.

We should note the dynamics of small cities and urban-type settlements near Belgorod. Some growth is observed in Yakovlevsky District (0.95% in Tomarovka and 0.75% in Yakovlevo for 2011–2019). Much faster growth was observed in Belgorod's satellite settlements: Razumnoye urban-type settlement (population in 2021 – 21,247 people; distance 11.1 km) – 27.8%, Severnoye (12,281 people; 9.5 km) – 20.8%. The rural settlements around Belgorod were actively developing *(Tab. 1)*.

Thus, closeness to a major population center does not guarantee positive development for a city or town. It is necessary to identify a set of other, non-geographic, factors and conditions that would stimulate growth.

Models of the influence of factors on the modern socio-economic development of small and medium-sized cities

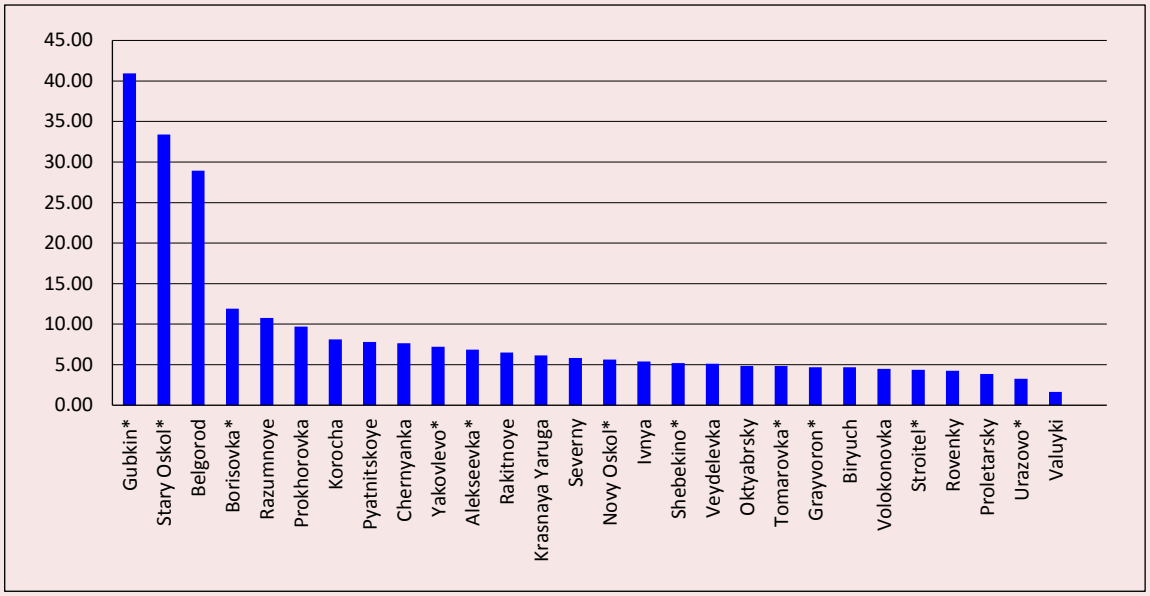
Let us analyze some indicators of the development of small and medium-sized cities (urban-type settlements) in the Belgorod Oblast. In the region there is a positive dynamics of local budget revenues, including per capita. The comparative analysis revealed no correlation between the size of the city by number of inhabitants and the size of the budget per capita – population growth is not an unconditional factor in increasing the city's budget. *Figure 4* shows the ranking of settlements in the Belgorod Oblast by per capita income of the local budget in 2019. We can see that the regional center is in third place, behind the cities where the mining industry is developed – Gubkin and Stary Oskol.

In some settlements, from time to time there is a significant increase in the per capita income of the local budget. The reason for this may be the improvement of the economic situation, the growth of the population's income and deductible taxes and one-time revenues from the budgetary system of the Russian Federation, subsidies and transfers *(Tab. 2)*.

Gratuitous receipts from other budgets, subsidies and transfers can be spent on the implementation of specific investment projects or solving current problems. We can judge the effectiveness of such receipts after some time – either they have a positive impact on the development of the city and stimulate the growth of local budget revenues from their own funds, or the financial situation in the city does not change.

Let us consider the dynamics of the number of students in general educational organizations. Slight reductions compared to 2006 occurred in Volokonovka, Pyatnitsky, Ivna, Biryuch, Rovenky

Figure 4. Distribution of cities and urban settlements of the Belgorod Oblast by local budget income per capita in 2019, thousand rubles per 1 inhabitant



* Data for 2018.

Source: compiled according to the database “Indicators of Municipal Structures” of Belgorodstat.

Table 2. Sources of revenue growth of local budgets in some settlements of the Belgorod Oblast in 2006–2020

Settlemenr	Donations from other budgets of the budgetary system of the Russian Federation	Interbudget subsidies	Other inter-budget transfers	Subsidies to the budgets of RF budget system	Income from sale of tangible and intangible assets	Taxes on personal income	Property taxes	Personal property tax	Land tax	Taxes on total income
Oktyabrsky	2020									
Razumnoye						2019*				
Severny	2012	2012	2012							
Veydelevka	2009–2011		2009–2011							
Pyatnitskoe	2012	2012	2008–2011		2011					
Korocha	2008	2008				2008				
Krasnaya Yaruga	2020	2020								2020
Prokhorovka	2008–2011, 2019–2020	2019–2020	2008–2011, 2019–2020	2019–2020						
Proletarsky	2011–2012		2011–2012							2011–2012
Chernyanka	2012, 2014, 2019	2012, 2014, 2019								
Yakovlevo	2008, 2011					2018	2018	2018	2018	

* Rather wrong, corrected in 2020.

Source: compiled according to the database “Indicators of Municipal Structures” of Belgorodstat.

and Yakovlevo. The number of schoolchildren grew in all other settlements, especially in Belgorod (23.84%), the nearest settlements – Severny (82.45%), Razumnoy (37.8%), Stroitel (48.54%), as well as Alekseevka, Tomarovka and others.

As the resulting indicators of socio-economic development of the city, we consider the revenues of the local budget *(l_budget)* and the population *(l_popul)*. The budget includes tax revenues, revenues from the use and sale of state and municipal property, profits of state and municipal enterprises, etc. In view of the fact that (with few exceptions) local budget revenues in the cities of the Belgorod Oblast are entirely own revenues, we can conclude that this indicator is a relevant reflection of economic development.

The population size, with noticeable changes in its distribution in cities and urban-type settlements of the region, reflects social development. In small settlements, this indicator is sensitive – when the standard of living declines, the population decreases due to the migration of people to more prosperous settlements, large cities or outside the region, as well as due to natural decline in population. And vice versa, cities with a high level of development become attractive for residents of the region and newcomers (for the Belgorod Oblast, these are often pensioners from the North).

As factor indicators we determine the number of students of general educational organizations *(l_school_learn)*, the size of the housing stock *(l_houses)*, investment in fixed capital and funds for shared construction *(l_invest)*, the number of sports facilities *(l_sport)* and the number of employees of cultural and leisure type organizations *(l_culture)*.

Using the method of least squares, we build two groups of models: the impact of factors on local budget revenues *(Tab. 3)* and the population *(Tab. 4)*. We checked for multicollinearity by the method of inflation factors (calculation of the variance bloating coefficient).

The main growth factor contributing to local budget revenues is the population size. Its increase by 1% leads to the growth of revenues by 1,147%. When other factors are included in the model, school education, creation of favorable conditions for the economy (investment in fixed capital), development of sports and housing conditions are seen as priorities. It is noteworthy that the number of schoolchildren plays an even greater role than the total number of residents of the city or town. This indicator, as well as investments in fixed

Table 3. The results of modeling the influence of factors on local budget revenues in cities and urban-type settlements of the Belgorod Oblast, 2006–2020

Variable	Model 1.1	Model 1.2	Model 1.3	Model 1.4
const		2.423** (0.589)	0.239 (2.064)	
l_popul	1.147*** (0.012)		0.895*** (0.248)	1.077*** (0.026)
l_school_learn		1.15*** (0.084)		
l_houses			0.229** (0.126)	
l_invest				0.720* (0.036)
l_sport				
Standard model error	0.703	0.627	0.656	0.648
R^2	0.750	0.753	0.758	0.772
Number of observations	295	288	266	255

*** Significance level is 1%; ** 5%; * 10%. Standard error is given in parentheses.
Source: own compilation; models are based on the database "Indicators of Municipal Structures" of Belgorodstat.

Table 4. The results of modeling the influence of factors on the population of cities and urban-type settlements of the Belgorod Oblast, 2006–2020.

Variable	Model 1.1	Model 1.2	Model 1.3	Model 1.4
const	2.828** (1.141)	2.656*** (0.864)	2.721*** (0.629)	4.302*** (0.347)
l_ houses	0.737*** (0.131)	0.674*** (0.101)	0.569*** (0.073)	0.301*** (0.051)
l_ invest		0.878** (0.033)		
l_culture			0.407*** (0.062)	
l_sport				0.665*** (0.077)
Standard model error	0.588	0.527	0.456	0.348
R^2	0.677	0.746	0.808	0.887
Number of observations	275	262	238	274

*** The significance level is 1%; ** 5%; * 0%. The standard error is given in parentheses.
Source: own compilation; models are based on the database "Indicators of Municipal Structures" of Belgorodstat.

capital, positively affects the amount of income of the local budget and forms the future appearance of the city.

The dynamics of the population of cities and urban-type settlements are due to a large number of factors, not all of which are included in the model. The most significant of them can be considered investment in fixed capital. It is the economy of a settlement that is the basis of its development. The availability of housing is important for the city: the growth of the housing stock by 1% stimulates an increase in the population by 0.737%. Creation of conditions for sports and development of cultural and leisure sector become significant factors. We should note that the latter factor was not statistically significant for the growth of local budget revenues.

Interpretation of the research findings

The testing of the proposed methodological approach to the determination of development trends and drivers in small and medium-sized cities of the Belgorod Oblast allowed drawing some conclusions. The analysis of the distribution of cities according to Zipf's law showed that the size of the main city of the oblast – Belgorod – sets higher standards for the number of inhabitants in other cities, with the exception of Stary Oskol. In the dynamics, the size of the region's cities changes due to internal and external migration and natural population movement in such a way that divergence trends intensify. More in-depth conclusions about the trends of urban development could be drawn on the basis of the analysis of such indicators as, for example, the average wages of workers by industry. It is noteworthy that significant population growth rates take place in rural settlements, some of which can already be classified as urban settlements according to this indicator. They are mostly all located near Belgorod, but their association with the regional center would further disrupt the distribution in the urban system.

Let us consider to what extent the hypothesis of the study is confirmed. First of all, the assumption of a significant positive impact of investment in fixed capital on the development of small and medium-sized cities is confirmed. Of course, the "labor" factor plays a greater role (Model 1.4 shows that local budget revenues will increase by 1.077% if the city's population grows by 1%) than the "capital" factor (by 0.72%). This is consistent with the provisions of economic theory. But the role of investment in small and medium-sized cities in the Belgorod Oblast is significant, which should be taken into account in local policy.

The assumption that an increase in the housing stock has a positive effect on the development of small and medium-sized cities is confirmed. A 1% increase in housing stock is accompanied by a 0.229% increase in local revenues (Model 1.3) and a 0.301–0.737% increase in population (Models 2.1–2.4). The housing issue remains a topical one. Local governments need to take into account the housing needs of the population for urban development.

The hypothesis of a positive influence of such factors as education, sports, and culture on the development of small and medium-sized cities is also confirmed. The development of general education in cities has a positive effect on economic indicators (more than the total population). A 1% increase in the number of students is accompanied by a 0.785% increase in local budget revenues (Model 1.2). Sport also has a positive influence, increasing the economic indicator by 0.392% (Model 1.5) and the social indicator by 0.665% (Model 2.4). Cultural development is reflected only on the population (by 0,407%, Model 2.3). We can assume that the influence of education, sport and culture is indirect, but it exists.

Thus, the importance of the economic component in small and medium-sized cities in the Belgorod Oblast is influenced to a greater extent by the number of inhabitants, especially those studying at school institutions, and the amount of investment in fixed capital. The growth of the population in small and medium-sized cities is stimulated not only by economic factors, but also by the provision of housing, the creation of conditions for sports and cultural and leisure development.

Conclusion

Modern trends in the development of small and medium-sized cities require new approaches to the development and implementation of socio-economic policies based on the results of an in-depth analysis of the dynamics of growth, place of the city in the overall regional system of settlement, factors and conditions.

The totality of urban development drivers in the works of scientists has become more diverse in recent decades, but for Russian researchers it remains very limited due to incomplete statistics. Among the factors, geographical and non-geographical (physical capital, human resources and technological progress) can be distinguished.

The scientific novelty for the research consists in proposing the methodology of determining the trends and drivers of development of small and medium-sized cities, which differs from traditional approaches by including the analysis of the distribution of cities in the regional system (according to Zipf's law) in the dynamics, and building a system of econometric models of the influence of factors on social and economic development. The proposed approach allows regional and local governments to pursue a more targeted development policy, understanding not only the current situation within the city, but also its role and place in the overall system of cities in the region.

The scientific hypothesis that in the first place the socio-economic situation in small and medium-sized cities is positively influenced by investment in fixed capital and only then by such factors as an increase in housing stock, development of education, sports and cultural institutions, has been confirmed.

In the future, it is advisable to conduct a study of the interconnection and inclusion of cities in the overall socio-economic system of the region. Thus, significant factors may include the distance between cities, the established transport system, the possibility and necessity of trips of inhabitants of small and medium-sized cities to larger centers for work (push-pull migration), etc. The results of the study are of practical value for the design and implementation of development policies for small and medium-sized cities in Russia.

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Substantiation for Including Municipalities of the Magadan Oblast in the Arctic Zone of the Russian Federation

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Abstract. The relevance and significance of the study are determined by the following: the analysis of international and Russian practices of establishing borders of the Arctic zone, trends and their changes observed in recent years in Russia, the study of the characteristics of economic activity in the Arctic, the adoption of the federal law to support business activities in the Arctic zone of the Russian Federation. The purpose of the work is to substantiate the inclusion of a number of such municipalities of the Magadan Oblast as Severo-Evensky, Omsukchansky, Srednekansky and Susumansky urban districts in the Arctic zone of the Russian Federation. The reason is the similarity of their natural, climatic and geographical characteristics with the Arctic regions, identity of the socio-economic development problems, unity of the Magadan Oblast municipalities and the Arctic regions of the Far Eastern Federal District by a common infrastructure. Scientific novelty of the study lies in proving the homogeneity of the conditions of the Magadan Oblast districts and the Arctic regions using the selected criteria. On the example of the project on the development of the Omolon iron-ore cluster, we assessed the effectiveness of its implementation for investors, considering the measures of state support in the Arctic zone of the Russian Federation. Thus, resource savings for the investor, taking into account the Arctic benefits, are more than twice as much as the savings from the use of the preferential economic zone regime in the Magadan Oblast. The research findings formed the basis of the expert conclusion on the expediency of inclusion of a part of the territory of Magadan Oblast into the Arctic zone of the Russian Federation, which will help create favorable conditions for investors in the development of natural resource potential, as well as ensure socio-economic development of the entire region.

Key words: Arctic regions, Arctic, Arctic zone of the Russian Federation, Magadan Oblast, borders of the Arctic zone, Arctic benefits.

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Introduction

The development of the Arctic territories has been in the focus of attention of specialists in various fields for many years. Active discussions are going on around the issue concerning the search for a unified approach to classifying land territories as part of the Arctic zone. The fundamental factors that distinguish an area as pertaining to the Arctic include its location beyond the border of the Arctic Circle and access to the Arctic Ocean. Each state that geographically belongs to the Arctic has its own specific features, according to which, in exceptional cases, the borders of their Arctic land territories have been expanded in order to increase the scale of state support for development of the Arctic zone.

The land borders of the Arctic zone of the Russian Federation (AZRF) have changed several times. The Decree of the RF President "On the land territories of the Arctic zone of the Russian

Federation"[1] was amended three times, expanding the borders of the Russian Arctic. The latest changes are recorded in the Federal Law "On state support for investment activities in the Arctic zone of the Russian Federation"[2]. Even at the stage of its development, the draft law prompted some RF regions to substantiate the inclusion of new territories (municipalities) in the Russian Arctic. Such activity is due to a large-scale list of tax and customs benefits and preferential regulation of labor relations provided for residents of the Russian Arctic (Khodachek, 2021).

The Magadan Oblast, a subarctic region, the northern part of which borders on the Arctic uluses of the Republic of Sakha (Yakutia) and Chukotka Autonomous Okrug, is working to substantiate the inclusion of part of its territory in the Russian Arctic. This is explained by the fact that the climatic, geographical and other conditions of the four municipal formations within the Magadan Oblast (Severo-Evensky, Omsukchansky, Srednekansky and Susumansky urban okrugs) are similar to those in the Russian Arctic.

In the present paper, we do not intend to study in detail all the efforts undertaken by government agencies and research organizations to determine the composition of the Russian Arctic and to develop criteria for its allocation. These issues have already been covered in the works of leading Russian scientists (Zhukov et al., 2018; Lukin, 2019; Pilyasov et al., 2018).

Since the Arctic border can be used for different purposes, there are no officially approved criteria and their values. We are primarily interested in the Arctic as an object of state administration, a set of subjects (territories) and their socio-economic development. The main objectives of the work are to generalize the currently used and proposed scientific criteria for the allocation of the Arctic land zone and, on the basis of empirical natural and economic material, to prove the compliance of four municipalities of the Magadan Oblast with these criteria in order to include them in the Russian Arctic so that they could get new development opportunities.

The information base included laws and regulations of the Russian Federation, Federal State Statistics Service data, materials of the Ministry of Natural Resources and Ecology of the Magadan Oblast, materials of the Magadan branch of the Territorial Fund of Geological Information for the Far Eastern Federal District, and publications of domestic and foreign scientists.

Review of approaches and criteria for the allocation of the boundaries of the Arctic land zone

World practice has no uniform official criteria for determining the land borders of the Arctic zone. Until the mid-1660s, the borders were allocated quite conditionally. The North was presented as the Arctic plus the sub-Arctic. Foreign authors most often considered the territory of the North and the Arctic through a list of administrative-territorial formations (Zhukov et al., 2018).

For example, economic geographer Louis-Edmond Hamelin determined the nordicity of Canada's regions based on *a comprehensive assessment of ten physical-geographical and economic-geographical features* (Soldatkin et al., 2002): geographical latitude of the area, summer and winter temperatures, duration of seasonal soil freezing, precipitation, forest cover, transport accessibility, population density, economic development. British scientists T. Armstrong, G. Rogers, and G. Rowley (Armstrong et al., 1978) also proceed from *the set of natural and economic-geographical factors* in determining the North and

[1] Presidential Decree 296 "On the land territories of the Arctic zone of the Russian Federation", dated May 2, 2014 (as amended by Presidential Decree 287, dated June 27, 2017, Presidential Decree 220, dated May 13, 2019, Presidential Decree 164, dated March 5, 2020). Available at: http://www.kremlin.ru/acts/bank/38377

[2] Federal Law 193-FZ "On state support for investment activities in the Arctic zone of the Russian Federation", dated July 13, 2020. *Rossiyskaya gazeta* (rg.ru). Available at: https://rg.ru/2020/07/16/193-fz-ob-arkticheskoy-zone-dok.html

the Arctic. According to American scientists G. Osherenko and O. Young, *Arctic territories include those located north of 60°N*, but in some cases – much further south (Osherenko et al., 1989).

The Encyclopedia of the Arctic (editor – Professor of Social Anthropology Mark Nuttall) provides the following mandatory criteria for determining the Arctic: *high latitude, long winter, short and cool summer, little precipitation, permafrost, frozen lakes and sea in winter, absence of trees* (Nuttall, 2005). *The Encyclopaedia Britannica* states that Arctic conditions are also found far south of the Arctic Circle, and the division into sub-Arctic and Arctic regions shows the *distribution of permafrost, glaciers and other indicators* (Ingold et al., 2019).

The Arctic Council[3] considers that the border of the Arctic is *a line proposed by the developers of the Conservation of Arctic Flora and Fauna (CAFF) project on the basis of a set of natural characteristics*. There are no severe restrictions on national approaches in this matter.

"None of the ways of defining the Arctic is satisfactory for all purposes ..." (Nuttall, 2005). The frontiers of the Arctic are being shifted so that certain territories could obtain state support. Thus, Canada, when determining the borders of the Arctic, is guided by the border of 60°N. The USA, taking into account political and economic factors, considers that the Arctic zone includes territories north of the Arctic Circle and south of it. The entire state of Alaska is part of the Arctic, although its southern point is located at almost 53°N. In Norway, there is no definition of Arctic territories in national regulatory legal acts; the Arctic territory is allocated only when conducting offshore operations related to oil and gas production: areas of the Norwegian Sea north of 65°N. In Denmark, the island of Greenland, recognized as part of the Arctic, extends southward to almost 58°N.

In Russia in Soviet times, the North was represented by the regions of the Far North (localities equated to it) and the Arctic regions, which, in turn, were determined by a secret list (Pilyasov et al., 2018). As environmental conditions were changing and new technologies emerging, the Arctic economy at the present stage has increased the number of functions[4] due to the addition of the mineral resources and transport functions (the Northern Sea Route (NSR)). Taking into account the fulfillment of these new functions in the future, the discussion about the borders of the Arctic is taking place both at the international, national and regional levels.

The legislative basis for the state regulation of the development of the Russian Arctic is currently represented by Presidential Decree 164 "On the fundamentals of the state policy of the Russian Federation in the Arctic for the period up to 2035", dated March 5, 2020; Presidential Decree 645 "On the strategy for development of the Arctic zone of the Russian Federation and ensuring national security for the period up to 2035", dated October 26, 2020; RF Government Resolution 484 "On approval of the state program of the Russian Federation "Socio-economic development of the Arctic zone of the Russian Federation", dated March 30, 2021. The territory of the Arctic zone is defined by Presidential Decree 296 "On the land territories of the Arctic zone of the Russian Federation"[5] (hereinafter – Presidential Decree 296) and the Federal Law "On state support for entrepreneurial activity in the Arctic zone of the Russian Federation"[6] *(Fig. 1)*.

[3] An authoritative Arctic international organization.

[4] The Arctic performs three functions: military, social and environmental.

[5] Presidential Decree 296, dated May 2, 2014. Available at: https://docs.cntd.ru/document/499093267

[6] Federal Law 193-FZ "On state support for entrepreneurial activity in the Arctic zone of the Russian Federation", dated July 13, 2020. *Rossiyskaya gazeta* (rg.ru). Available at: https://rg.ru/2020/07/16/193-fz-ob-arkticheskoy-zone-dok.html

Figure 1. Borders of the Arctic zone of the Russian Federation, 2021

Note: the territory of the Arctic zone of the Russian Federation is highlighted in blue.
Source: Compiled on the basis of Esri CIS spatial data.

Discussions about the uncertainty of the "arctic" criteria of the territories and borders of the Arctic arise regularly both in the scientific community and in public administration (Zhukov et al., 2018; Pilyasov et al., 2018; Kochemasova et al., 2019; Emel'yanova, 2019). Russian scientists offer many scientific approaches to the identification of the southern land borders of the Russian Arctic (Lukin, 2014; Toskunina et al., 2013). Let us note, for example, astronomical (according to the latitude of the Arctic Circle 6633'N) and other options (60th, 65th, 70th parallel of the Northern Hemisphere); bioclimatic (according to the level of discomfort of natural living conditions, according to the July isotherm +10°C); physical and geographical (according to the geographical differentiation of territories and landscapes); administrative (according to territorial and administrative boundaries) (Lukin, 2019); geo-cultural (according to settlement, land use, development of ethnoculture) (Lukin, 2019); geopolitical (according to the availability of access to the seashore of the Arctic Ocean); geo-economic (according to the complexity of the functioning of the economy, taking into account the development of the NSR; Voronenko, Greyzik, 2019; Leonov, Zaostrovskikh, 2021), northern import, modernization of the Arctic economy (Gal'tseva et al., 2020); social (taking into account demography, the standard of living and quality of life) (Lukin, 2019).

Let us focus on several significant works of recent years, which substantiate a set of criteria for determining the boundaries of the Arctic.

Yu.F. Lukin's monograph *The Diverse Arctic in the Flow of Time and Meanings* (Lukin, 2019) uses several interrelated natural-geographical, socio-economic and political-legal criteria: the Arctic Circle (66°33′44″N); geographical differentiation of Arctic landscapes and zoning of territories; natural-climatic criteria; internal administrative-territorial borders of entities and external borders of territorial

waters, exclusive economic zones of Arctic states; cultural and ethnic landscape; arctic societies; economics; geopolitics. Yu.F. Lukin notes that the common borders of the Arctic, defined on the basis of the use of natural and climatic indicators, as well as cultural anthropology, ethnology, and geopolitical claims, almost never coincide and are a permanent, conflict-causing factor among scientists, politicians, managers, in public administration and geopolitics.

M.A. Zhukov and colleagues proposed clear natural and economic criteria for the allocation of the AZRF with an application algorithm taking into account the developments of specialized scientific organizations[7]. The criteria are presented in the 2015[8]–2017 publications on the website "Arktika segodnya" [Arctic Today], in journals (Zhukov et al., 2017b) and monographs (Zhukov et al., 2018):

1. ***Latitudinal position criteria*** – attribution of the territory to subzones of UV deficiency. A territory is included in the AZRF if it has a northern position within the boundaries of the subzone of moderate UV deficiency (if this is justified by other criteria as well).

2. ***Arctic and subarctic climate***, assessed by the bioclimatic characteristics of the discomfort of people's life.

3. ***Arctic and subarctic landscapes***[9]. The location of territories within the tundra and forest tundra provides for their inclusion in the AZRF, with the exception of the territories of Kamchatka Krai and the Okhotsk coast. The location of territories within the northern taiga provides for the possibility of their inclusion in the AZRF (if this is justified by other criteria).

4. ***Access to the coast of the Arctic Ocean***[10].

5. ***CAFF-border*** as an additional criterion justifying the inclusion of territories in the AZRF (if this is justified by other criteria).

6. ***Arctic specifics of economic systems***: transport and economic attraction to the Northern Sea Route and being in its zone of influence; proximity to the seas of the Arctic Ocean; periphery, isolation and remoteness of Arctic economic systems from large industrial centers (old-developed regions); focal/point-network nature of territory development; pronounced uneven settlement, concentration of people in settlements; mono- and oligopoly of the production specialization of local settlements and economic development zones, raw material orientation and the removal of a significant part of the final redistribution outside the territory; non-economic "northern" rise in price in an extreme Arctic form, observed almost in the entire range or a very significant part of the directions of financial costs for management and life.

At the same time, M.A. Zhukov notes that nature has no borders of the Arctic, but for the most part there is a very wide "transitional area" that allows one or another administrative and municipal territorial formations to be attributed to the AZRF with a high degree of objectivity (Zhukov, 2018).

Analyzing the southern border of the Arctic as a biogeographic boundary, Doctor of Sciences

[7] Arctic and Antarctic Research Institute of the Federal Service for Hydrometeorology and Environmental Monitoring of Russia, RAS Institute for Geography, Luzin Institute for Economic Studies – Subdivision of the Federal Research Center "Kola Science Center of the Russian Academy of Sciences", All-Russian Scientific Coordination Center "Sever" under the RF Ministry of Economic Development/ Autonomous Non-Commercial Organization "Sever".

[8] Zhukov M.A. (2015). Materials for determining the criteria for the allocation of the Arctic zone of the Russian Federation. Expert Council on the Arctic and Antarctic under the Federation Council. Available at: https://www.arctic-today.ru/index.php/rajonirovanie-arktiki/115-materialy-k-opredeleniyu-kriteriev-vydeleniya-arkticheskoj-zony-rossijskoj-federatsii (accessed: September 19, 2021); Zhukov M.A., Filippov V.V., Kadashova N.A., Krainov V.N., Telesnina V.M. (2016). Criteria for the allocation of the Arctic zone of the Russian Federation and the algorithm of their use. Available at: https://arctic-today.ru/index.php/biblioteka (accessed: September 19, 2021).

[9] According to the Arctic and Antarctic Research Institute of the Federal Service for Hydrometeorology and Environmental Monitoring of Russia.

[10] According to the opinion of the Arctic and Antarctic Research Institute of the Federal Service for Hydrometeorology and Environmental Monitoring of Russia.

(Geography) A.A. Tishkov believes that the decision on the composition of the AZRF is "not the result of a physical and geographical, medical and biological or ecological scientific study, but a political act that takes into account natural, social, demographic and political realities, as well as the convenience of public administration" (Tishkov, 2012). The natural borders of the Arctic are not suitable for public administration due to the instability caused by climate change.

Thus, with a variety of approaches to establishing the southern border of the Russian Arctic, both foreign and Russian scientists take into account the governability factor (Vasil'ev, Selin, 2014); therefore, there remains an opportunity to expand the boundaries of the AZRF. According to A.N. Pilyasov, if the northern legislation was developing in Russia at the pace at which the Arctic is developing, then no "waves" up into the Arctic, would never have arisen in the Northern regions. The socio-economic zone of the Arctic should be considered as a single region and take into account the close connection of the Arctic territories with the North of Russia (Pilyasov et al., 2018).

The essence of almost all studies boils down to the following: the mechanisms and laws of socio-economic development of the Arctic are so specific (Larsen, Fordahl, 2015; Huskey, 2006; Petrov et al., 2016) that it is absolutely necessary to allocate the Arctic into a separate production, to develop independent principles and mechanisms of socio-economic development for it (Zamyatina, Pilyasov, 2017; Pilyasov, 2009).

Research findings

Based on the opinions of reputable foreign and Russian scientists, we examined important characteristics of the regions (municipal formations) included in the AZRF and compared them with the

Figure 2. The outline of the administrative division of the Magadan Oblast in the context of urban okrugs

Source: Website of the Magadan Oblast Government. Available at: https://www.49gov.ru/our_region/municipalites/

Table 1. Characteristics of the "Arctic" municipalities of the Magadan Oblast

Municipal formation – urban okrug	Area, thousand sq. km	Distance to Magadan, km	Population as of January 1, 2020, people	Population density	Average July isotherm, 2019, °C	Northern latitude, degrees	Potential	Note
Severo-Evensky	102.0	535	1876	0.02	12.2	60.5–66.0	Silver, gold, iron, lead, zinc, molybdenum, copper, coal, commonly occurring minerals (COMs); marine biological resources. *Promising object: Omolonsky iron ore area (iron resources – about 760 million tons).*	Borders on Chukotka Autonomous Okrug. Zones of the Arctic mountain taiga, tundra and forest tundra. Permafrost. In the south there is an access to the coast of Gizhigin Bay of the Sea of Okhotsk. About 75% of the population are indigenous small-numbered peoples of the North (ISNPs). There is no centralized power supply. Passenger transportation by air only. Cargo delivery in summer – by sea and by air, in winter – by air, if there is a winter road, then by motor transport.
Omsukchansky	60.4	580	4963	0.08	13.6	60.8–64.8	Silver, gold, tin, lead, zinc, brown and hard coal, COMs. *Promising objects: deposits of the above minerals.*	Continental climate. Zone of tundra forests and taiga open woodland. In the south-east there is an access to the coast of Gizhigin Bay of the Sea of Okhotsk. About 10% of the population is ISNPs of the North. Top silver mining region in Russia.
Srednekansky	91.8	500	2124	0.02	15.4	62.0–65.4	Gold, silver, tin, copper, cobalt, indium, bismuth, tungsten, iron, lead, zinc, cadmium, selenium, hard and brown coal, fluorspar. Energy potential. *Promising objects: Oroekskaya metallogenic zone (copper) – 11 million tons, Bakhapchinskoye deposit and Malinovaya zone (tungsten) – 125 thousand tons.*	Borders on the Republic of Sakha (Yakutia) and Chukotka Autonomous Okrug. The climate is sharply continental; 70–140 m permafrost The territory is located in the sub-Arctic zone, in the forest tundra zone. About 16% of the population is ISNPs of the North. There is a powerful energy potential of the Kolyma HPP and Ust-Srednekanskaya HPP cascade.
Susumansky	46.8	635	6741	0.15	13.1	62.0–64.5	Placer gold, coal, COMs, lead. *Promising objects: deposits of the above minerals.*	Borders on the Republic of Sakha (Yakutia). The climate is sharply continental. A combination of the mountain tundra zone and mountain taiga. Permafrost. A large volume of technogenic gold-bearing complex has been accumulated.

Sources: Investment passports of municipal formations as of January 1, 2021: Susumansky Urban Okrug. Available at: http://susumanskiy-rayon.ru/economy/invest/investpasport//; Srednekansky Urban Okrug. Available at: http://admmosrednekan.ru/economy/socialeconomy/pasport-munitsipalnogo-obrazovaniya//; Severo-Evensky Urban Okrug. Available at: https://sevensk.49gov.ru/common/upload/30/editor/file/PASPORT_MO_za_2020g._.pdf/; Omsukchansky Urban Okrug. Available at: pasport-omsukchanskogo-gorodskogo-okruga-2021-god.docx (live.com); Gal'tseva N.V., Sharypova O.A. (2020). Mineral resource complex of the Far North-East of Russia: Prospects and conditions for development. *Mineral'nye resursy Rossii. Ekonomika i upravlenie,* 4–5, 64–68.

characteristics of Severo-Evensky, Omsukchansky, Srednekansky, Susumansky urban okrugs of the Magadan Oblast *(Fig. 2)*. The natural and economic criteria for the allocation of the AZRF proposed by M.A. Zhukov are taken as a basis. The comparison was carried out in accordance with the quantitative expressions of the criterion in the Arctic regions of Russia (if available) or with the actual values of the indicators (if the quantitative criterion is absent).

The municipal formations under consideration are characterized by a low number and density of population and are located at a distance from the

Table 2. Geographical coordinates of the Arctic territories of the Russian Federation and municipalities of the Magadan Oblast

RF constituent entity/municipal formation	Northern latitude, degrees
Chukotka Autonomous Okrug	61.8–71.5
Yamalo-Nenets Autonomous Okrug	63.3–73.5
Municipal formation “Momsky District” (Republic of Sakha (Yakutia))	64.0–67.8
Rural settlement “Settlement of Yukta” (Krasnoyarsk Krai)	63.3
Rural settlement “Settlement of Kislokan” (Krasnoyarsk Krai)	63.0
Rural settlement “Settlement of Surinda” (Krasnoyarsk Krai)	62.0
Severo-Evensky Urban Okrug	*60.5–66.0*
Omsukchansky Urban Okrug	*60.8–64.8*
Srednekansky Urban Okrug	*62.0–65.4*
Susumansky Urban Okrug	*62.0–64.5*
Source: https://yandex.ru/maps/	

Figure 3. The boundary of the cryolithozone of the Russian Federation

Source: Surprises of “eternal ice”. Available at: https://scientificrussia.ru/articles/syurprizy-vechnogo-lda

Table 3. Average monthly temperature in July in a number of regions included in the AZRF and in the Magadan Oblast, °C

Region	2005	Rank in the RF 2005	2010	Rank in the RF 2010	2015	Rank in the RF 2015	2017	Rank in the RF 2017	2019	Rank in the RF 2019
Arctic regions*										
Nenets Autonomous Okrug	10.1	2	10.0	3	8.1	2	14.9	10	9.7	2
Murmansk Oblast	13.8	8	14.7	8	10.0	3	13.6	6	11.2	4
Yamalo-Nenets Autonomous Okrug	13.3	6	9.7	2	13.3	9	14.5	8	15.2	20
Taymyrsky Dolgano-Nenetsky District	5.7	1	4.7	1	7.9	1	6.5	1	6.9	1
Chukotka Autonomous Okrug	10.9	3	11.1	4	12.4	6	10.3	2	10.8	3
Magadan Oblast, *including urban okrugs***:*	13.6	7	16.7	13	15.0	16	12.3	3	12.7	7
Severo-Evensky	*12.1*	–	*14.5*	–	*15.7*	–	*12.3*	–	*12.2*	–
Omsukchansky	*16.3*	–	*23.7*	–	*15.5*	–	*13.4*	–	*13.6*	–
Srednekansky	*18.6*	–	*20.7*	–	*18.3*	–	*15.2*	–	*15.4*	–
Susumansky	*16.0*	–	*23.5*	–	*15.9*	–	*12.9*	–	*13.1*	–

Sources: *Russian Statistical Yearbook: Statistics Collection*. Rosstat. Moscow, 2006; 2016, 2018, 2020.
* Regions and municipalities that are geographically completely related to the Russian Arctic.
**Data of the average July isotherm (source: http://www.pogodaiklimat.ru/archive.php; https://www.gismeteo.ru/diary)

regional center *(Tab. 1)*. The population of the districts is decreasing annually. In the development of a rich natural resource potential (Galtseva, Sharypova, 2020), the drive-in drive-out work practices prevail.

Uniformity of geographical and climatic characteristics of municipalities of the Magadan Oblast and the Arctic territories of the Russian Federation

a) Geographical location. The municipal formations are located in the range of the northern latitude close to the interval of the northern latitude of the territories of the AZRF. That is, the northern borders of urban okrugs of the Magadan Oblast are located above the southern points of some territories of the AZRF *(Tab. 2)*.

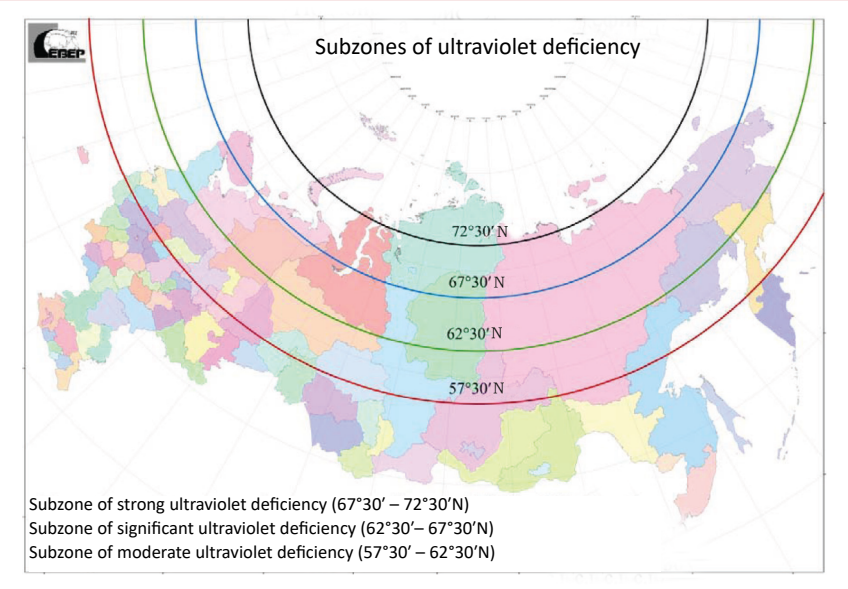
b) Extreme natural and climatic conditions. Magadan Oblast districts are characterized by almost ubiquitous permafrost *(Fig. 3)*.

Table 3 provides information on the average monthly temperature in July in the RF Arctic territories and the data on the Magadan Oblast and its municipal formations. Only two RF constituent entities out of those, whose entire territory is in the Arctic, meet the criterion of the average July temperature ranging from 10°C and below. The Magadan Oblast, including three of the four districts we are considering, is characterized by the temperature conditions that in some years are worse, in comparison with certain Arctic regions.

There is no clear trend of an increase or decrease in the July temperature. From 2005 to 2019, the average July isotherm in the Magadan Oblast as a whole decreased by 1°C. In the Omsukchansky, Srednekansky and Susumansky urban okrugs of the Magadan Oblast, there is a decrease in the average July isotherm by 3°C. In 2017, the Magadan Oblast ranked third among RF constituent entities in terms of the average monthly temperature in July.

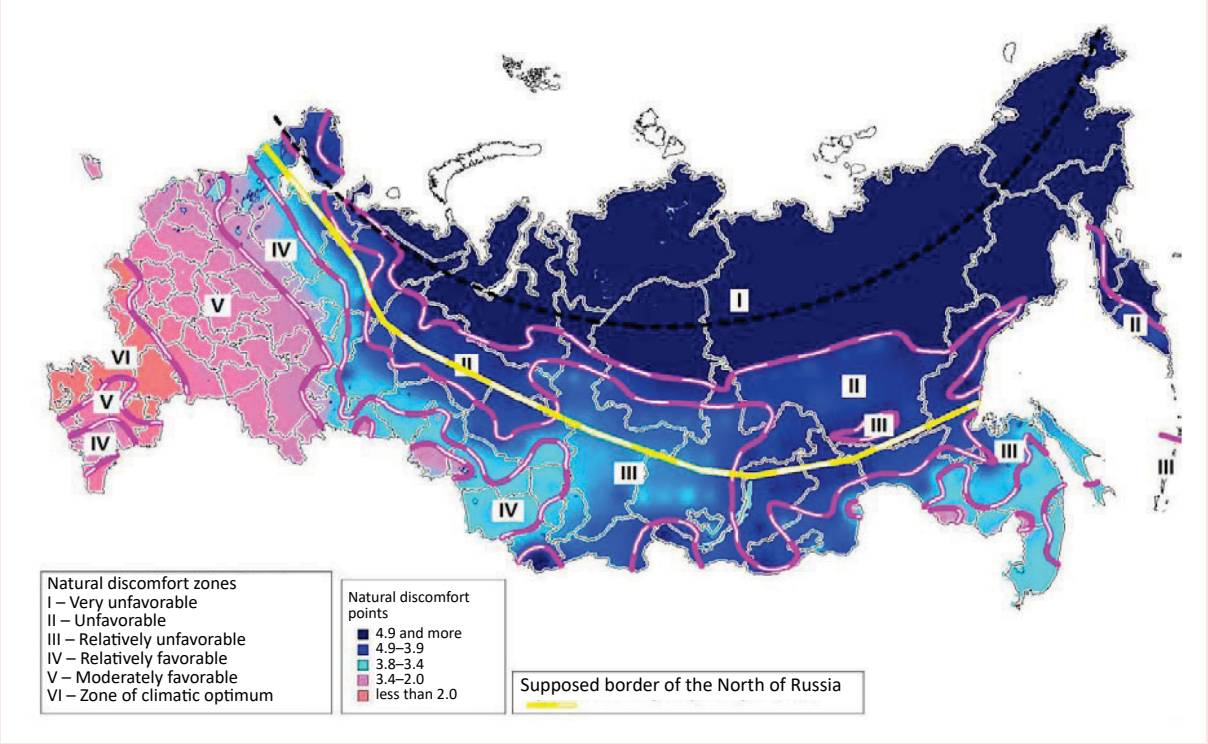
c) Ultraviolet deficiency. Half of the territory of the Magadan Oblast, including the areas under consideration, is located within the boundaries of

Figure 4. Cartographic diagram “Subzones of ultraviolet deficiency”



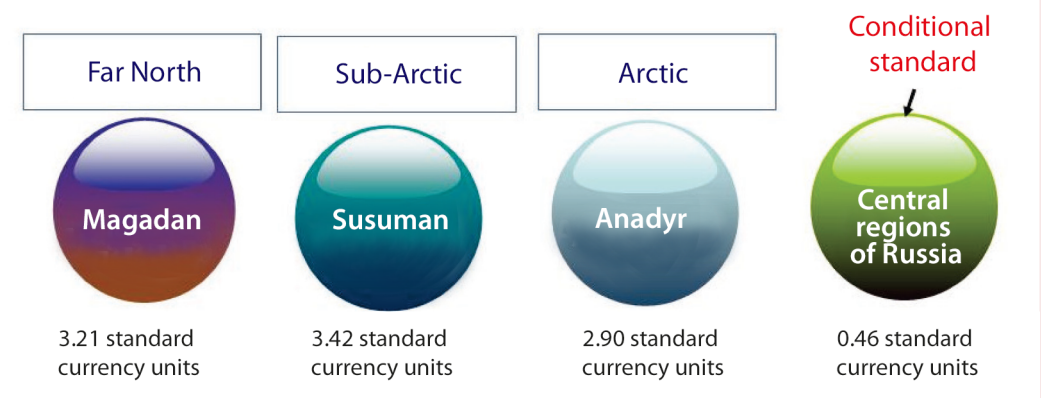
Source: Zhukov M.A., Krainov V.N. (2018). *Opredelenie sostava Arkticheskoi zony Rossiiskoi Federatsii* [Determining the composition of the Arctic zone of the Russian Federation]. Syktyvkar: Komi respublikanskaya akademiya gosudarstvennoi sluzhby i upravleniya.

Figure 5. Cartographic diagram “The influence of the natural conditions of the territory of the Russian Federation on the living conditions of the population (integrated map)”



Source: Zhukov M.A., Krainov V.N. (2018). *Opredelenie sostava Arkticheskoi zony Rossiiskoi Federatsii* [Determining the composition of the Arctic zone of the Russian Federation]. Syktyvkar: Komi respublikanskaya akademiya gosudarstvennoi sluzhby i upravleniya.

Figure 6. The "cost of adaptation" indicator



Source: Lugovaya E.A., Aver'yanova I.V. (2020). Assessing tension coefficient of body adaptation reserves under chronic exposure to factors existing in polar regions. *Health Risk Analysis*, 2, 101–109.

the subzone of significant ultraviolet deficiency (62.3–67.3°N), which allows them to be included in the group of circumpolar (Arctic) territories *(Fig. 4)*.

d) Bioclimatic characteristics. Due to the harsh natural and climatic conditions, the Magadan Oblast belongs to a very unfavorable zone for human habitation with an index of 4.9 points or more *(Fig. 5)*.

According to researchers at the Scientific Research Center "Arktika", Far Eastern Branch of the Russian Academy of Sciences, the discomfort of living in the Magadan Oblast, determined by the "cost of adaptation" indicator[11], is higher (Maksimov, 2006; Lugovaya, Averyanova, 2020) than in Chukotka Autonomous Okrug included in the Arctic *(Fig. 6)*. The indicator is calculated taking into account natural-climatic, economic-geographical, socio-economic and biomedical factors.

We have already noted that in the Pacific sector, the zone of the Far North is somewhat "sliding" to the south. As a result, the living conditions in the Pacific sectors of the Arctic and sub-Arctic are more difficult than in the Yakut sectors (Leonov, 2013).

[11] Suitability of the territory for living there.

Similarities of socio-economic development issues

The districts of the Magadan Oblast and the Arctic regions are united by the similarity of socio-economic problems that are due to geographical and climatic conditions.

Russia's Arctic territories can be divided into a group of old industrial regions (Murmansk Oblast, Arkhangelsk Oblast, Krasnoyarsk Krai – Norilsk Industrial and Taimyrsky municipal districts) and a group of regions of relatively recent large-scale industrial development (Nenets Autonomous Okrug, Yamalo-Nenets Autonomous Okrug, Arctic uluses of the Republic of Sakha (Yakutia), Chukotka Autonomous Okrug). The beginning of the development of the Arctic territory and the age of the branches of specialization influence modern socio-economic development in the region (Gal'tseva et al., 2015). The main branches of industrial specialization of the Russian Arctic are mining, ferrous and non-ferrous metallurgy, to a lesser extent – fishing and woodworking industries (Chanysheva et al., 2021). The main characteristics of the current socio-economic situation of the Magadan Oblast, reflecting the economic criteria for the allocation of the AZRF, are as follows:

a) single-industry economy based on the extraction of gold and silver and dependent on the

situation on global raw materials markets, the future of which is also associated with the development of mineral resources;

b) low purchasing power of high per capita incomes in the region, taking into account the significant amount of the subsistence level *(Tab. 4)*, which reduces the standard of living and causes migration outflow (Gal'tseva et al., 2020; Belevskikh, Tvahova, 2021);

Table 4. The subsistence level of the able-bodied population in the regions of the AZRF and the Magadan Oblast

Region	IV quarter 2020, rubles	Rank among the RF constituent entities
Arctic regions		
Nenets Autonomous Okrug	22971	2
Murmansk Oblast	18438	7
Yamalo-Nenets Autonomous Okrug	17407	6
Chukotka Autonomous Okrug	24711	1
Magadan Oblast	**22027**	**4***

* Kamchatka Krai ranks third (22535 rubles).
Source: Federal State Statistics Service. Available at: https://rosstat.gov.ru/vpm

c) isolation and remoteness of municipal economic systems, which is especially pronounced in Severo-Evensky Urban Okrug, where only small aircraft can be used in the absence of winter roads. Regional centers in Severo-Evensky, Omsukchansky, Srednekansky, Susumansky urban okrugs have air communication with the regional center. Low transport accessibility compromises the access of the population to social services;

d) fragmented development of territories. Currently, the development of natural resources is carried out mainly in areas that have roads and energy sources. Part of the region's territory, including Severo-Evensky Urban Okrug and the northern part of Srednekansky Urban Okrug, is characterized by low transport and energy accessibility, which leads to even higher financial costs in all types of economic activity;

e) uneven settlement, population concentration in the regional center (Magadan – 66.0% of Magadan Oblast population) and district centers of urban okrugs (urban-type settlement of Omsukchan – 76.7% of the okrug's population; urban-type settlement of Evensk – 72.0%, urban-type settlement of Seimchan – 93%, town of Susuman – 64.5%);

f) objectively increased costs of doing business (a feature of the Arctic economy); thus, the average actual cost of construction of one square meter of the total area of residential premises in the Magadan Oblast is 1.9 times higher than the Russian average (Favstritskaya, 2021);

g) a high share of infrastructure facilities in the development of new large promising mineral deposits; for example, the development of Omolonsky iron ore area (Severo-Evensky Urban Okrug) requires constructing a seaport/berth in the village of Evensk, a road (160 km), a 220 kV power line (170 km). The costs of infrastructure creation, including geological exploration, licensing, and construction of a mining and processing integrated plant account for over 50% of the total required investments.

Access of municipal districts to the coast of the Arctic Ocean

A number of Arctic territories already included in the list do not have access to the Arctic Ocean. However, the water system of the Magadan Oblast is part of the Arctic water system (85% of the region is occupied by the territory of the Kolyma catchment area, which falls into the Arctic Ocean). With the intensification of traffic along the NSR, river navigation and road transportation will develop, which will change the pattern of deliveries to remote Arctic and northern regions of the Far East. The Magadan ice-free seaport adapted for year-round transportation of goods, along with highways, taking into account winter roads, make it possible to carry out the main delivery of goods to the Arctic via meridional transport routes through the Magadan Oblast (Baklanov, Romanov, 2015).

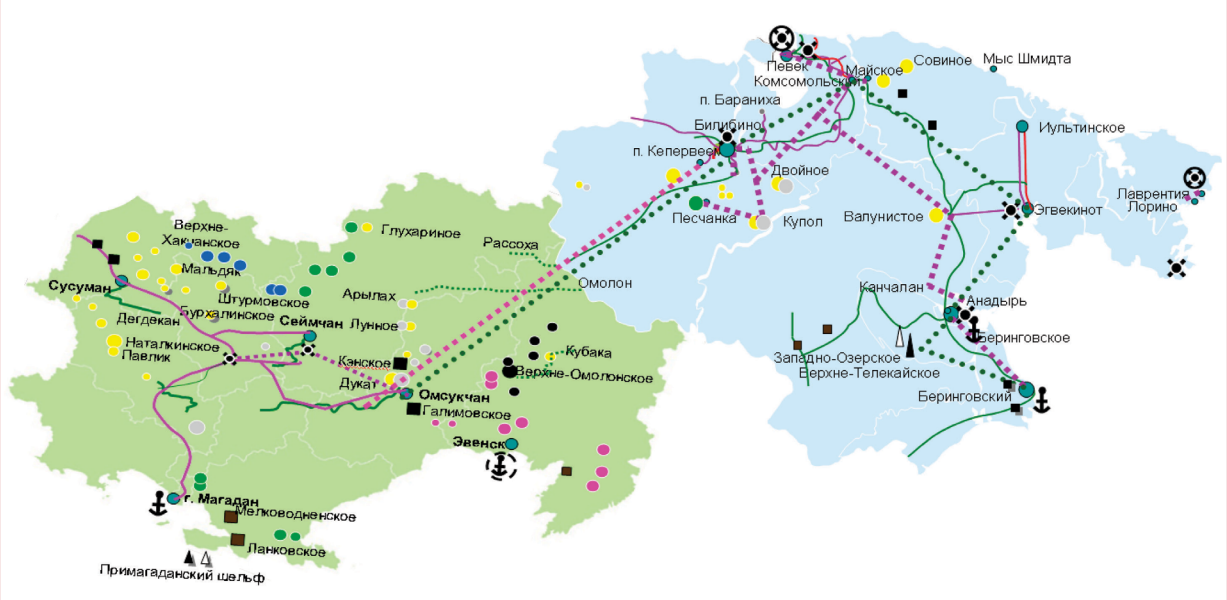
There are grounds to include the city of Magadan into the strongholds of the NSR of the "second order". The creation of modern infrastructure in the NSR and meridian directions will contribute to the implementation of resource projects, which, as a result, will provide an additional impetus to the socio-economic development of the Arctic and Arctic regions of the North-East of Russia.

Connectivity of the municipalities of the Magadan Oblast and the Arctic regions of the Far Eastern Federal District (Far Eastern Federal District) with a single infrastructure

Currently, the Kolyma Highway and the Magadan seaport are already being used to supply cargo to the Arctic regions of the Republic of Sakha (Yakutia). The Magadan Oblast and the Republic of Sakha (Yakutia) are connected via the current Federal Automobile Highway R504 "Kolyma" with a length of 2,032 km, of which 1,197 km go through the territory of the Republic of Sakha (Yakutia), and 835 km – through the Magadan Oblast. The construction of the Kolyma – Omsukchan – Omolon – Anadyr highway with a length of more than 1,800 km continues. The highway should provide year-round automobile communication between the Magadan Oblast and Chukotka Autonomous Okrug.

The electric power of the Kolyma power plants is supplied to Oymyakonsky ulus of the Republic of Sakha (Yakutia). The potential of two hydroelectric power plants (one of them – Ust-Srednekanskaya – is located in Srednekansky Urban Okrug) with excess capacity is necessary for the implementation of large energy-intensive projects for development of natural resources in Chukotka Autonomous Okrug. Currently, a project for the construction of a power line from the Magadan Oblast to Chukotka Autonomous Okrug is being discussed *(Fig. 7)*.

Figure 7. Interconnectedness of the Magadan Oblast and Chukotka Autonomous Okrug via a unified transport and energy infrastructure



Source: compiled on the basis of Esri CIS spatial data.

Let us summarize the results of the comparisons made on the natural and economic criteria for inclusion of territories in the AZRF according to the algorithm proposed by M.A. Zhukov *(Tab. 5, 6)*.

According to natural criteria, we observe an almost complete compliance of the characteristics, with the exception of the criterion of location of municipal districts within the CAFF boundaries. According to economic criteria, we note almost complete compliance here as well, with the exception of the criterion of proximity to the seas of the Arctic Ocean. It is worth noting that the territories already included in the Russian Arctic also do not meet all the criteria (Zhukov et al., 2017a).

The development of promising facilities in the considered urban okrugs will significantly improve the socio-economic situation throughout the Magadan Oblast due to an increase in industrial production and tax collection, a decrease in the subsidization of the regional budget, and an increase in the number of population. However,

Table 5. Comparison of the characteristics of Magadan Oblast territories with the natural criteria for inclusion in the AZRF

Urban okrug	Subzones of UV deficiency (northern latitude)			Bioclimatic characteristics of discomfort			Arctic and Sub-Arctic landscapes		Location within the CAFF boundary
	strong 67°30′–72°30′	significant 62°30′–67°30′	moderate 57°30′–62°30′	Relatively unfavorable discomfort zone	Unfavorable zone of natural discomfort	Very unfavorable zone of natural discomfort	Location of the territories within tundra and forest tundra	Location of the territories within the northern taiga	
Severo-Evensky	-	+	-	-	-	+	+	+	-
Omsukchansky	-	+	-	-	-	+	+	+	-
Srednekansky	-	+	-	-	-	+	+	-	-
Susumansky	-	+	-	-	-	+	+	+	-
Source: own assessment according to M.A. Zhukov's algorithm (Zhukov et al., 2017a).									

Table 6. Comparison of the characteristics of Magadan Oblast territories with the economic criteria for inclusion in the AZRF

Urban okrug	Arctic specifics of economic systems						
	transport and economic attraction of territories to the NSR	proximity of municipal districts to the seas of the Arctic Ocean	periphery, isolation and remoteness of economic systems from large industrial centers	focal or point-network nature of territory development	pronounced unevenness of settlement, concentration of people in settlements	Single-industry orientation of economic development zones, raw material orientation and removal of final processing outside the territory	non-economic extreme "northern" appreciation
Severo-Evensky	+	-	+	+	+	+	+
Omsukchansky	-	-	+	+	+	+	+
Srednekansky	+	-	+	+	+	+	+
Susumansky	+	-	+	+	+	+	+
Source: own assessment according to M.A. Zhukov's algorithm (Zhukov et al., 2017a).							

Table 7. Changes in project indicators relative to the basic option

Indicator	Project implementation options		
	Basic option without benefits	Taking into account the benefits of the SEZ	Taking into account Arctic benefits
Current production costs for 10 years, %	100	95.4	84.1
Total investments, %	100	82.4	82.4
Costs for 10 years of production, total %	100	92.5	83.8
Payback period, years	10	8.6	7.8
Total cost savings for the implementation of the project, million USD	–	433	936
Source: own assessment.			

given the remoteness of the territories and their underdevelopment, additional preferences are required so as to attract investors; Arctic benefits represent one of the options of such preferences.

Effects of the inclusion of northern urban okrugs of the Magadan Oblast in the AZRF

Investment effects. Let us evaluate the effectiveness of the current state Arctic preferences[12] for the investor on the example of the development of Yuzhno-Omolonsky iron ore area, a large promising facility in Severo-Evensky Urban Okrug. The object is 160 km away from the coast. The import of goods and the export of finished products require building a road and a seaport/berth (currently there is an offshore discharge of cargo there), power supply requires constructing a power line or a power plant.

AZRF residents are provided with tax benefits (land, profit, mining, property); benefits for insurance premiums; exemption from customs duties; simplification of legal regulation of labor relations. Taking into consideration the fact that income tax benefits are valid for 10 years from the moment of the income receipt, we made a comparative assessment of the effectiveness of the project implementation in different tax and customs regimes over the same period. The evaluation results indicate a reduction in costs by 16.2%, a reduction in the payback period of costs by almost 2.2 years *(Tab. 7)*. In the conditions of the Special Economic Zone (SEZ) regime in the Magadan Oblast[13], cost savings will be only 7.5%, and the payback period is 1.4 years lower than the base option. Thus, using the benefits for investment projects in the AZRF, the investor will be able to reduce costs compared not only with the basic version of tax and customs payments, but also with the benefits in force until 2025 in the conditions of the SEZ in the Magadan Oblast.

When the proposed territories are included in the AZRF, the following *socio-economic effects for the region* are expected in the course of development of large deposits:

– high-performance jobs will be created;

– population outflow (including due to the influx of migrant workers) will be curbed;

– tax revenues will be increased;

– infrastructure will be created so as to develop deposits that will be used by related industries and inhabitants (roads, power lines, etc.);

– wages will grow due to the application of a higher locality pay rate and northern allowances. It will be fair for Magadan Oblast districts to have the same current locality pay rate (2) and the amount of northern allowances (100%) as the nearest Arctic region – Chukotka Autonomous Okrug.

[12] Federal Law 193-FZ "On state support for entrepreneurial activity in the Arctic zone of the Russian Federation", dated July 13, 2020. *Rossiyskaya gazeta* (rg.ru). Available at: https://rg.ru/2020/07/16/193-fz-ob-arkticheskoy-zone-dok.html

[13] In the calculations, SEZ benefits are also extended for 10 years. The operation of the SEZ regime in the region has already been extended twice, it is possible to further extend the SEZ regime from 2025 to 2030.

As a result, wages will increase 1.2-fold in Susumansky, Srednekansky and Omsukchansky districts, and 1.1-fold in Severo-Evensky District.

Ethnic effects will be expressed in support for the development of traditional economic sectors of the indigenous small-numbered peoples of the North, since in three of the four urban okrugs of the Magadan Oblast under consideration (Severo-Evensky, Omsukchansky, Srednekansky) the share of ISNPs is from 10 to 75% of the total population. The inclusion of the municipalities under consideration in the AZRF will increase the effectiveness of addressing such tasks as supporting ethno-cultural projects, infrastructure development as a way to retain ISNPs in traditional industries, increasing the prestige of traditional economic sectors, etc. (Tishkov et al., 2016; Gal'tseva et al., 2017).

Conclusions

In the course of the study, we substantiated the economic feasibility of including four urban okrugs of the Magadan Oblast in the list of Arctic territories of the Russian Federation. Due to the fact that Russia has no legally established criteria for including territories in the AZRF and their values, the expediency of such inclusion is based on identifying the compliance of the climatic, economic characteristics and specifics of economic activity of the considered urban okrugs with the features of AZRF regions, namely:

– *geographical location of areas in the permafrost zone* in combination with the boundaries of northern latitude, landscapes, the average July isotherm;

– *location in a very unfavorable zone of natural discomfort (4.9 points or more)*; due to a harsh climate, the living conditions in these areas are among the most severe ones;

– *interregional connectivity and unity of economic complexes with territories already included in the AZRF*, primarily Chukotka Autonomous Okrug and the Republic of Sakha (Yakutia);

– *participation in the development of the NSR* due to the active development and use of meridional transport routes with a non-freezing port and rivers of the Magadan Oblast.

The inclusion of four municipalities of the Magadan Oblast in the Arctic is substantiated taking into account the significant infrastructural and unique natural resource potential.

The multifactorial extremity and the fact that, according to most parameters, the considered urban okrugs of the Magadan Oblast are in much worse conditions than the regions of Russia already classified as Arctic territories can be considered the basis for changing the southern border of the AZRF. The inclusion of four municipal formations of the Magadan Oblast in the Arctic will provide the following benefits:

– *ensure the unity of the natural and economic systems* of the Magadan Oblast and neighboring regions – Chukotka Autonomous Okrug and the Republic of Sakha (Yakutia);

– *attract investors for the implementation of major projects in the field of subsoil use* in the Arctic with the help of preferential conditions;

– *improve the quality of life* for those living and working in municipal formations of the Magadan Oblast;

– *stabilize the population of the territory* at a level sufficient to reduce social tension and promote sustainable development;

– *provide support for the implementation of social projects*;

– *promote the development of traditional economic sectors that ensure increased employment and self-employment of the indigenous small-numbered peoples of the North* living in these urban okrugs.

After their inclusion in the AZRF, the regions of the Magadan Oblast will contribute to the fulfillment of Arctic functions – those related to mining, transport, and preservation of the economic paradigm of the indigenous peoples of the North.

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Assessing Governmental Policy Aimed at Promoting Innovation Activity in Agribusiness as a Factor in Achieving the Sustainable Development Goals

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Abstract. In the context of new global challenges and fulfillment of commitments to implement the Sustainable Development Agenda for the period up to 2030, it becomes especially relevant to assess the effectiveness of the current innovation policy pursued by the Russian Federation and its compliance with the priorities of sustainable development adopted by the international community. The purpose of the study is to assess the results of state policy aimed at enhancing innovation in the agricultural sector and to determine the extent to which the targets of programs and strategies for the development of agribusiness in the innovation sector comply with the priorities of Agenda 2030. Applying the system approach to the study of the concept for sustainable development and using our own integrated methodology, we have found that there are no significant results regarding the implementation of innovation policy; we have also revealed an extremely low degree of consistency of federal and regional sectoral programs with the priorities of the Sustainable Development Goals. We have determined that at present it is difficult to conduct a quantitative assessment of the results of innovation policy implementation at the level of a particular region, industry or company; the available indicators do not help to assess their contribution to the achievement of innovation-oriented Sustainable Development Goals. In this regard, we propose to include the objectives of the Sustainable Development Goals in state, sectoral and regional programs for scientific and technological development and to develop a system of their indicators, consistent with the targets of the documents on strategic development of agribusiness in the innovation sector, for monitoring purposes. Thus, the scientific novelty of the research lies in the development and implementation of our own approach to identifying the degree of compliance of the targets of current programs for development of the agricultural sector with the priorities of innovation-oriented Sustainable Development Goals. The results of this study can be used by executive authorities in the development and substantiation of correcting measures aimed at improving state policy in the field of promotion of innovation in the agricultural sector and, as a result, achieving the Sustainable Development Goals.

Key words: state innovation policy, promotion of innovation activity, sustainable development, Sustainable Development Goals, Agenda 2030, food security, agribusiness.

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Introduction

The new development paradigm, which takes into account three core elements – economic growth, social inclusion and environmental protection –provides for qualitative changes based on the widespread use of effective innovation in order to ensure long-term sustainable economic growth. Since successful innovation development can be achieved only by creating appropriate organizational, economic and legal conditions, the role of the state in the formation of an up-to-date innovation policy and its effective implementation is significantly increasing. In this regard, the paper examines individual strategic planning documents in the field of science and technology development, current legislative and other regulatory legal acts of the federal and regional levels, and also assesses the effectiveness of government measures aimed at enhancing innovation.

As we know, in 2011, Russia adopted the Innovation Development Strategy of the Russian Federation for the period up to 2020[1] as a fundamental document of the state innovation policy. Currently, in order to improve innovation policy, the RF Government is working on the formation of a new Strategy taking into account national development goals[2]. However, we should note that Russia was among the States that agreed on the road map adopted by the United Nations in 2015 – the 2030 Agenda for Sustainable Development (Agenda 2030) and committed to achieving 17 Sustainable Development Goals (SDGs) (Kolmar, Sakharov, 2019). Therefore, in the conditions of fulfilling the obligations assumed, while improving the existing strategic documents, it becomes necessary to supplement them with the targets of the SDGs.

Within the framework of this study, special attention is paid to the targets of SDG8[3] and SDG9[4]. Obviously, the inclusion of certain targets of these goals in the RF Innovation Development Strategy that is currently being developed and their successful achievement will contribute to the development of the country's innovation potential and will influence the implementation of Agenda 2030. Thus, achieving target 9.5 (SDG 9) is aimed at promoting "... scientific research, increasing the technological potential of industrial sectors, including by stimulating innovation activity by 2030 ..."[5]. In turn, target 8.3 (SDG 8) involves "promoting development-oriented policies that enhance productive activity, creation of decent jobs, entrepreneurship, creativity and innovation, and encourage the official recognition and development of micro-, small and medium-sized enterprises, including by providing them with access to financial services"[6]. Finally, target 8.2 (SDG 8) – "increasing productivity in the economy" – should be achieved through diversification, technical modernization and innovation[7].

We consider it appropriate to recognize that after the adoption of Agenda 2030 its priorities have already been taken into account in a number of Russia's strategic planning documents. In this regard, the study attempts to determine the degree of consistency of the targets of development programs and strategies with the priorities of SDG 8 and SDG 9 and to assess the degree of integration of Agenda 2030 objectives into state programs in the field of innovation at the federal and regional levels.

As we know, the key functions of the state aimed at achieving sustainable development include food security. In Agenda 2030, one of the central places is given to the problems of food production, agricultural sustainability and innovation development; in this regard, we focus on regulatory documents and the results of implementation of the state innovation policy in the agricultural sector that affect the achievement of the SDGs.

Thus, the purpose of this study is to assess the results of state policy aimed at enhancing innovation in the agricultural sector and to determine the degree of consistency of the targets contained in the programs and strategies for development of agribusiness in the innovation sector with Agenda 2030 priorities.

[1] Innovation Development Strategy of the Russian Federation for the period up to 2020: RF Government Resolution 2227-r,dated December 8, 2011. Available at: http://government.ru/docs/9282/ (accessed: September 18, 2021).

[2] On the national development goals of the Russian Federation for the period up to 2030: Presidential Decree 474, dated July 21, 2020. Available at: http://publication.pravo.gov.ru/Document/View/0001202007210012_(accessed: September 18, 2021).

[3] SDG 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

[4] SDG 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

[5] Transforming our world: the 2030 Agenda for Sustainable Development. Available at: https://docs.cntd.ru/document/420355765 (accessed: September 18, 2021).

[6] Ibidem.

[7] Ibidem.

Scientific novelty of the research lies in the development and implementation of our own approach to identifying the degree of consistency of the targets of current programs for development of the agricultural sector with the priorities of innovation-oriented SDGs.

We put forward the following hypothesis: governmental policy aimed to promote innovation activity of the Russian agribusiness contributes to the formation of key innovation trends in its development in the aspect of sustainability and, as a result, the achievement of the UN SDGs.

In order to test the hypothesis we analyze the results of implementation of innovation policy in the Russian Federation, namely, the actually achieved indicators of the Innovation Development Strategy for the period up to 2020 are compared with the target indicators and the indicators of the SDGs; planned target indicators of the program for scientific and technological development of agriculture are compared with Rosstat data. To assess current state policy in the field of promoting innovation in agribusiness as a factor in achieving the SDGs, our study sets the following tasks: (1) to analyze sectoral state programs for development of the agricultural sector in the innovation sphere; (2) to identify the degree of consistency of the targets of existing programs and strategies for development of agribusiness in the innovation sphere with the priorities of the SDGs; (3) to assess the regulatory framework and the results of promoting innovation activities of agribusiness at the level of a particular region.

Theoretical aspects of the study

In the modern world, there is an understanding that innovation-based development is a path that has no alternative (Kirsanova, 2013). In the course of a theoretical analysis it was established that "the conclusions of researchers regarding the essence of innovation are ambiguous, the definition is multifaceted, the content is multidimensional" (Gorshkova, Ivanov, 2016). It is noteworthy that this term is used not only independently, but also to designate such related concepts as "innovation activity" and "innovation development". Nevertheless, one of the classical definitions is considered to be that by J. Schumpeter, according to which "innovation" includes any changes associated with the use of new or improved solutions in engineering, technology, production organization, supply, etc. (Schumpeter, 1982).

Adhering to this viewpoint and proceeding from the goal set in the article, we will pay attention to the essence of innovation activity in the agro-industrial complex (AIC). In our opinion, it is necessary to support the approach according to which innovation activity in the agro-industrial complex is "a set of interrelated sequential actions to create new or improved agricultural products or their processing, original models of its production in the conditions of constant development of STP. Innovation activity of agricultural organizations is a kind of aggregated assessment of the intensity with which innovations are created, implemented and used" (Strel'nikov, 2017).

Every year, an increasing number of experts are involved in research on agricultural innovation and the potential for innovation development of Russian agriculture (Sandu et al., 2015; Sandu et al., 2020; Kuz'min et al., 2019). Thus, according to M.V. Zhadan, "the innovatization of agriculture is a necessary condition for satisfying the world population's need for food" (Zhadan, 2019). The work (Truflyak et al., 2020) presents important conclusions concerning the necessity and content of the processes of monitoring and forecasting scientific and technological development of Russia's agro-industrial complex for the period up to 2030.

Nevertheless, there are few works in which their authors attempt to assess institutional conditions for the innovation activity of agribusiness. In this regard, of interest are the studies representing

opinions on the content, assessment and improvement of state support for innovation in the agro-industrial complex (Ushachev et al., 2021; Altukhov, 2021). We find it important to mention the opinion of experts from the Higher School of Economics on the need to improve the institutional environment of innovation activity and at the same time build a flexible system for legal regulation in the agro-industrial complex, capable of adapting to new conditions in a timely manner (Orlova et al., 2020). The researchers also draw attention to the indisputable fact that "Acceleration of the pace of scientific and technological development and a more rapid introduction of innovation in the economy and social sphere have led to significant changes in approaches to the formation and implementation of state scientific, technological and innovation policy" (Truflyak et al., 2020).

Meanwhile, we agree with I.S. Sandu, V.I. Nechaev and N.E. Ryzhenkova who believe that the current stage of the technical and technological process in the country's agriculture has contradictions between certain activity aimed to promote innovation and the factors that hinder this activity; such factors include the lack of innovation management mechanisms (Sandu et al., 2020). V.I. Kiryushin's conclusion is very valuable from a methodological point of view: he proposes to improve regulatory support in the innovation system of the agro-industrial complex, develop the infrastructure of innovation process, certification systems and promotion of scientific and technological developments (Kiryushin, 2019). The work of E.A. Derunova, M.Ya. Vasil'chenko and V.L. Shabanov reflects the need to develop mechanisms to stimulate innovation and investment activity in the agrarian economy (Derunova et al., 2021). Sharing this point of view, we believe that the improvement of innovation policy will ensure the growth of innovation and entrepreneurial activity of Russian business, and in the agricultural sector as well.

It is impossible to ignore the fact that Russian researchers consider human resources reduction an increasingly acute problem regarding the implementation of an innovation development path. Thus, T.V. Kasaeva and A.R. Kappusheva come to the conclusion that Russia is not among the leading countries in terms of accumulated human capital and conditions for its active development (Kasaeva, Kappusheva, 2021). Other authors note that the current situation with academic personnel in the country is caused by the lack of consistency in the implementation of innovation policy at the federal and regional levels (Gorbunov et al., 2019). In addition, experts point out that it is impossible to develop resource potential and introduce promising equipment and innovation technology under demographic constraints (Turyansky et al., 2021). We agree with the researchers who note a negative trend associated with a low level of funding allocated to the research in the agricultural sector, which is becoming a serious challenge to ensuring the country's food security and requires improving the overall institutional conditions for innovation and doing business in Russia (Kolmar, Sakharov, 2019).

It is noteworthy that some Russian authors propose an approach according to which modern innovation should largely reflect the introduction of digital technologies, as a result of which the issues related to improving legal regulation of digitalization process and the organizational mechanism of state support for digital technology both in the agro-industrial complex and in the economy of the Russian Federation as a whole were actualized (Ushachev, Kolesnikov, 2020). N.P. Sovetova draws attention to the need to create an innovation platform for building the potential of rural areas and to identify prerequisites for the susceptibility of the rural economy and inhabitants to innovations within the framework of a catch-up development paradigm and the circular (waste-free) economy model (Sovetova, 2021).

Thus, summarizing the above opinions of Russian scientists, we note that at present there is a need to accelerate the pace of scientific and technological development of Russia's agricultural sector on the basis of improving the regulatory framework, developing and implementing state measures aimed at boosting innovation activity of agribusiness.

At the same time, in the context of new global challenges and the fulfillment of commitments to implement Agenda 2030, the works of Russian and foreign scientists devoted to the study of priorities in the field of sustainable development and the achievement of the UN SDGs are becoming particularly relevant. According to Elsevier, over the past five years, over four million articles and reviews on the achievement of the SDGs have been published, and the volume of scientific and applied research in this area continues to increase[8]. For example, the publication by R. Valentini, J. Sievenpiper, M. Antonelli and K. Dembska analyzed the sustainability of the food system based on the UN SDGs and proposed methods, including institutional ones, to achieve long-term sustainability (Valentini et al., 2019). The role of institutional conditions for achieving the SDGs is outlined on a system-wide basis in the work of specialists from Utrecht University (the Netherlands), who convincingly demonstrated the need to measure the real progress of the SDGs, to harmonize and integrate various aspects of sustainable development (Bierman et al., 2017).

The works of other foreign authors focus on the fact that, despite the key role of the private sector in the success of achieving the SDGs, the assessment of its contribution is still an insufficiently studied and complex issue (Calabrese et al., 2021; Diaz-Sarachaga, 2021; García-Sánchez et al., 2020). The researchers emphasize that it is business that can play a significant role in promoting Agenda 2030 by integrating the SDGs into its strategies and offering new solutions to global sustainable development problems (Rosati, Faria, 2019). The work of P. Hazlewood and M. Bouye, which explores the issue of private sector incentive measures regarding the integration of SDGs into business models (Hazlewood, Bouye, 2018), also focuses on the above-mentioned issues.

Russian researchers have also contributed to studying the achievement of the SDGs at the present stage. In our opinion, the work by O.I. Kolmar and A.G. Sakharov (Kolmar, Sakharov, 2019) provides a very valuable practical analysis of the level of reflection of the UN Sustainable Development Goals in the state policy of the Russian Federation. S.N. Bobylev and S.V. Solovyova (Bobylev, Solovyova, 2017) substantiate the inclusion of the sustainability concept in the national long-term development documents that are currently being developed. Other authors consider Russian priorities and directions for adapting Agenda 2030 in the agricultural sector (Cherednichenko et al., 2018). The current trends of business participation in the implementation of the SDGs are touched upon in the works of E.B. Zav'yalova, E.A. Starikova (Zav'yalova, Starikova, 2018), D.B. Kuvalin, A.K. Moiseev, Yu.V. Zinchenko (Kuvalin et al., 2019). The issues of integrating SDGs into business models are reflected in the work of O.I. Dunaev, V.A. Nagornov (Dunaev, Nagornov, 2017). It is noteworthy that among the factors contributing to the achievement of the SDGs, representatives of Russian business note the introduction of innovation, new energy- and resource-saving technology[9].

[8] Elsevier (2020). Landmark analysis by Elsevier maps research data as UN Sustainable Development Goals reach fifth anniversary. Available at: https://www.prnewswire.com/news-releases/landmark-analysis-by-elsevier-maps-research-data-as-un-sustainable-development-goals-reach-fifth-anniversary-301136167.html

[9] Voluntary National Review on the Implementation of the 2030 Agenda for Sustainable Development. Available at: https://sustainabledevelopment.un.org/content/documents/26421VNR_2020_Russia_Report_Russian.pdf

Meanwhile, based on the analysis of numerous publications devoted to the implementation of innovation policy, monitoring and forecasting scientific and technological development and achieving the SDGs, we came to the conclusion that Russian authors have not conducted any studies on the assessment of the current policy in the field of promoting innovation and identifying the degree of consistency of the targets of state programs and strategies for development of agribusiness in the innovation sphere with the priorities of Agenda 2030.

Research methodology

The article is a logical continuation of research on the subject of a scientific project aimed at working out a methodology and developing an organizational and economic mechanism for achieving the SDGs in the national agri-food system.

Within the framework of the project, a review of existing strategies and programs directly or indirectly related to the development of the national agri-food system was carried out, and an assessment of the compliance of their targets with the priorities of the SDGs was given.

The article uses our own integrated research methodology based on two methodological approaches (statistical and sociological) to assess the effectiveness of the state innovation policy implemented in the Russian Federation and the degree of integration of Agenda 2030 priorities into the documents on strategic development in the agricultural sector. An attempt has also been made to determine the degree of consistency of the targets contained in existing programs and strategies for development of agribusiness in the innovation sector with the targets of SDG 9 and SDG 8 using comparative analysis methods.

The information base for the analysis includes statistical data and materials of the Federal State Statistics Service, methodological and analytical developments of the Institute for Statistical Studies and Economics of Knowledge of the National Research University "Higher School of Economics"[10], program documents and legal acts regulating relations in the innovation sphere, and publications of Russian and foreign researchers in periodicals.

The conducted research was based on a system approach to the study of the sustainable development concept, presented in documents and reports on the UN websites, in the works of Russian and foreign scientists, and Internet sources.

Along with statistical data, the quantitative and qualitative assessment of individual processes and phenomena used the information obtained in the course of a sociological survey of representatives of agribusiness in Stavropol Krai carried out as part of a comprehensive study on the subject of the project. In the course of field studies we held meetings with managers and specialists of large, medium-sized, small agricultural enterprises and farms of Stavropol Krai.

All surveys were conducted voluntarily, on the basis of a preliminary agreement with strict compliance with anti-epidemic requirements in connection with the spread of the new coronavirus infection. Respondents could refuse to participate in the survey without explaining why. The methodological tool of the study was a questionnaire developed taking into account the identified socio-economic and environmental problems relevant to the national agri-food system; the content of the questionnaire was discussed with representatives of agribusiness and executive authorities at the regional level – specialists from the Ministry of Agriculture of Stavropol Krai. The questionnaire included questions about the socio-demographic characteristics of respondents (age, gender), the field of their professional activity in accordance

[10] Gokhberg L.M., Gracheva G.A., Ditkovskii K.A. et al. (2021). *Indikatory innovatsionnoi deyatel'nosti: 2021: stat. sb.* [Innovation Activity Indicators: 2021: Statistics Collection]. Moscow: NIU VShE.

with their position, the category and size of farm, its location in the context of agro-climatic zoning of Stavropol Krai and the limits of administrative-territorial units, a block of socio-economic and environmental issues that allow identifying factors that hinder sustainable development of agriculture and rural areas in the region.

Taking into account the subject matter of our study, relevant questions were included in the questionnaire, providing an opportunity to assess the degree of awareness of the expert community regarding the concept of "sustainable development of agriculture (agriculture, rural areas)", awareness of the adoption of the 17 Goals under Agenda 2030 and their priority for agricultural producers in the region. Special attention was paid to the technologies used, the increase in the level of environmental safety of production, and the introduction of nature-saving technologies to improve soil fertility and quality.

The developed tools allowed respondents to reflect their attitude toward new farming techniques and innovation technology and express their opinion about the institutional conditions of agricultural production and its further development.

The questionnaire included questions about the reasons hindering the development of innovation activity, with the possibility of choosing an answer from the proposed set of options or giving one's own answer.

Detailed information about the methodology of the study is provided in the "Results and discussion" section.

The results of the expert survey were processed using the IBM SPSS Statistics software product (version 21).

Due to the lack of statistical information for objective assessment, we had to use an applied methodological approach to assess the results of implementation of the state policy in the field of promoting innovation in agribusiness and the extent of integration of Agenda 2030 priorities into state programs for development of the agricultural sector at the regional level.

Results and discussion

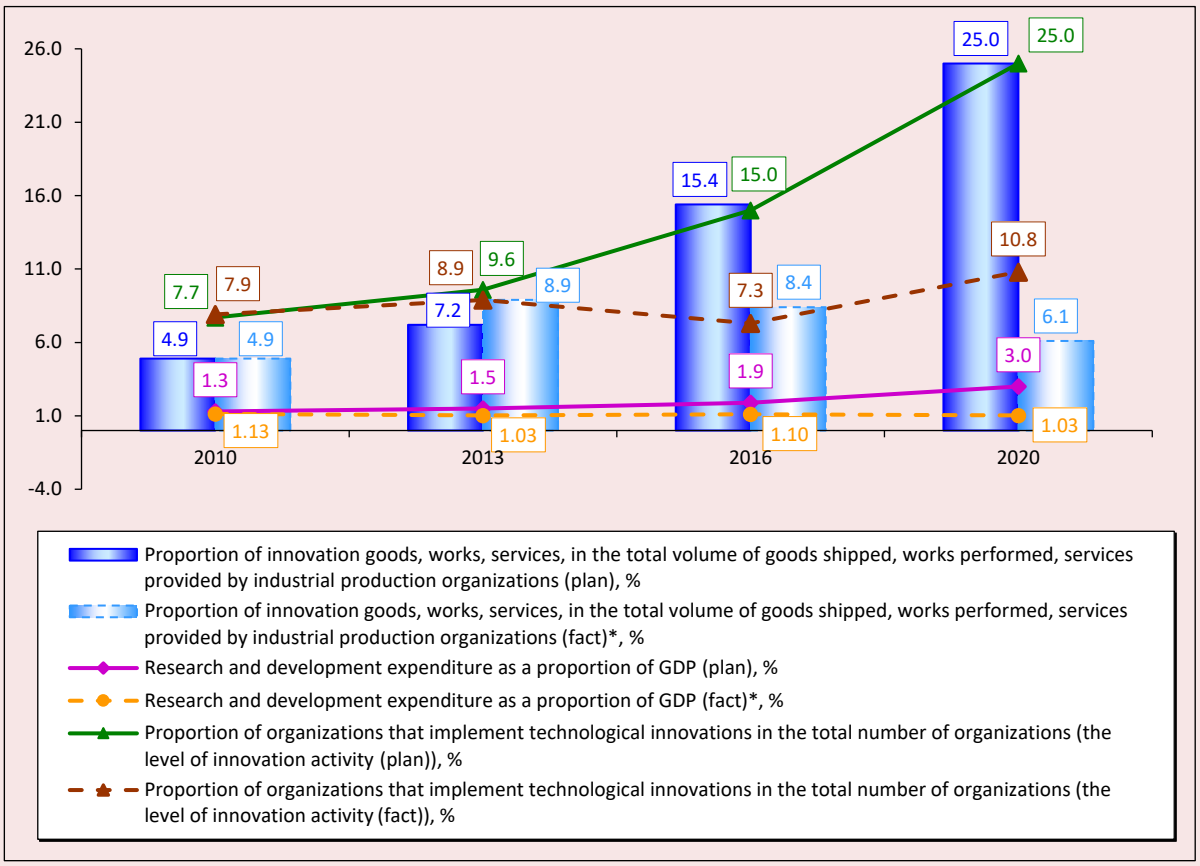
Assessing the results of innovation policy in the Russian Federation and the extent of integration of Agenda 2030 objectives into strategic development documents

The conducted research has shown that in the last decade, innovation policy implemented in the Russian Federation has undergone significant changes. As mentioned earlier, the fundamental document on national innovation policy was the Innovation Development Strategy of the Russian Federation for the period up to 2020 adopted in 2011, which defined the goals, priorities and instruments of national innovation policy, long-term guidelines for development and financing of fundamental and applied science, commercialization of developments. The goals and main directions of modernization and innovation development of the Russian economy are reflected in the Decree of the President of the Russian Federation dated May 7, 2018 no. 204 "On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024"[11] and "The main directions of Government activities for the period up to 2024"[12]. Later, in 2020, a new Decree of the President of the Russian Federation "On the national development goals of the Russian Federation for the period up to 2030" stated that the main priority of innovation development was Russia's joining the top ten countries of the world by 2030 in terms of the quality of general education and

[11] On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024: Presidential Decree 204, dated May 7, 2018. Available at: http://www.kremlin.ru/acts/bank/43027 (accessed: September 18, 2021).

[12] The main directions of Government activities for the period up to 2024: Approved by Chairman of the RF Government, September 29, 2018. Available at: http://government.ru/news/34168/ (accessed: September 18, 2021).

Figure 1. Target indicators for implementing the Innovation Development Strategy of the Russian Federation for the period up to 2020 (plan and fact)



* Actual values of the indicators "Proportion of innovation goods, works, services, in the total volume of goods shipped, works performed, services provided by industrial production organizations" and "Research and development expenditure as a proportion of GDP" are presented for comparison for 2019, due to the lack of data for 2020.

Source: Federal State Statistics Service. Target indicators for implementing the Innovation Development Strategy of the Russian Federation for the period up to 2020. Available at: https://rosstat.gov.ru/folder/14477# (accessed: September 18, 2021).

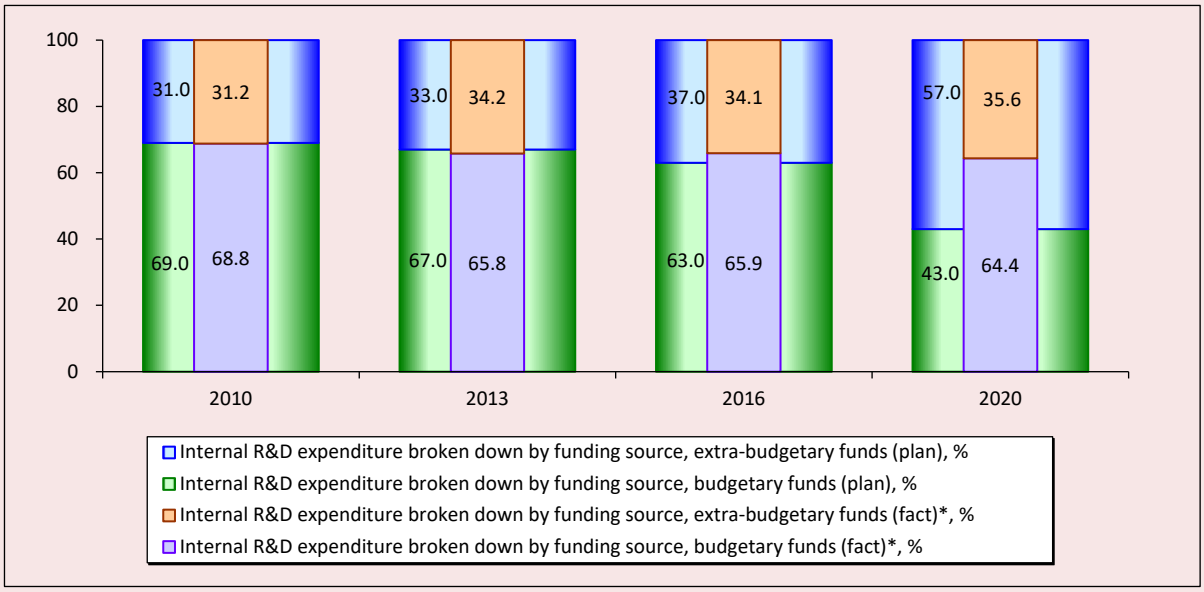
the volume of research and development, including through the creation of an effective system of higher education[13].

The analysis of the ongoing innovation policy shows that, basically, the targets of SDG 8 and SDG 9 within Agenda 2030 in their adapted formulation are integrated into the existing program and regulatory documents on innovation development. However, these documents contain many tasks and indicators that significantly complicate the monitoring and assessment of the degree of achievement of the SDGs. For example, the Innovation Development Strategy of the Russian Federation until 2020 alone contains 45 target indicators, of which only one is consistent with SDG target indicator 9.5.1 "Research and development expenditure as a proportion of Russia's GDP (GDP)".

To assess the effectiveness of innovation policy, let us consider the dynamics of individual target indicators of the fundamental document in

[13] On the national development goals of the Russian Federation for the period up to 2030: Presidential Decree 474, dated July 21, 2020. Available at: http://publication.pravo.gov.ru/Document/View/0001202007210012 (accessed: September 18, 2021).

Figure 2. Target indicators for implementing the Innovation Development Strategy of the Russian Federation for the period up to 2020 (sources of funding, plan and fact)



* Actual values of the indicators "Internal R&D expenditure broken down by funding source, budgetary funds" and "Internal R&D expenditure broken down by funding source, extra-budgetary funds" are given for 2019 for comparison, due to the lack of data for 2020.

Source: Federal State Statistics Service. Target indicators for implementing the Innovation Development Strategy of the Russian Federation for the period up to 2020. Available at: https://rosstat.gov.ru/folder/14477# (accessed: December 5, 2021).

comparison with the values actually achieved *(Fig. 1, 2)*. Thus, the value of the indicator "Research and development expenditure as a proportion of GDP" (SDG 9.5.1) in 2019 was 1.03%, having decreased by 0.1% relative to 2010. In accordance with the target value, the indicator was supposed to have increased to 3% by 2020, but this did not happen. The share of innovation goods, works and services in the total volume of goods by 2020 was supposed to be 25%, but the actual level of the indicator by 2019 has reached only 6.1%. Despite the lack of data for 2020, we can already assume that its planned level will not be reached as well.

The actual value of "The aggregate level of innovation activity of industrial production organizations" (in the current formulation "Proportion of organizations that implement technological innovations in the total number of organizations (the level of innovation activity)", which is the main target of the Strategy, with a planned value of 25% amounted only to 10.8% by 2020; this is significantly lower than the same indicator in developed countries. In addition, the Strategy assumed a decrease in the share of state participation and a sharp increase in business participation in financing innovation: by 2020, the share of budget funds was to be 43%, the share of extra-budgetary sources – 57%. However, this ratio has changed slightly since 2010: in 2019, the share of the state decreased to 64.4%, the share of private investment increased to only 35.6% (see Fig. 2).

The above trends confirm the national indicators of the SDGs in the field of innovation and science, in particular the values of indicators 9.5.1 and 9.5.2 that allow us to assess the achievement of target 9.5 of SDG 9 *(Tab. 1)*.

Table 1. Dynamics of national SDG indicators (innovation and science) in the Russian Federation for the period from 2011 to 2019

SDG indicator	2011	2013	2015	2016	2017	2018	2019	Trend
Research and development expenditure as a proportion of Russia's GDP, % (9.5.1)	1.01	1.03	1.10	1.10	1.11	1.0	1.03	→
Researchers (in full-time equivalent) per million inhabitants, people (9.5.2)	3128.7	3066.7	3065.1	2921.5	2795.6	2764.5	2730.3	↓
Number of advanced manufacturing technologies developed, new for Russia, units	no data	no data	no data	no data	1212	1384	1403	↑
Proportion of innovation goods, works, services, in the total volume of goods shipped, works performed, services provided by organizations, % (OKVED 2)	no data	no data	no data	no data	no data	6.5	5.3	↓
Inventive activity ratio (number of domestic patent applications for inventions filed in Russia per 10 thousand people)	no data	2	2	1.83	1.55	1.7	1.59	↓
Russia's ranking according to the proportion of patent applications for inventions filed in the world in areas determined by scientific and technological development priorities	10	9	10	10	10	11	no data	↓
Russia's ranking according to the number of researchers in full-time equivalent among the world's leading countries (according to the OECD)	4	4	4	4	5	6	no data	↓
Proportion of researchers under the age of 39 in the total number of Russian researchers, %	37.5	40.3	42.9	43.3	43.9	43.9	44.2	↑
Internal research and development expenditure from all sources (at current prices), billion rubles	610.4	749.8	914.7	943.8	1019.2	1028.2	1134.8	↑

↓ – indicator has deteriorated; ↑ – indicator has improved;

→ – indicator does not change or increases by less than 50% of the required rate to achieve the implementation of the SDGs.

Compiled according to: Federal State Statistics Service. National set of SDG indicators. Available at: https://rosstat.gov.ru/sdg/national (accessed: September 18, 2021).

According to the data in Table 1, most of the indicators show negative dynamics. Despite the fact that indicator 9.5.1 "Research and development expenditure as a proportion of GDP" showed some growth in recent years (from 1% in 2018 to 1.03% in 2019), Russia still lags significantly behind the world's leading countries that allocate more than 3% of GDP for these purposes.

Therefore, in the current conditions, it is premature to talk about achieving innovation-oriented SDGs. Even if we take into account the fact that internal research and development expenditure increased by more than 80% compared to 2011, still, judging by the overall results, we can conclude that from among the three possible development scenarios[14] proposed in the Strategy, an inertial scenario was implemented, which is characterized by its authors as "the absence of large-scale efforts aimed at innovation development, and the focus of the policy mainly on maintaining macroeconomic stability, and low parameters of budget expenditures on science, innovation and investment in human capital development. Innovation policy is carried out mainly through general measures aimed at the development of institutions, formation of a favorable business

[14] 1) Scenario of inertial (import-oriented) technological development; 2) Scenario of catching up development and local technological competitiveness; 3) Scenario of achieving leadership in major scientific and technological sectors and fundamental research.

climate, and through organizational assistance measures that do not require significant expenses". This scenario, according to the developers, was likely to "further weaken the national innovation system and increase economic dependence on foreign technology"[15]. Actually, this has happened, taking into account the fact that Russia's lagging behind and depending on industrially developed countries in scientific, technological and innovation development continue to increase (Shulepov et al., 2021).

Thus, despite the fact that in recent years the state has been paying significant attention to innovation development and issuing numerous strategic planning documents and measures to support innovation, the current innovation policy, unfortunately, does not produce significant results. According to the findings of our analysis, the indicators actually achieved during the implementation of the Strategy are significantly lower than the established target indicators for the period up to 2020; this fact does not help to move forward in achieving the SDGs.

Assessing the results of agricultural policy in the field of scientific and technological development and its consistency with the priorities of the SDGs

The results of implementation of agrarian policy in the innovation sphere at the sectoral level. Considering the results of implementation of the agrarian policy, we should note that food security is one of the main directions in ensuring the country's national security in the long term and the most important component of the state socio-economic policy.

The Food Security Doctrine of the Russian Federation, approved in 2020 by a Decree of the President of the Russian Federation, is among the strategic planning documents developed within the framework of goal-setting. The Doctrine highlights the need to achieve the SDGs of Agenda 2030 among the priorities of state policy in the field of ensuring food security[16]. The Federal Scientific and Technological Program for Development of Agriculture for the period from 2017 to 2025, approved by an RF Government Resolution, states that "the most significant risks in the field of food security include technological risks caused by the lag in the level of technological development of the domestic production base from the production base of developed countries..."[17]. Thus, one of the key directions in ensuring food security is accelerated scientific and technological development, which requires the elaboration and implementation of state measures aimed at boosting innovation activity of agribusiness. In turn, increasing the level of scientific and technological development due to the growth of innovation activity of agribusiness can contribute to the achievement of SDG 8 and SDG 9.

Exploring the conditions for development of innovation activities in the agricultural sector, we consider it necessary to focus separately on the priority areas of implementation of the innovation policy developed by the RF Ministry of Agriculture within the framework of the State Program for Development of Agriculture and regulation of agricultural products, raw materials and food markets, approved by an RF Government Resolution in 2012[18]. Thus, the main priorities of innovation policy include the formation of a

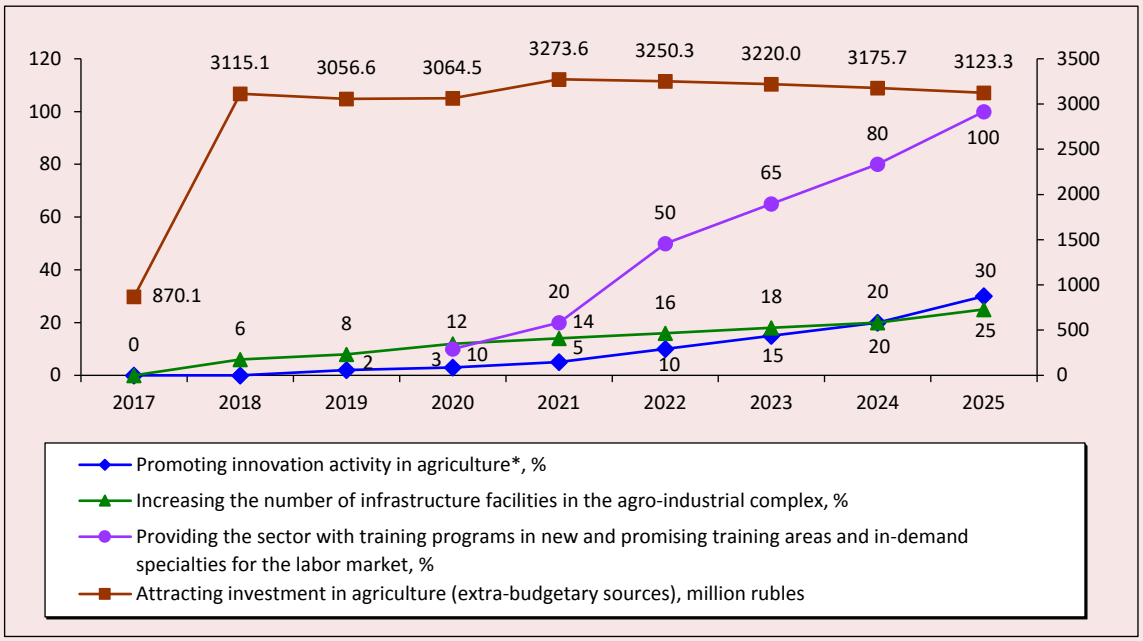
[15] Innovation Development Strategy of the Russian Federation for the period up to 2020: RF Government Resolution 2227-r, dated December 8, 2011. Available at: http://government.ru/docs/9282/ (accessed: September 18, 2021).

[16] On the approval of the Food Security Doctrine of the Russian Federation: Presidential Decree 20, dated January 21, 2020. Available at: http://kremlin.ru/acts/bank/45106 (accessed: September 17, 2021).

[17] Federal Scientific and Technological Program for Development of Agriculture for the period from 2017 to 2025: Approved by RF Government Resolution 996, dated August 25, 2017. Available at: http://government.ru/docs/29004/ (accessed September 17, 2021).

[18] On the State Program for Development of Agriculture and Regulation of Agricultural Products, Raw Materials and Food Markets: RF Government Resolution 717, dated July 14, 2012 (as amended on February 11, 2019). Available at: http://government.ru/rugovclassifier/815/events/ (accessed: September 17, 2021).

Figure 3. Target indicators of the Federal Scientific and Technical Program for Development of Agriculture for 2017–2025



* The value of the target indicator "Promoting innovation activity in agriculture" is calculated as the ratio of the number of organizations that carried out technological innovation within the framework of the scientific and technical program in the current year to the number of such organizations in the previous year.

Source: Federal Scientific and Technical Program for Development of Agriculture for 2017–2025: Approved by RF Government Decree 996, dated August 25, 2017. Available at: http://government.ru/docs/29004/ (accessed: September 17, 2021).

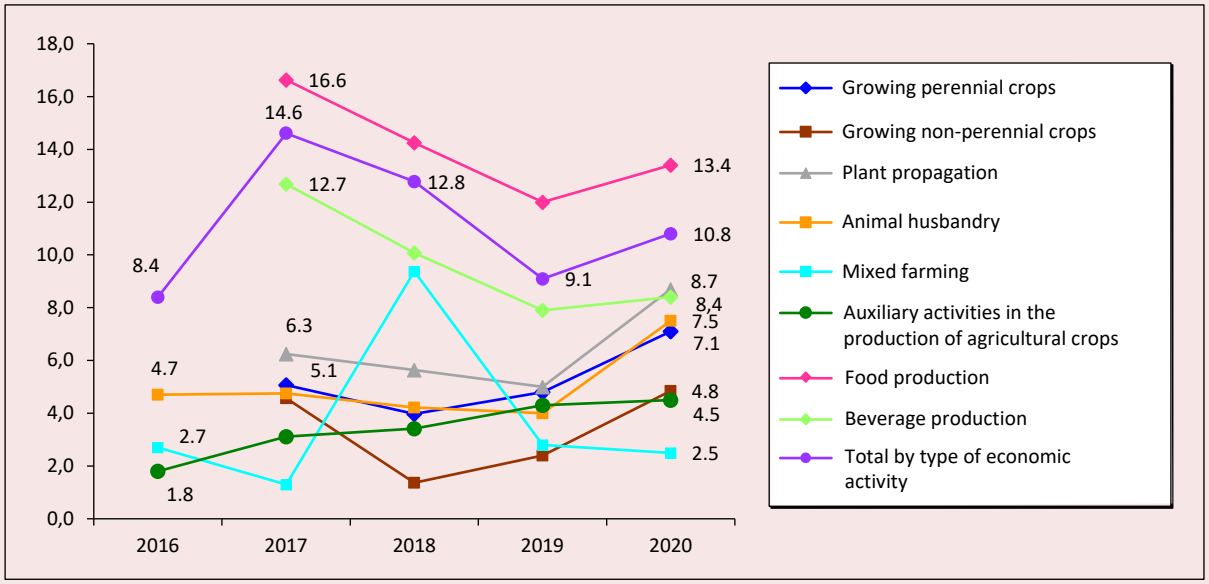
regulatory framework in the field of innovation, execution of fundamental and applied research, personnel training and retraining, development of infrastructure for innovation processes, development of state support measures for agricultural producers.

One of the most important documents defining innovation development in agriculture is the previously mentioned Federal Scientific and Technical Program for Development of Agriculture for 2017–2025" (hereinafter referred to as the scientific and technical program), which provides for the creation of information and consulting centers, support and promotion of research and development. The main target indicators of the scientific and technical program, which allow assessing its effectiveness, include the growth of innovation activity, attracting investment in agriculture, infrastructure development and providing the industry with training programs in new and promising training areas and in-demand specialties for the labor market *(Fig. 3)*.

In accordance with the scientific and technical program, the indicator "Promoting innovation activity in agriculture"[19] in 2020 was supposed to be 3%. Unfortunately, it is not possible to make a comparative assessment, since we could not find actual values of this indicator among the available statistical data. A similar situation develops when searching for quantitative indicators for infrastructure facilities and personnel training programs. This is due to the fact that the target indicators and

[19] Promoting innovation activity in agriculture implies an annual increase in the number of organizations implementing technological innovations.

Figure 4. The level of innovation activity of organizations (total and by type of economic activity), %



Source: Results of federal statistical observations. Federal State Statistics Service.

Form no. 4-innovation "Information on innovation activities of organizations". 2019. Available at: https://rosstat.gov.ru/folder/11189 (accessed: September 18, 2021).

indicators of the scientific and technical program are reflected as a percentage in relation to the previous year, while Rosstat does not monitor the absolute values of these indicators. However, statistical reporting forms contain some information on the indicator "The level of innovation activity in agriculture"[20]. These data are accumulated from a reference form of the federal statistical observation of activities in the field of education, science, innovation and information technology (Form no. 4-innovation "Information on innovation activities of organizations").

According to Rosstat, 7,259 agricultural organizations were surveyed in 2019. Among them, there were only 304 organizations that carried out innovation activities. The value of the indicator "The level of innovation activity of agricultural organizations" in 2019 was 4.2%, which is almost twice lower than the same indicator calculated collectively for all types of activity (9.1%). The highest value of this indicator in agriculture was recorded in 2017 (4.6%).

Figure 4 shows the indicators of innovation activity of agricultural organizations for the period from 2016 to 2020 in the context of industries (subsectors) compared with similar indicators for food production organizations and the aggregate indicator for all types of economic activity. Thus, the maximum values of the level of innovation activity in 2020 were recorded only in the subsectors of crop production such as plant propagation (8.7%) and growing non-perennial crops (7.1%), and in animal husbandry (7.5%). The scale of innovation processes in other types of agricultural production is minor and does not have any significant effect on general trends in the development of innovation activities in the agricultural sector[21].

[20] The share of organizations that implemented technological innovations, in the total number of surveyed organizations.

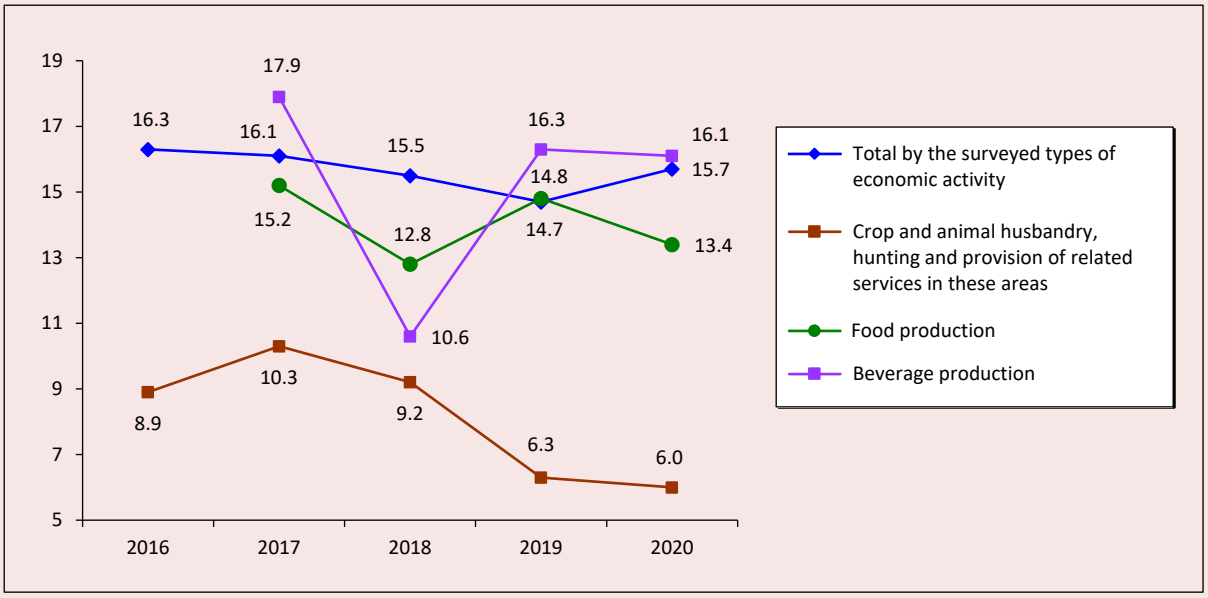
[21] Federal State Statistics Service. Technological development of economic sectors. Science, innovation and advanced manufacturing technology. The level of innovation activity of organizations. Available at: https://rosstat.gov.ru/folder/11189 (accessed: September 17, 2021).

Thus, we observe a low intensity of innovation activity of agricultural organizations in comparison with the aggregate indicator for all types of activity. The insufficient level of innovation activity is aggravated by the low return on the implementation of technological innovation; this fact is confirmed by agricultural producers' assessments regarding the effect of innovation results. Thus, according to statistical observations, representatives of over 85% of organizations indicated that there was no impact of innovation on increasing the yield and productivity of animals, preserving, restoring and increasing soil fertility, reducing dependence on weather, natural and climatic conditions[22].

According to Rosstat, the actual volume of innovation goods, works, and services of agricultural organizations in 2019 amounted to 69.6 billion rubles, their share in total sales was 2.3%[23], which is significantly lower than not only the planned indicator of the Innovation Development Strategy (25%), but also the actually achieved value (6.1%).

Taking into account the fact that investment activity has a significant impact on the development of innovation activity, we should have a closer look at the dynamics of the indicator "The share of investments in fixed assets of agriculture aimed at reconstruction and modernization" *(Fig. 5)*.

Figure 5. The share of investments aimed at reconstruction and modernization (by type of economic activity (OKVED codes 2)), in the total volume of investments in fixed assets in the Russian Federation, %



Source: Results of federal statistical observations. Federal State Statistics Service. Form no. 4-innovation "Information on innovation activities of organizations". Available at: https://rosstat.gov.ru/folder/11189 (accessed: September 18, 2021).

[22] Results of federal statistical observations. Federal State Statistics Service. Form no. 4-innovation "Information on innovation activities of organizations". Available at: https://rosstat.gov.ru/folder/11189 (accessed: September 18, 2021).

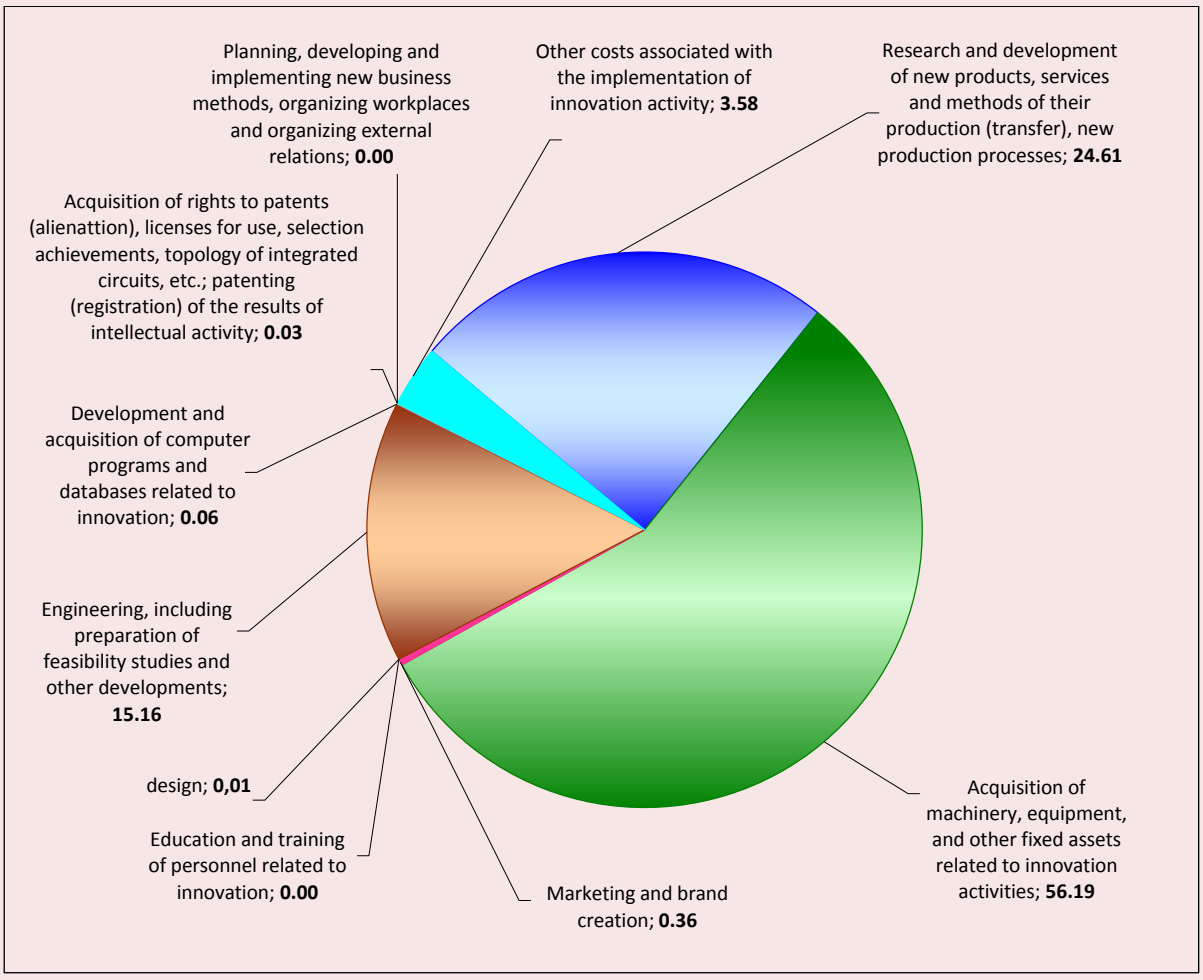
[23] Gokhberg L.M., Gracheva G.A., Ditkovskii K.A. et al. (2021). *Indikatory innovatsionnoi deyatel'nosti: 2021: stat. sb.* [Innovation Activity Indicators: 2021: Statistics Collection]. Moscow: NIU VShE. Available at: https://issek.hse.ru/mirror/pubs/share/465578843.pdf; Federal State Statistics Service. Science and innovation. The volume of innovation goods, works, and services. Available at: https://rosstat.gov.ru/folder/14477 (accessed: November 18, 2021).

As we can see, the share of investments in the fixed assets of agriculture aimed at reconstruction and modernization is the lowest in comparison with the indicators of other types of economic activity and the aggregate indicator; moreover, its dynamics have been negative since 2017 (reduction from 10.9 to 6.0% by 2020).

However, we recall that "Attracting investments in agriculture (extra-budgetary funding sources)", which is the target indicator of the Federal Scientific and Technical Program for Development of Agriculture for 2017–2025 (see Fig. 3) implied a significant increase in investments (3.6-fold) at the expense of private business: from 870.1 million rubles in 2017 to 3,115.1 million rubles by 2020.

According to the results of Rosstat's sample survey, we can conclude that purchasing machinery, equipment and other fixed assets related to innovation was the most popular expenditure item for agricultural organizations in the total volume of investments in innovation development, according to the data for 2019. The share of expenditures for these purposes was 56% *(Fig. 6)*.

Figure 6. Cost structure for innovation activities in agriculture of the Russian Federation in 2019 (by type of innovation activity), %



Source: Results of federal statistical observations. Federal State Statistics Service. Form no. 4-innovation "Information on innovation activities of organizations". 2019. Available at: https://rosstat.gov.ru/folder/14477# (accessed: December 4, 2021).

Table 2. Internal R&D expenditure in the Russian Federation, million rubles

Indicator	2016	2017	2018	2019	2020	2020 to 2016, %
Internal research and development expenditure, total	943815,2	1019152,4	1028247,6	1134786,7	832128,6	88.2
including agriculture, forestry, hunting, fishing and fish farming	529,0	568,5	357,8	319,1	150,1	28.4
The share of agriculture, forestry, hunting, fishing and fish farming in total costs, %	0,06	0,06	0,03	0,03	0,02	
Compiled according to: Federal State Statistics Service. Internal research and development expenditure (by type of economic activity). Available at: https://rosstat.gov.ru/folder/14477 (accessed: September 18, 2021).						

In the same year, agricultural organizations spent almost half as much on research and development of new products, services and methods of their production (transfer), and new production processes (25%). At the same time, agricultural organizations did not actually carry out organizational expenses such as planning, development and implementation of new business methods, organization of workplaces and organization of external relations, as well as personnel training and advanced training costs related to innovation activity.

Effective innovation development, in addition to creating general legal conditions for doing business and financing them, requires additional, specific conditions, such as financing education and R&D. *Table 2* shows internal R&D expenditure in the Russian Federation by type of economic activity "Agriculture, forestry, hunting, fishing and fish farming", as well as their share in total expenditure for the period from 2016 to 2020.

This information reflects a negative trend in the financing of science and innovation in the agricultural sector. Special attention should be paid to the rapid decline in the sector's indicators in terms of value and percentage: for example, the amount of costs for these purposes by 2020 decreased 3.5-fold, and their share at such small values – 3-fold. Naturally, in the current situation, it is of little use to talk about the size of the share of such costs in Russia's gross domestic product and compare the indicator with the national SDG indicator (9.5.1).

Thus, the analysis carried out, including the comparison of Rosstat data with the target indicators of the current program for development of agriculture in the innovation sector, has shown their inconsistency, which does not allow us to say that the tasks set are effective. However, given the low level of innovation activity in agribusiness organizations, reduction in the share of investments in fixed assets and R&D expenditure, we have to admit that the efforts of the state currently being undertaken to solve the problems of innovation development in the agricultural sector are not entirely successful. Obviously, the current level of scientific and technological development cannot contribute to the achievement of SDG 8 and SDG 9.

Regional features of legal regulation and promotion of innovation activity of agribusiness. Russia's regions, having their own industry specifics and priorities, are characterized by uneven development of various aspects of innovation processes. In the article, we consider regional innovation development features in the case of Stavropol Krai, an RF constituent entity specializing in agriculture.

Legal basis for innovation activity in Stavropol Krai (SK) agriculture is the SK state program "Development of Agriculture"; it is based on the principles of long-term goals of regional socio-economic development[24]. The priority direction

[24] On the approval of the state program of Stavropol Krai "Development of Agriculture": Stavropol Krai Government Resolution 620-p, dated December 28, 2018 (as amended on July 9, 2021). Available at: https://docs.cntd.ru/document/550317147 (accessed: September 17, 2021).

in the implementation of the state program is to develop and introduce state support measures in the form of subsidies and grants for development of innovation technology in agricultural production. The recipients of this type of state support are agricultural producers and agribusiness organizations, regardless of the scale of their activity and organizational and legal form. The most important regulatory documents executed in accordance with this program and aimed at the development of innovation activity in Stavropol Krai are as follows:

1. The procedure for granting subsidies at the expense of SK budget to reimburse part of the expenditure on supporting elite seed farming[25]. This event is included in the subprogram "Development of Crop Production" within the state program for development of agriculture in SK. The expected end result of this subprogram is the annual preservation of the share of areas (in the total share of crops) that are sown with elite seeds of agricultural crops at the level of 6%.

2. The procedure for granting subsidies at the expense of SK budget to reimburse part of the expenditure on supporting livestock breeding[26]. It is included in the subprogram "Development of Animal Husbandry" within the state program for development of agriculture in SK. The implementation of the event helps to preserve and increase the genetic potential of farm animals in the region. In accordance with the planned indicators under the subprogram, from 2019 to 2024, the increase in breeding brood stock will be 3.7% (from 57.2 to 59.3 thousand head).

It worth noting that these measures can contribute to the achievement of target 2.5 of SDG 2[27]. However, the national indicator to assess the solution of this problem is still being developed at the national level: 2.5.1 "Number of plant and animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities"[28]. Among the national indicators of the SDGs, indicator 2.5.2 "Proportion of local breeds used for agricultural production in the territory of the Russian Federation" has been monitored since 2018. Its value in 2018 was 93.5%, in 2019 – 93.4%[29]. These indicators can indirectly characterize the results of implementation of a scientific and technical program that initiates the development of innovation activity in the field of breeding and genetics.

The main documents governing and regulating activities in the innovation sphere also include the law of Stavropol Krai "On innovation activity in Stavropol Krai" aimed at creating favorable conditions for business, including state support for innovation, state assistance in the implementation of innovation projects and the development of innovation infrastructure[30].

Separately, we should note that since 2018, SK has been implementing an incentive measure providing for state support to reimburse part of the direct costs incurred for the creation and (or) modernization of regional agro-industrial complex

[25] On the approval of the procedure for granting subsidies at the expense of Stavropol Krai budget to reimburse part of the expenditure on supporting elite seed farming: Stavropol Krai Government Resolution 224-p, dated April 29, 2020. Available at: http://publication.pravo.gov.ru/Document/View/2600202005010012 (accessed: September 18, 2021).

[26] On the approval of the procedure for granting subsidies at the expense of Stavropol Krai budget to reimburse part of the expenditure on supporting livestock breeding: Stavropol Krai Government Resolution 437-p, dated December 15, 2010 (as amended on May 17, 2021). Available at: https://docs.cntd.ru/document/461504185 (September 20, 2021).

[27] SDG 2, Target 2.5: By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.

[28] National set of SDG indicators. Federal State Statistics Service. Available at: https://rosstat.gov.ru/sdg/national (accessed: September 18, 2021).

[29] Ibidem.

[30] On innovation activity in Stavropol Krai: Law of Stavropol Krai 13-kz, dated March 11, 2004 (as amended on December 27, 2019). *KonsultantPlyus: Legal Reference System.* Available at: http://www.consultant.ru/ (accessed: October 10, 2021).

facilities. Thus, in accordance with the state program for development of agriculture in Stavropol Krai from 2019 to 2024, it is planned to modernize 12 facilities for crop production, one dairy livestock complex, one breeding and genetic center in poultry farming, and one sheep farm.

In 2019, the RF Ministry of Agriculture developed a departmental project "Digital Agriculture", which represents methodological recommendations to form an integrated approach to the introduction of a single mechanism of innovation technology both at the level of a single entity and the country as a whole. The main goal of the project is digital transformation of agriculture through the introduction of digital technology and platform solutions to ensure a technological breakthrough in the agro-industrial complex and achieve two-fold productivity growth at "digital" agricultural enterprises by 2024. Major activities under the project include collecting statistical data on the agro-industrial complex ("Single window"), providing information support and services to agricultural entities, creating a set of services "Effective hectare", "Land of knowledge" and "Traceability of agricultural products", the project "Digital agro-meteorological stations", as well as "Services based on public-private partnership" (including unmanned aerial photography and agro-meteorological monitoring of agricultural lands)[31]. Within the framework of the departmental project "Digital Agriculture", the Ministry of Agriculture of Stavropol Krai is implementing a set of measures for remote sensing of agricultural lands.

Thus, we can say that the conditions created in the region under consideration, in terms of normative regulation and promotion of innovation activity, are quite favorable for the growth of innovation activity of agribusiness. However, despite the efforts taken by the federal and regional authorities, according to a sample survey of Rosstat, the volume of innovation goods, works and services of agricultural organizations in Stavropol Krai in 2019 amounted to only two thousand rubles32; this fact raises many questions.

Problems in assessing the results of innovation development and achievement of the SDGs in the agricultural sector at the regional level. The analysis has shown that at present it is not possible to quantify the results of implementation of innovation policy in the agricultural sector of Stavropol Krai, because the continuous accounting of such indicators by type of economic activity at the regional level is not actually carried out.

In our opinion, a quantitative assessment of the results of implementation of innovation policy in the sector at the level of a particular region or company can be given only on the basis of indirect indicators and the findings of our own research. Indirect indicators include the results of statistical observations published by Severo-Kavkazstat (Rosstat regional office of North Caucasian Federal District) according to Form no. 4-innovation. Thus, the level of innovation activity in Stavropol Krai organizations in 2019 amounted to only 5.1%, having decreased by almost 4% in comparison with 2017. During the same period, the share of investments in machinery, equipment, and vehicles in the total volume of investments in fixed assets decreased. Thus, the general trend in innovation development, according to official statistics of Stavropol Krai, is negative. We can assume that similar dynamics are observed in the agricultural sector.

Regarding our own research, we should note that in 2020, while implementing a scientific project supported by the Russian Foundation for Basic

[31] *Departmental Project "Digital Agriculture": Official Publication*. Moscow: FGBNU "Rosinformagrotekh", 2019. 48 p.

[32] Results of federal statistical observations. Federal State Statistics Service. Form no. 4-innovation "Information on innovation activities of organizations". 2019. Available at: https://rosstat.gov.ru/storage/mediabank/4-innov.html (accessed: November 18, 2021).

Research, we conducted a survey of representatives of agribusiness in Stavropol Krai; the survey aimed to identify factors hindering the achievement of sustainable development in agriculture and rural territories of SK33. The questionnaire included questions that allow us to assess the level of use of innovation technologies and the factors hindering their implementation. After processing the data on the basis of a qualitative assessment of individual processes and phenomena, we obtained quantitative results that cannot be verified according to official statistical records data. As mentioned earlier, the questionnaire also included questions that helped to assess the awareness of the expert community regarding the term "sustainable development of the agro-industrial complex (agriculture, rural areas)", awareness of the adoption of the 17 goals of Agenda 2030 and their priority for agricultural producers in the region.

Figure 7 shows the distribution of respondents' answers to the question about the relevance of each of the SDGs to them (one answer option was allowed for each of the 17 SDGs). To provide a deeper understanding of the content of the SDGs, we supplemented them with our own comments. The results obtained indicate that SDG 8 is most relevant for the representatives of agribusiness; this goal includes tasks to improve production efficiency and labor productivity, create decent jobs, develop micro, small and medium-sized enterprises, entrepreneurship, innovation (73.2%). At the same time, 53.7% of respondents indicated that SDG 9, whose targets are aimed at promoting innovation, enhancing scientific research, and upgrading infrastructure, was also relevant.

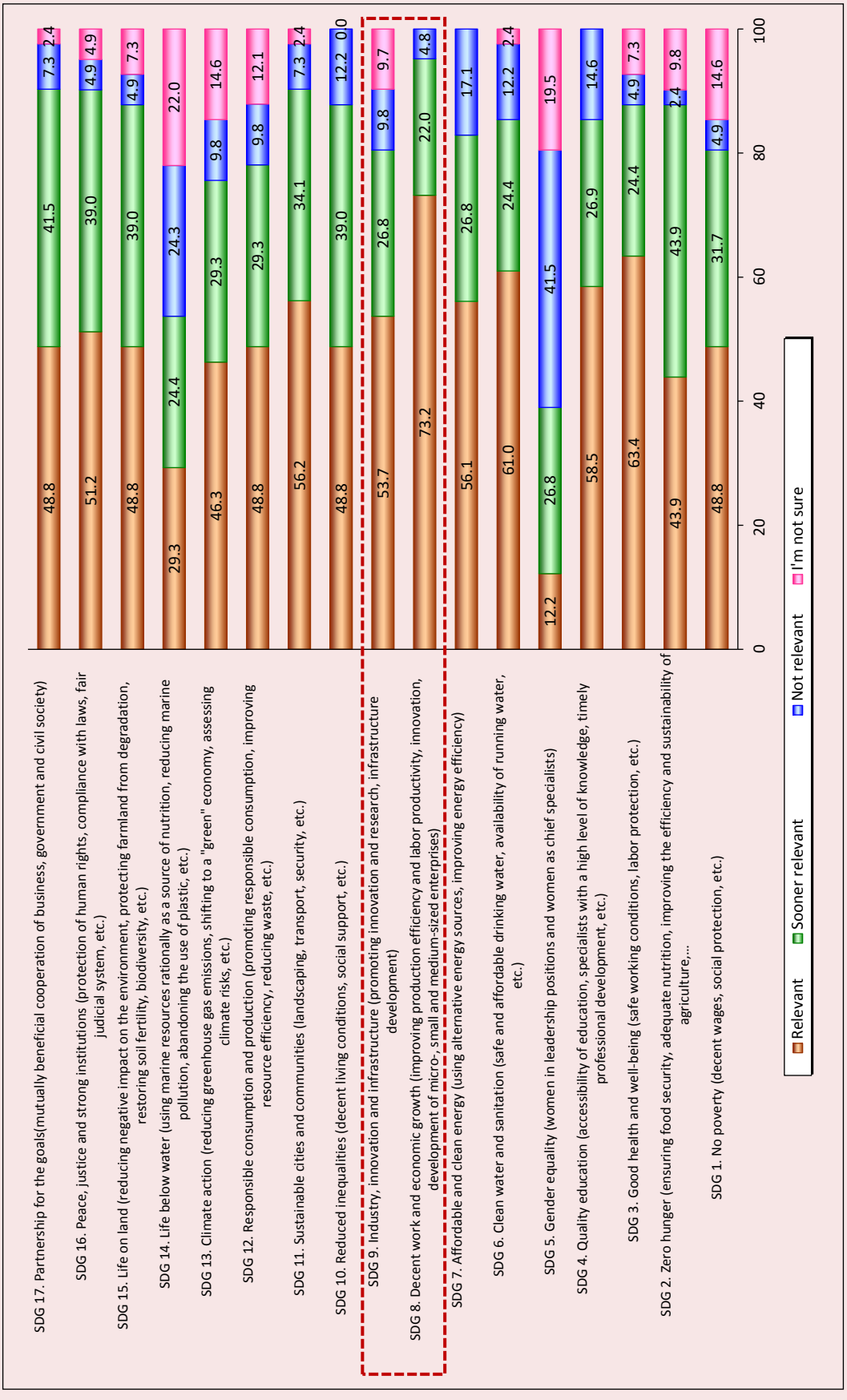
To enable a more detailed understanding of the content of each of the 17 SDGs, the questionnaire included a list of socio-economic and environmental problems that, as we believe, hinder the achievement of sustainable development in the agricultural sector. Thus, in the ranked row, the problem of insufficient state support ranked first (3.78 points on a five-point scale), followed by lack of funds for production modernization (3.46), outdated equipment and technology (3.15) and lack of funds for innovation (3.12).

The question "Does your farm take measures to raise the level of environmental safety of agricultural production, improve fertility and soil quality?" received an affirmative answer from 80.5% of respondents. When answering the question "What specific soil-saving technologies do you apply?", all respondents noted the scientifically substantiated alternation of crops (crop rotation), as well as introduction of organic fertilizers (76%) and the use of biological preparations (66.7%). While 38% of representatives of agricultural organizations and only 18% of farmers said they were using innovation technology.

Speaking about the reasons hindering innovation activity of agricultural producers, over 60% of experts highlighted the high cost of innovations, 17% pointed out the lack of their own funds, about 15% found it difficult to answer, and 5% pointed out the delayed effect of scientific and technological innovation.

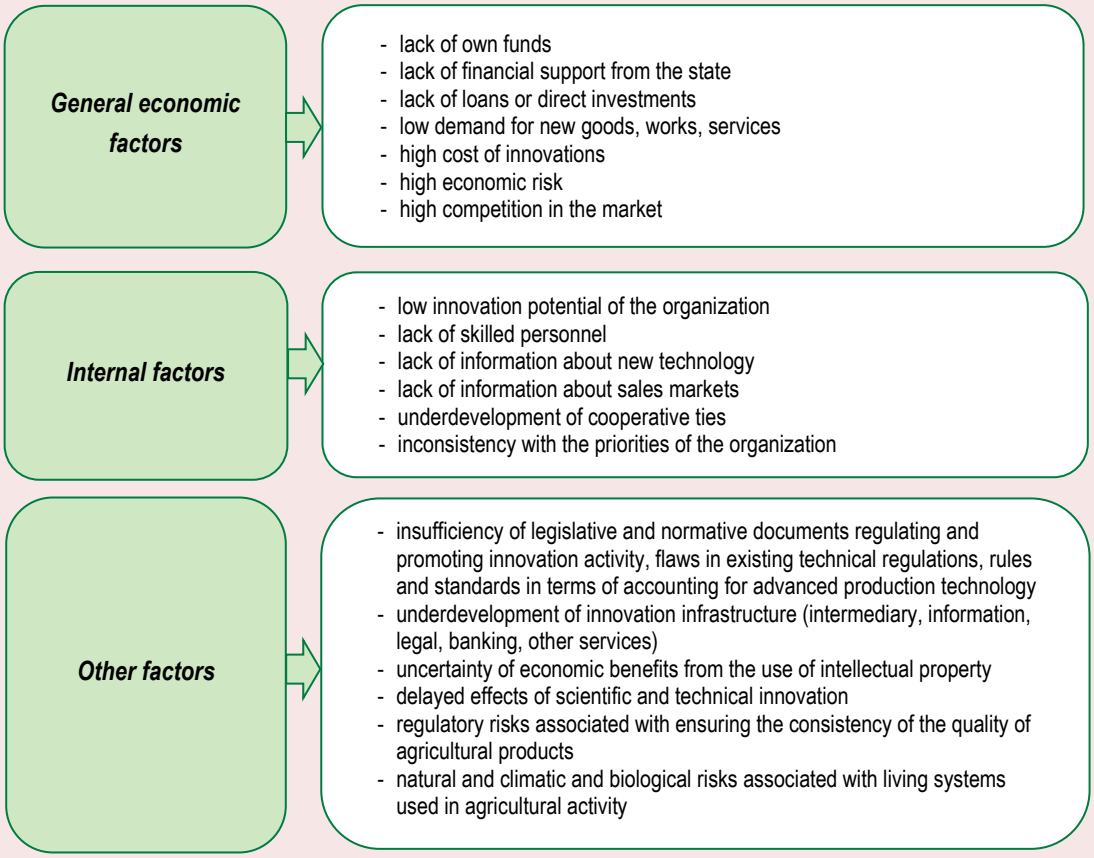
[33] Primary information was collected as follows: interviewers filled out questionnaires when conducting personal surveys at respondents' farms (organizations, peasant (farmer) enterprises); respondents could also fill out a questionnaire on their own via Google forms received by e-mail or mobile phone. The general population of the sample includes 463 agricultural organizations and 1,651 peasant (farmer) enterprises according to the register of subjects of state support for development of agriculture as of September 23, 2020. Sample size was 205 respondents from 26 municipal and urban districts. Thirty-six representatives of large, medium-sized and small agribusiness enterprises, as well as heads of peasant (farmer) enterprises from seven municipal and urban districts of the region, took part in the personal survey. The majority of participants in the expert survey were men (70.7%), the proportion of women was 29.3%. Depending on the age group, the proportions of respondents were distributed as follows: under 30 years old – 12.2%; 31–40 years old – 17.1%; 41–50 years old – 26.8%; 51–60 years old – 34.1%; over 60 years old – 9.8%. The fields of professional activity of respondents, taking into account basic education and in accordance with their position: agronomy – 34.1%, management – 26.8%, economics – 24.4%, mechanization – 7.3%, animal husbandry – 4.9%, plant protection – 2.4%.

Figure 7. Distribution of respondents' answers to the question about the relevance of the SDGs, % of respondents



Source: own elaboration.

Figure 8. Factors hindering the introduction of innovations in the Russian Federation



Source: Results of federal statistical observations. Federal State Statistics Service. Form no. 4-innovation "Information on innovation activities of organizations". 2019. Available at: https://rosstat.gov.ru/folder/14477 (accessed: September 18, 2021).

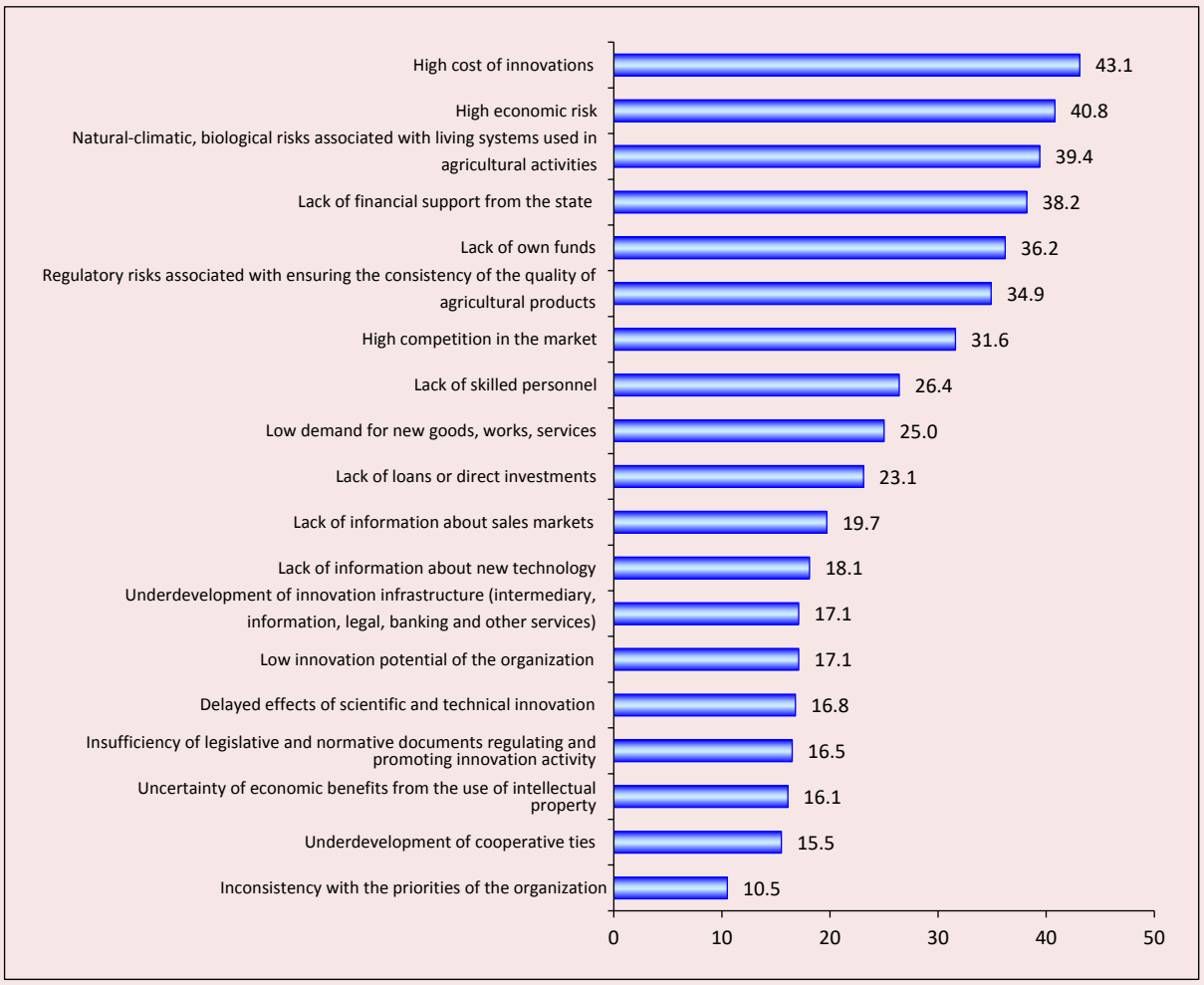
It is worth noting that the results of the survey of agribusiness representatives in Stavropol Krai partially coincide with the results obtained by Rosstat in 2019 according to a sample survey of RF agricultural organizations that assessed the factors hindering the introduction of innovation.

Figure 8 shows a list of general economic, internal and other factors included in the reporting for a sample survey of organizations that implement innovations.

Figure 9 shows a ranked number of major factors hindering innovation, according to representatives of agricultural organizations that implemented innovations and assessed the obstacles according to their significance as significant, major, or critical. We can conclude that most representatives of agricultural organizations do not complain about the insufficiency of legislative and regulatory documents that govern and promote innovation activities. Thus, the share of those who noted this factor among the obstacles is only 16.5%.

The underdevelopment of innovation infrastructure was indicated by slightly more respondents: 17.1%. The high cost of innovations and the high economic risk of their implementation in agribusiness were noted by 43.1 and 43.8% of representatives of agricultural organizations, respectively; insufficient financial support from the state – by 38.2%; lack of own funds for scientific

Figure 9. The share of agricultural organizations that implement innovations and assess the factors hindering innovation activity as significant, major or critical (2017–2019), %



Source: Federal State Statistics Service Results of federal statistical observations. Form no. 4-innovation "Information on innovation activities of organizations". 2019. Available at: https://rosstat.gov.ru/folder/14477 (accessed: September 18, 2021).

research and their implementation – by 36.2% of respondents; 26.4% of agribusiness representatives are concerned about the problem of attracting qualified personnel ready to engage in high-risk innovation projects.

Thus, based on Rosstat's available indicators and our own research findings, we can conclude that the level of scientific and technological development in the agricultural sector is insufficiently high and there exist many factors that hinder the growth of innovation activity in agribusiness. To date, it is difficult to give a more accurate quantitative assessment of the results of implementation of innovation policy at the level of a particular region or industry, since the specifics of statistical accounting and regional statistics provide very limited opportunities to obtain data from these sources. Experts agree that statistical data do not fully reflect the objective picture in innovation activity (Khmeleva, 2016).

The study has also revealed the lack of consistency of the target indicators of the current program for development of agriculture in the innovation sector with the indicators of Rosstat, and even more so with the priorities of the SDGs. Despite the fact that Rosstat is making great efforts to monitor the SDGs at the national level, and almost all official statistical information is developed regionally, at this stage it is not possible to assess the contribution of a particular region, industry or company to the achievement of the SDGs due to the absence of such indicators.

Conclusion

In the course of the study, we have found that in recent years the Russian government has been paying significant attention to innovation development, working on numerous strategic planning documents and measures to support innovations. However, current state policy in the field of innovation does not produce significant results; the basic indicators for the innovation sector – the share of innovation products, the level of business participation in research and development financing – are facing stagnation and even a decrease. It has to be stated that the indicators actually achieved during the implementation of the Innovation Development Strategy for the period up to 2020 are significantly lower than the established target indicators.

Our analysis of the degree of consistency of strategic planning documents on innovation development with the targets of SDG 9 and SDG 8 has shown that their tasks in an adapted formulation are integrated into existing policy and regulatory documents. Meanwhile, the analysis of the national indicators of SDG 9 (Innovation and Science) for 2011–2019 has revealed negative dynamics in most of them. We have also established that monitoring and assessing the degree of achievement of innovation-oriented SDGs is significantly complicated by many inconsistent indicators in strategic planning documents and Rosstat data.

Having assessed the effectiveness of current state policy in the field of innovation activities of agribusiness, we reveal a low level of innovation activity of organizations, a reduction in the share of investments in fixed assets and expenditure on science and development; this allows us to say that the efforts of the state in this area are not entirely successful. Comparing the target indicators of the current agricultural development program in the innovation sphere with Rosstat data and the priorities of the SDGs has shown their inconsistency. Despite the complexity of the assessment, it is obvious that the negative dynamics of indicators and the current level of scientific and technological development of the agricultural sector cannot contribute to the achievement of SDG 8 and SDG 9.

Addressing the tasks set in the study, we looked into the regional specifics of normative and legal regulation and promotion of innovation activity of agribusiness on the example of Stavropol Krai, an RF constituent entity specializing in agriculture.

Despite the fact that, in general, the conditions created in the region are quite favorable, our assessment allows us to conclude that the level of scientific and technological development of the agricultural sector is not high enough and there are many factors hindering the growth of innovation activity of agribusiness. This conclusion is based on the results of our survey of agribusiness representatives. Its results indicate that agricultural producers are most concerned about the problems of insufficient state support, obsolescence of equipment and technology, high cost of innovations, lack of own funds for production modernization and innovation activity, and the delayed effects of scientific and technical innovations. At the same time, only about a third of representatives of agricultural organizations and a fifth of farmers said they were implementing innovation technology. At the same time, despite many hindering

factors hindering the introduction of innovation, representatives of agribusiness consider innovation-oriented targets of the SDGs to be relevant.

Thus, all of the above does not confirm our hypothesis that the state policy aimed to promote innovation activity of Russian agribusiness does not contribute to the formation of key innovation trends in its development in terms of sustainability and achievement of the UN SDGs.

Obviously, in order to achieve further progress toward the implementation of Agenda 2030, it will be necessary to develop a number of key measures, namely, to improve the system for evaluating and monitoring the indicators, because without them it would be impossible to set development goals correctly and achieve them.

The study has also revealed that today it is difficult to evaluate the results of implementation of innovation policy at the level of a particular region so as to compare them with the SDG indicators, since the opportunities provided by regional statistics are very limited. Therefore, in the current conditions, it is necessary to increase the level of consistency in the implementation of the goals of Agenda 2030 and in the assessment of their achievement; in particular, it is necessary to include the SDG targets and indicators in strategic planning documents at various levels more comprehensively and to monitor them, as well.

To do this, it will be necessary to revise the organization of strategic and program planning processes and ensure that the composition of indicators characterizing the goals and targets of the SDGs correspond to their values and are consistent with those stated in strategic development documents. At the same time, it is recommended that Rosstat should monitor such indicators and use them to assess the effectiveness of execution of strategic tasks. In addition to the national system of indicators for assessing the achievement of the SDGs at the level of region, sector or business, it will be necessary to develop secondary indicator systems resulting from the transformation of primary indicators of strategic planning documents at the federal, sectoral and regional levels.

Thus, the inclusion of certain targets of SDG 8 and SDG 9 in state, sectoral and regional programs for scientific and technological development and their comprehensive achievement will contribute to the development of the country's innovation potential. At the same time, a system of indicators consistent with the targets of documents on the strategic development of agribusiness in the innovation sector will help to monitor and assess the effectiveness of the targets set, and forecast scientific and technological development. In turn, enhancing the level of scientific and technological development of the agricultural sector will contribute to the achievement of the SDGs.

The novelty of our research lies in the development and implementation of our own approach to determining the degree of consistency of the targets of existing programs and strategies for development of agribusiness in the innovation sector with the priorities of the SDGs.

Practical recommendations and the main conclusions of our study can be used by scientists in their research on similar topics, by federal and regional authorities in the course of substantiating adjustment measures aimed to improve state policy in the field of enhancing innovation in the agricultural sector and implementing the targets of Agenda 2030.

Taking into account the recommendations we have highlighted, the task for the next stage of work on this topic will be to develop a system of indicators for monitoring and assessing the achievement of all 17 SDGs in the national agri-food system, including innovation-oriented SDGs.

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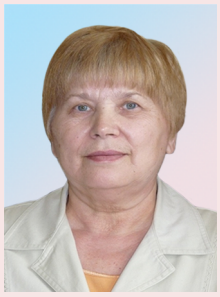
Identifying the Effect of Decoupling in Major Economic Sectors of the Komi Republic



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Abstract. The concept of decoupling is currently recognized as a strategic basis for moving toward an environmentally sustainable economy. This fact is confirmed by a review of publications discussing the possibility of achieving an imperative distinction between economic activity, welfare, and resource utilization. In this regard, the relevance of the problem of ensuring sustainable eco-economic development of the region is increasing, which determined the purpose of the work – to obtain the evidence base proving the actual achievement of decoupling in basic industries (extractive, manufacturing, energy). In order to assess the relationship between economic activity and environmental impact at the industry level, we adapted the Tapio decoupling model known as the Decoupling Diamond, which includes eight decoupling states depending on economic growth rate, resource consumption or environmental impact and the value of the elasticity coefficient representing the growth ratio of these indicators. Determining the state of decoupling in each industry includes calculating the rate of change in gross value added (in comparable prices) and environmental indicators: water abstraction, dirty discharge, air pollutant emissions, production waste generation for the period 2010–2019. The results obtained indicate that the rates of change in gross value added, consumption of natural resources, and the negative impact on the environment are related, separated, or negatively divided. For all of the industries under consideration we have revealed a weak negative decoupling on the dirty discharge, for the energy industry – a weak decoupling on the production waste generation. We have identified a downward trend in current and investment environmental costs in the extractive and manufacturing industries, as well as an increase in

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the proportion of payments for negative environmental impact (NEI) and a decline in innovation activity. The results of the study indicate the need to improve the economic performance of basic industries and strengthen their environmental protection activities; subsequently, the results may be in demand for regulation of eco-economic relations.

Key words: decoupling model, industries, economic growth rates, environmental impact, environmental costs, Komi Republic.

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Introduction

The relevance of resource efficiency and environmental impact reduction is outlined in a number of documents developed by the leading global environmental organization UNEP (United Nations Environment Programme) and aimed at implementing the Sustainable Development Goals in accordance with the 2030 Agenda[1]. At the second session of the UN Environment Assembly (May 23–27, 2016)[2], states recognized that the transition to sustainable development on a global scale requires a fundamental change in the consumption and production patterns of countries.

International experts in comparing scenarios for a possible future in the "Global Resources Outlook 2019" and a number of other works have shown the benefits of disseminating sustainable consumption and production models (IRP, 2017; IRP, 2019; IRP, 2020). It is important to emphasize that in the sustainable development publications discussed above, the distinction between economic activity and human well-being, on the one hand, and resource use and resource efficiency, on the other, is a key point, derived from the concept of decoupling (IRP, 2017). The essence of the decoupling concept, currently recognized as the strategic basis for the movement toward a sustainable economy, is visualized in *Figure 1.*

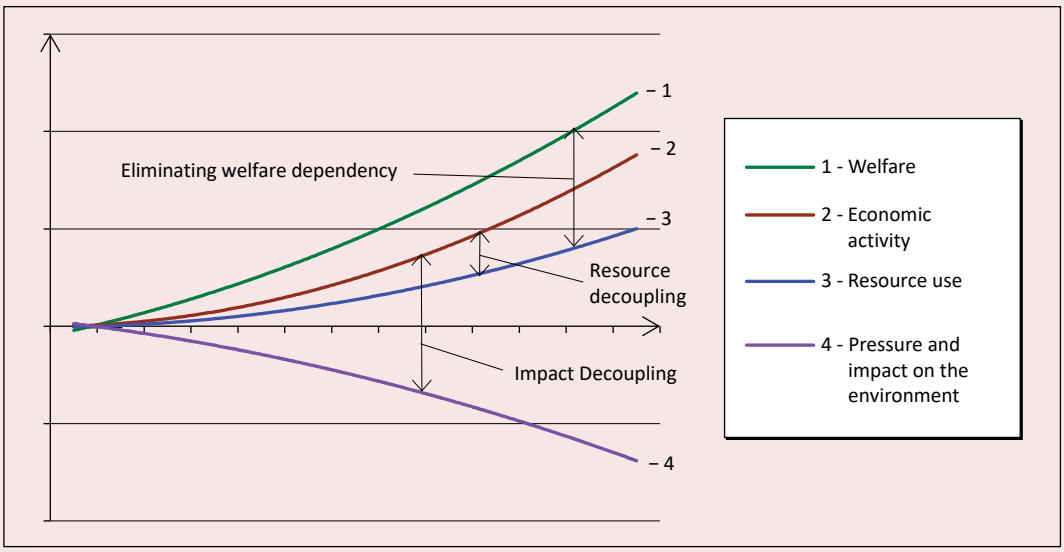
This conceptual model *(Fig. 1)* points to an ideal goal where economic growth and human well-being would increase while slowing resource use and environmental degradation to levels compatible with planetary boundaries, thus ensuring sustainable resource use and conservation for future generations. We should note that the theoretical foundations of decoupling are based on the assumption of economic growth and other variants of the situation are not considered. In this regard, some uncertainty and vagueness of the concept of "sustainable" gives rise to the existence of different points of view and interpretations regarding decoupling in research papers.

Thus, the authors (Wiedmann et al., 2020) acknowledge that humanity needs to reevaluate the role of growth-oriented economies and the pursuit of abundance, noting that over the past several decades (1970–2017), global growth in prosperity has consistently increased resource use and pollutant emissions at a higher rate than they have declined due to better technology. A convincing argument against continued economic growth in developed

[1] Sustainable Development Goals, adopted by United Nations General Assembly on September 25, 2015, as part of Resolution 70/1, "Transforming our World: The 2030 Agenda for Sustainable Development".

[2] Report of the second session of the United Nations Environment Assembly (2016). Resolution 2/8 "Sustainable Consumption and Production Patterns". Nairobi, May 23–27. P. 51–53 (117 p.). Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/11192/K1608498-Res-19%20RU.pdf?sequence=5&isAllowed=y

Figure 1. The essence of the decoupling concept



Source: own compilation according to the data (IRP, 2017).

countries is made by British scientist T. Jackson in his book *Prosperity Without Growth: Foundations for the Economy of Tomorrow*, released in 2009 and reprinted in 2017 (Jackson, 2017). A proponent of degrowth is scientist Timothy Parrique[3], who has investigated the economic implications of ideas of slow growth and post-growth (Parrique et al., 2019). Researchers (Eisenmenger et al., 2020) note that the question *"Is economic growth sustainable?"*, which has arisen in recent decades, remains controversial. A critical review of the Sustainable Development Goals (Ward et al., 2016) concluded that their progress by 2030 will not ensure the sustainability of social structures and the reduction of resource use according to planetary boundaries, as the current events of the European gas crisis attest.

The analysis of published works on the subject under consideration also showed that a significant part of the scientific papers focuses on the study of the decoupling effect and its measurement. The studies of foreign authors prevail, which focus on the analysis of the relationship between economic growth and emission rates, most often greenhouse gases and CO2, at the national level. Of greatest interest are the studies of a review type, carried out in order to present the evidence base of the real achievement of the decoupling effect. For example, in a paper by Finnish scientists (Wiedenhofer et al., 2020), the authors analyzed 179 articles published between 1990 and 2019 discussing separation at different geographic scales (from regional, national to global) based on categorization by type of separation. The authors note that cases of absolute separation of the use of land and natural waters from economy-wide GDP are not confirmed either nationally or internationally.

We should also note a systematic review in which the authors analyzed 835 empirical studies (1976–2019) related to final/utility energy, exergy, material resource use, CO2 and total greenhouse gas emissions, that is of interest. The authors conclude that examples of absolute long-term decoupling

[3] In 2020 he defended his PhD dissertation "The Political Economy of Slowing Growth" (University of Clermont Auvergne, France; Stockholm University, Stockholm Resilience Center, Sweden).

are rare and argue for more research on the interdependencies between welfare, resources, and emissions (Haberl et al., 2020; Vadén et al., 2020). In the context of sustainable resource use policies, material flow and its productivity (productivity of labor, materials, and energy) have a significant place in research (Bleischwitz, 2010). There is a general trend that material productivity in Europe has improved, the economy creates more value (by GDP) per ton of resources used, but the level of this indicator differs by a factor of 17 across the EU-27[4]. At the same time, researchers at the Sustainable Europe Research Institute (SERI), analyzing the interaction between resources and labor productivity, point out that labor productivity has grown stronger than resource productivity, nevertheless it is important to consider their role in economic growth (Stocker et al, 2015). An analysis of global trends in material use in relation to the development of world GDP shows that relative separation was the norm throughout the twentieth century. But since 2002, material productivity has begun to decline at an average annual rate of 1.3% due to the rapid expansion of material production in many regions of the world, with production growth rates exceeding global GDP, resulting in a lack of separation (Krausmann et al., 2017).

There are few studies on this topic in Russia (Bobylev et al., 2019). In the works of Russian scientists, much attention is paid to the analysis of the relationship between trends in economic development, resource consumption and environmental pollution at the regional level (Tret'yakova, 2019; Shkiperova, 2014; Kozhevnikov, Lebedeva, 2019) or individual industries (Akulov, 2014; Yashalova, 2014; Zabelina, 2019).

An assessment of the ecological consequences of the economic development of the regions in Russia's Northwestern Federal District (NWFD) shows that the economic growth of the regions in NWFD is green only with respect to water use (Tret'yakova, 2019). From the analysis of the relationship between economic growth and ecological quality in the Republic of Karelia, it follows that the decoupling effect appears only in relation to air pollutant emissions from stationary sources (Shkiperova, 2014). One of the main problems hindering environmental and economic development and the emergence of a sustainable decoupling effect in the regions of the European North of Russia is the high energy and natural resource intensity of the regional economy (Kozhevnikov, Lebedeva, 2019). The paper (Akulov, 2014) investigated the impact of the coal industry on the environment in the region of industrial type (Kemerovo Oblast) during the period of dynamic growth of the industry and shows the absence of decoupling effect. In contrast, the analysis of the levels of natural resource intensity and environmental impact of major industries in the Vologda Oblast shows that in the period 2000–2012 the pollution intensity decreased with the growth of gross regional product (Yashalova, 2014). The analysis of the negative environmental impact and resource consumption in the border regions of the East of the Russian Federation and the constituent entities of the Baikal region showed heterogeneity in their manifestation of the decoupling effect for all types of economic activity (Zabelina, 2019).

In the monograph (Bobylev et al., 2019), the authors present the results of identifying the mismatch between trends in economic development and certain types of environmental impact (water use, wastewater discharge, air pollution by sulfur dioxide and particulate matter) in Russia and federal okrugs during the period 2000–2014. The decoupling effect is observed in air pollution emissions and water use in the Russian economy as a whole and in most constituent entitites. At the same time, according to the Kuznets curve) only

[4] According to (Bleischwitz, 2010) the highest rates are in the UK, France, Malta, Italy, Belgium, Luxembourg, Germany, Sweden, and the lowest are in countries such as Bulgaria, Romania, Estonia, the Czech Republic, etc.

seven regions are on the downward section[5]. This leaves the question of whether there is a decoupling effect at the industry level in these regions.

Thus, due to the heterogeneity of Russian regions by the level of environmental and economic development and the lack of comprehensive evidence of the sustainable effect of decoupling at the sectoral level of a particular region, the assessment of the relationship nature of economic activity, resource use and environmental impact of the basic industries of the northern region is an urgent task. The purpose of the study is revealing the decoupling effect in basic industries (extracting, manufacturing and energy) of Komi Republic. On this basis, the study involves the formation of a database of economic and environmental performance of basic industries, decoupling analysis based on an adapted Tapio model, considering the rate of change in economic growth and resource intensity and environmental impact, their comparison, visualization and synthesis of the results. The novelty of the work consists in obtaining relevant for the region results of the study of the relationship nature of economic and environmental factors broken down by industry sectors using the decoupling model.

Materials and research methods

The study was conducted in accordance with the DPSIR[6] model, integrated into the process of preparing materials for the report "State of the Environment in the Russian Federation"[7]. We assumed that drivers are the following types of economic activity related to the use of natural resources in the Republic: extraction of mineral resources (coal, oil, gas), manufacturing, production and distribution of electricity, gas and water. The empirical basis of the study was sectoral indicators of the database Komistat[8], reports on the state of the environment in the Komi Republic for 2010–2020.

It follows from the review of the literature that to identify the decoupling effect, the most widely used is the method proposed by the OECD[9], based on the DPSIR model. According to this method the ratio of environmental and economic indicators is estimated: $Df = 1 - (EP/DF)_t / (EP/DF)_o$, where Df is the decoupling factor, EP – environmental pressure, DF – driving force (GDP, GVA), o,t – indices denoting the time period. The method is limited to estimating two states of decoupling (absolute and relative).

The method was developed in the works of J. Vehmas, where the decoupling model described six states (Vehmas et al., 2003). Subsequently this model was modified by P. Tapio and included eight decoupling states depending on the growth rate of resource consumption or environmental pressure (ΔEP, %), economic growth (ΔGDP, %) and the value of the elasticity ratio, determined by the ratio: $e = \Delta EP/\Delta GDP$ (Tapio, 2005). In the subsequent work P. Tapio made some amendments to the model and named it the Decoupling Diamond (Finel, Tapio, 2012) *(Fig. 2)*.

Adapting the Decoupling Diamond model to assess the relationship between economic activity and environmental impact at the industry level, we note that the rates of change in pollutant impact ΔEP and gross value added ΔGVA can either be related (expansive coupling and recessive coupling)

[5] Moscow Oblast, the city of Moscow, Saint Petersburg, the Komi Republic, the Tyumen Oblast, the Republic of Sakha (Yakutia), and the Sakhalin Oblast. (Zelenaya...2019, 153).

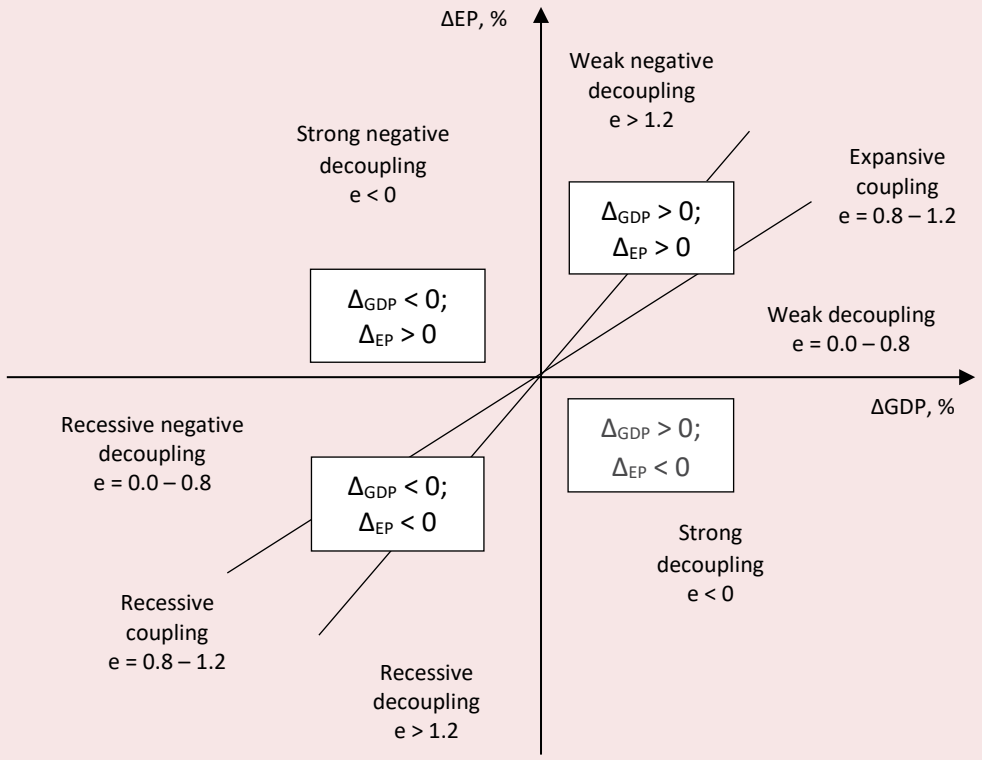
[6] Drivers – Pressures – State – Impact – Response

[7] According to the Government Decree no. 966, dated September 24, 2012 (revised on September 10, 2014) "On the preparation and distribution of the annual state report on the state and protection of the environment".

[8] National Accounts for the Komi Republic and Russia (2020): Stat. Coll. Syktyvkar: Komistat. P. 107; Statistical Yearbook of the Komi Republic (2016): Stat. Coll. Syktyvkar: Komistat. P. 391; Industrial production in the Komi Republic: Stat. Coll. for 2013–2020. Syktyvkar: Komistat.

[9] Indicators to Measure Decoupling of Environmental Pressure from Economic Growth (2002). Paris: OECD; Environmental Indicators-Development, Measurement and Use (2003). Paris: OECD.

Figure 2. State of decoupling according to the Tapio Decoupling Diamond model



Source: compiled according to the data (Finel, Tapio, 2012).

or separated (strong decoupling, weak decoupling, recessive decoupling), or negatively separated (strong negative decoupling, weak negative decoupling, recessive negative decoupling) *(Fig. 2)*.

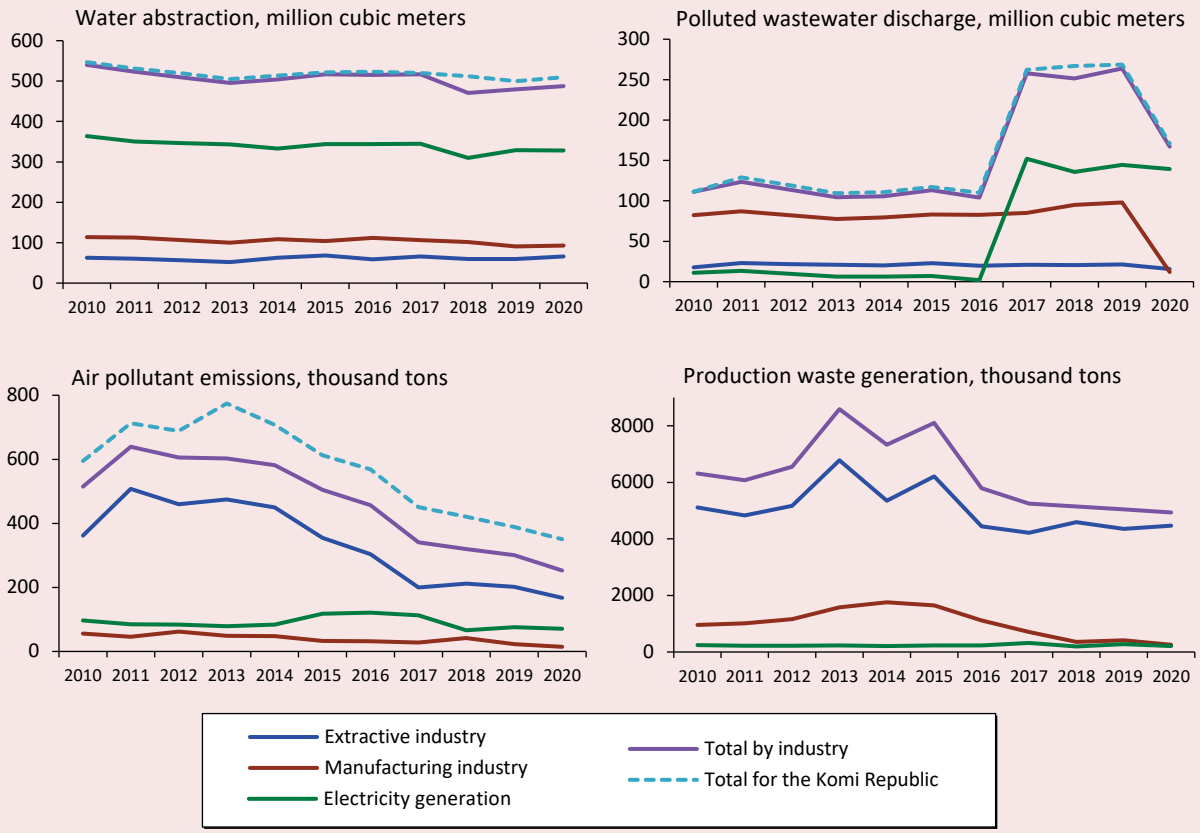
Assessing the decoupling effect involves the conversion of economic performance data (GVA) to comparable prices based on an index of physical volume of production for each industry. At the next stage, we determine the rate of change in economic growth (GVA_i/GVA_{i-1}, %) and environmental indicators (EP_i/EP_{i-1}, % – water abstraction, wastewater discharge, air pollutant emissions, waste generation) in the corresponding time period ($t_{i-1} - t_i$). Then we calculate the value of growth of the indicators under consideration ΔGVA_i, % and ΔEP_i, % and calculate the coefficient of decoupling elasticity as the ratio of changes in these indicators in the form: $Ke_i = (\Delta EP_i, \%) / (\Delta GVA_i, \%)$. The results obtained for each industry are visualized by the selection of optimal diagrams, on which we base our decoupling analysis.

Research findings

Analysis of statistical data (2010–2019) broken down by types of economic activity showed that the negative environmental impact is mainly caused by extraction of mineral resources, manufacturing, production and distribution of electricity, gas and water. The diagrams in *Figure 3* give an idea of the environmental impact level of these industries over the past decade.

According to *Figure 3*, in 2020, industry's proportion of fresh water intake is 96% (including 64% of electric utilities' contribution), 98% of polluted wastewater discharges (electric utilities' proportion is 82%), 72% of air pollutant emissions (including 48% extraction, 20% electricity generation), 98% of waste generation (including 91% of extraction).

Figure 3. Dynamics of the main environmental indicators due to the activities of industrial enterprises in the period 2010–2020 (Komi Republic)



Source: own compilation according to the data of Komistat.

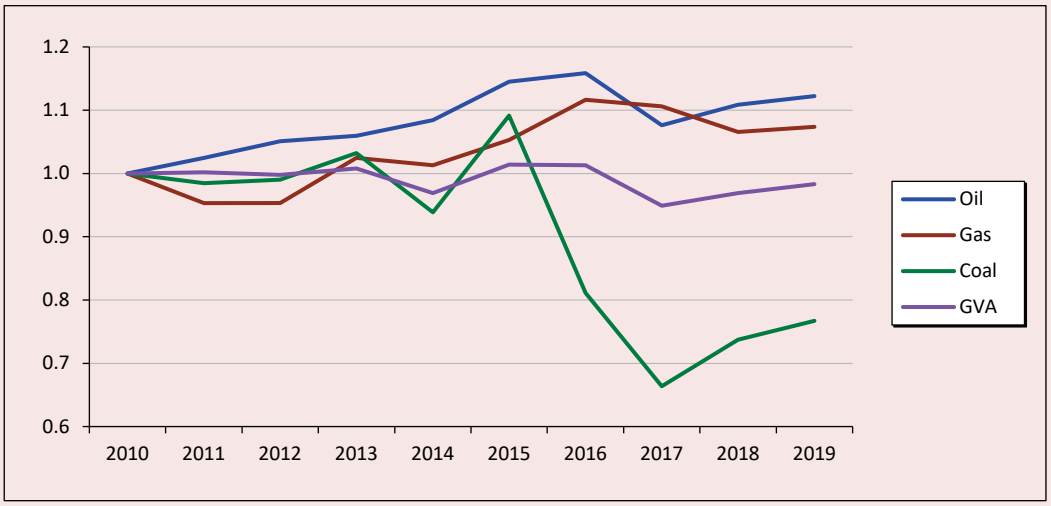
For the extractive industry this period is characterized by an increase in oil production (12%), gas (7%) and a decrease in coal (23%). The economic performance, assessed by the value of gross value added (GVA) in comparable prices, decreased to 98.3%, which is associated with the unstable activity of coal enterprises *(Fig. 4)*.

The change in the pace of economic activity in the industry affects the features of natural resource management. Determinants of this relationship are shown in *Table 1*: Δ fresh water abstraction – to identify resource decoupling; Δ polluted wastewater discharge, Δ air pollutant emissions, Δ waste generation – to register environmental impact decoupling. To visualize the nature of the relationship, we used a scatter diagram *(Fig. 5)*.

Calculation of decoupling elasticity coefficient (Ke) on *fresh water abstraction* shows that strong decoupling takes place in case of GVA increase and water abstraction decrease with negative Ke value in 2011, 2013, 2018 and 2019 (see Tab. 1). On the scatter diagram in the axes "Δ water extraction – ΔGVA" these years are located in the IV quarter of the coordinate plane (– +) (see Fig. 5).

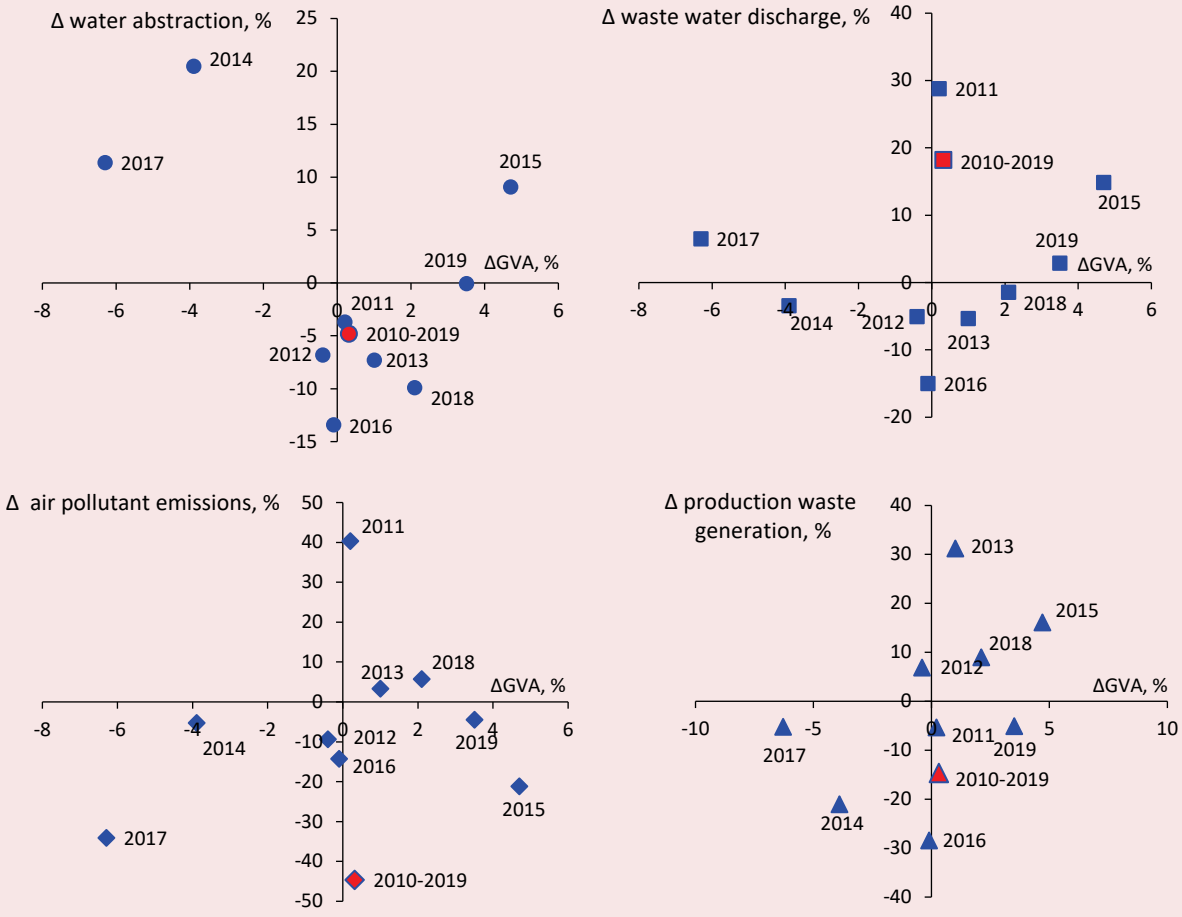
With negative ΔGVA, increased Δwater abstraction, and Ke < 0 in 2014 and 2017, the strong decoupling carries a negative nature (Str.neg.dec.). On the scatter diagram, these years are in the II quarter (+ –). The calculated indicators of 2015 are positive, the value of the coefficient Ke > 1.2, which causes a weak negative decoupling (W.neg. dec.) with the location of the marker of the year

Figure 4. The economic performance of the extractive industry in the period 2010–2019 (Komi Republic)



Source: own compilation according to the data of Komistat.

Figure 5. The nature of the relationship between the rate of economic growth and the environmental burden in the extractive industry in the period 2010–2019 (Komi Republic)



Source: compiled according to the calculated data in Table 1.

Table 1. Decoupling elasticity coefficient (Ke) and decoupling types in the extractive industry in the period 2010–2019 (Komi Republic)

	ΔGVA, %	Fresh water abstraction			Waste water discharge			Air pollutant emissions			Production waste generation		
		Δ water abstraction, %	K e	Decoupling type	Δ discharge, %	K e	Decoupling type	Δ emissions, %	K e	Decoupling type	Δ waste, %	K e	Decoupling type
2011	0.2	-3.7	-18.4	Str.dec.	28.8	144.0	W.neg. dec.	40.3	201.5	W.neg. dec.	-5.36	-26.78	Str.dec.
2012	-0.4	-6.8	16.9	Rec.dec.	-5.0	12.5	Rec.dec.	-9.4	23.6	Rec.dec.	6.87	-17.18	Str.neg. dec.
2013	1	-7.3	-7.3	Str.dec	-5.3	-5.3	Str.dec.	3.3	3.3	W.neg. dec.	31.22	31.22	W.neg. dec.
2014	-3.9	20.5	-5.3	Str.neg. dec.	-3.4	0.9	Rec.cou.	-5.3	1.36	Rec.dec.	-21.03	5.39	Rec. dec.
2015	4.7	9.1	1.9	W.neg. dec.	14.9	3.2	W.neg. dec.	-21.2	-4.51	Str.dec.	16.11	3.43	W.neg. dec.
2016	-0.1	-13.4	134	Rec.dec.	-15.0	150.0	Rec.dec.	-14.3	143.1	Rec. dec.	-28.44	284.4	Rec.dec.
2017	-6.3	11.4	-1.8	Str.neg. dec.	6.5	-1.0	Str.neg. dec.	-34.1	5.41	Rec.dec.	-5.22	0.83	Rec.cou.
2018	2.1	-9.9	-4.7	Str.dec.	-1.4	-0.7	Str.dec.	5.7	2.71	W.neg. dec.	8.93	4.25	W.neg. dec.
2019	3.5	-0.05	-0.01	Str.dec.	2.9	0.83	Exp.cou.	-4.5	-1.3	Str.dec.	-5.11	-1.46	Str.dec.
2010–2019	0.32	-4.82	-15.1	Str.dec.	18.2	56.7	W.neg. dec.	-44.7	-138	Str.dec.	-14.7	-46.0	Str.dec.

Note: Str.dec. – Strong decoupling; Str.neg.dec. – Strong negative decoupling; W.dec. – Weak decoupling; W.neg. dec. – Weak negative decouplin; Exp.cou. – Expansive coupling; Rec.dec. – Recessive decoupling; Rec. neg.dec. – Recessive negative decoupling; Rec.cou. – Recessive coupling;
Source: own compilation according to the data of Komistat.

in the I quarter (+ +). The manifestation of recessive decoupling (Rec.dec.) in 2012 and 2016 is determined by a decrease in both economic growth and water abstraction, the value of Ke > 1.2. The points are located in the III quarter (– –).

In general, the resource decoupling by water abstraction in the period 2010–2019 relative to the base year 2010 is of a strong decoupling nature (Str.dec.), due to the indicators: ΔWDS > 0, Δ water abstraction < 0, Ke < 0. On the "water abstraction" scatter diagram, the estimated point "2010–2019" as a red marker is located in the zone of strong disconnect between economic growth and water abstraction, in the fourth quarter (– +).

Calculated environmental impact data on the *waste water discharge* (see Tab. 1, Fig. 5) show that in 2014 the growth of ΔWDS is negative and close to the rate of reduction of waste water discharge, Ke = 0.9, which causes a recessive coupling (Rec.cou). In 2019, with positive increases in these indicators and Ke = 0.8, their coupling becomes expansive (Rec.cou). A strong decoupling (Str.dec.) is observed in 2013 and 2018, when ΔGVA, equals1.0 and 2.1%, respectively, and Δ polluted wastewater discharge, -5.3 and -1.4%, respectively (Ke < 0). The period of 2010–2019 is generally characterized by positive values of ΔGVA > 0, Δ waste water discharge > 0, coefficient Ke > 1.2. According to this point "2010–2019" (red marker) is located in the upper part of the I quarter of the diagram (see Fig. 5), which corresponds to a weak negative state of decoupling (W.neg.dec).

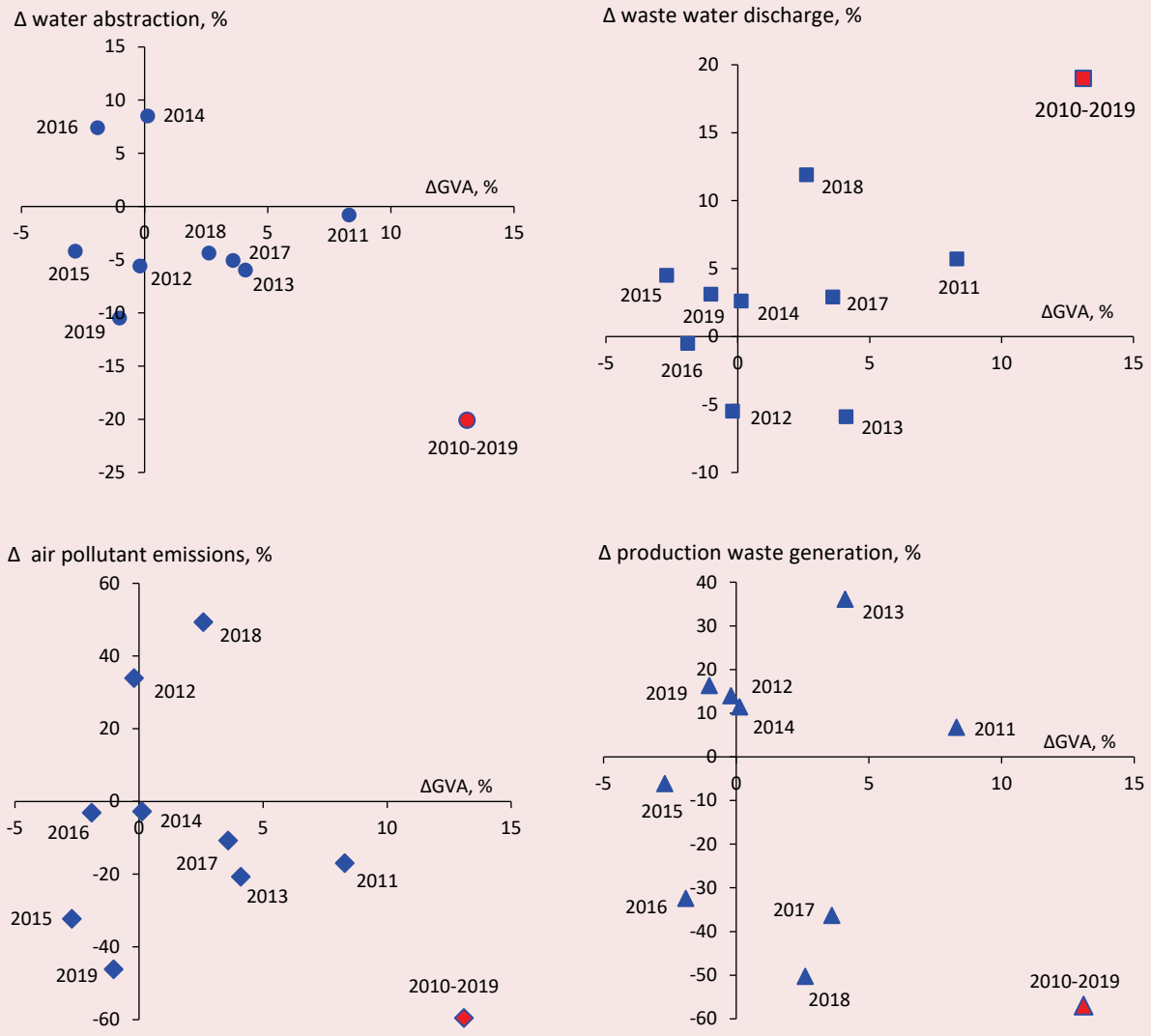
Calculation of the decoupling elasticity coefficient for *air pollutant emissions* shows that in 2015 and 2019, the best environmental and economic results, characterized by a strong decoupling, were achieved (Str.dec.). In other years, we see an alternation of weak negative decoupling driven by emissions growth (2011, 2013, 2018) with recessive decoupling driven by the economic slowdown (2012, 2014, 2016, 2017). Assessing the studied period 2010–2019 as a whole, we can conclude that at the industry level there is a strong decoupling of economic growth from air pollutant emissions (Str. dec.). On the diagram, the point "2010–2019" is located in the IV quarter (marker in red).

The state of decoupling for production waste generation is similar to other environmental impact indicators in the industry and is variable, ranging from a strong decoupling in 2011 and 2019 to a recessive coupling in 2017. Overall, the 2010–2019 period is rated strong decoupling as a result of a significant decrease in waste generation (14.7%).

Manufacturing industry. The contribution of the industry to the gross regional product is about 10–11%. In terms of gross value added, the most important industries are wood processing and manufacturing of wood products (GVA proportion of 15–16%), paper production (30–33%), petroleum products (30–55%), chemical products (2%). Considering the dynamics of the main types of environmental impact, we should note that the *volume of water abstraction* of the manufacturing industry is 1.4 times greater than that of extractive companies and 3.5 times less than the volume of fresh water abstraction in the electric power industry (See Fig. 3). Over the period 2010–2020 the proportion of the industry in the water abstraction of the Komi Republic decreased from 21 to 18% due to the increase in the use of recycled water. The calculation of the decoupling elasticity coefficient (Ke) for the manufacturing industry indicators is performed similarly to Table 1, but in order to reduce the volume the results are presented only as scatter diagrams in *Figure 6*.

In the *"water abstraction"* diagram, the location of the 2011, 2013, 2017, 2018, and 2010–2019 points in the fourth quarter indicates the existence of strong decoupling as a result of reduced water abstraction and an increase in Δ GVA, with Ke < 0. With economic decline and higher rates of water abstraction decline, when the coefficient of Ke is greater than 1.2 (2012, 2015, 2019), decoupling becomes recessive, with markers located in the third

Figure 6. The nature of the relationship between economic growth and environmental burden in manufacturing industry in the period 2010–2019 (Komi Republic)



Source: own compilation according to the data of the calculation similar to that in Table 1.

quarter. Strong negative decoupling was detected in 2016, which is caused by both reduction of ΔGVA and growth of water abstraction, Ke = -3.9. Weak negative decoupling was observed in 2014.

Gross *air pollutant emissions* from stationary sources in the manufacturing industry are the lowest in quantitative terms, their proportion is 4.1%. We can note a trend toward a constant reduction of air pollutant emissions. For the period 2010–2019, the volume of emissions decreased by 59.6%. The diagram shows that when ΔGVA is negative, there is recessive decoupling (2015, 2016, and 2019); when GVA is positive, there is strong decoupling (2011, 2013, 2014, 2017, the whole period 2010–2019).

A relatively high contribution of the industry to environmental pollution is caused by *waste water discharge* due to the improper operation of the biological stage of the pulp and paper production treatment facilities, which in the period under review were under reconstruction.

According to the calculation results, the industry contribution to this type of pollutant impact in the period 2010–2019 exists in the form of a weak negative decoupling due to the increase in waste water discharges, which is 19%. In the diagram (Fig. 6), only the 2013 marker is located in the zone of strong decoupling. 2011 and 2017 are in the zone of weak decoupling, 2014 and 2018 – in the weak negative decoupling, which is due to an increase in waste water discharges with an increase in GVA. In the other years, due to declining economic growth while waste water discharges increased, the nature of decoupling is recessive (2012), recessive negative (2016), or strong negative (2015, 2019). In the nearest future (since 2020) the situation should change to the strong decoupling resulting waste water discharge reduction by 8-fold and the industry's proportion in the total water discharge from 74% to 7% (due to the introduction of treatment facilities in the pulp and paper industry after reconstruction).

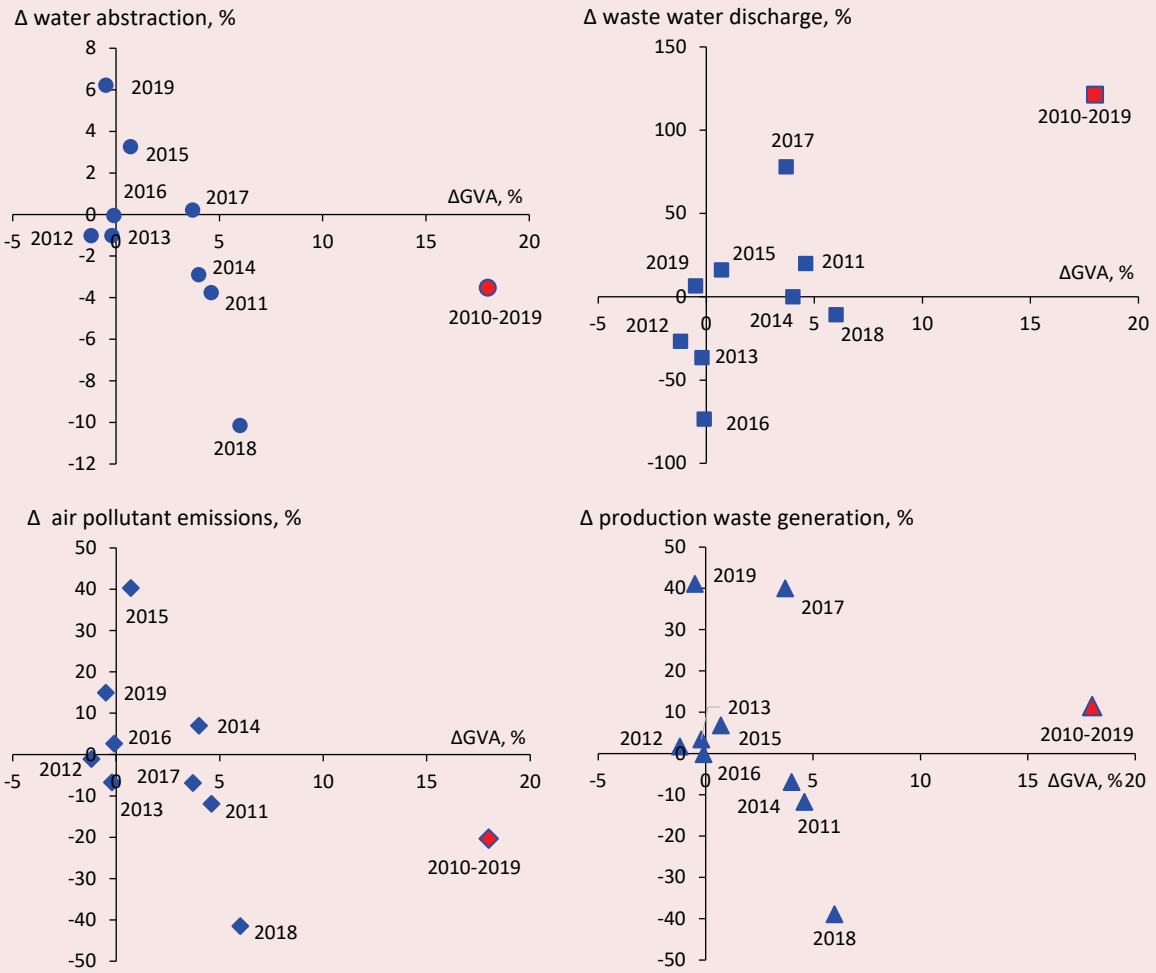
We should note that the manufacturing enterprises of the industry are also sources of *waste generation*, but their volume is 10-fold less compared to the extractive enterprises. The peak of waste generation was observed in 2014, relative to which at present the amount of industry waste has decreased by almost 7-fold. Calculations show that the relationship between economic growth and waste generation in the period 2010–2019 in the industry has a strong decoupling nature, due to the high rate of waste generation reduction (57%) with the growth of ΔGVA.

Production and distribution of electricity, gas and water. In the period 2010–2019 the ratio of the industry in the gross added value of industrial production decreased gradually from 10.3% to 5%, despite the growth of electricity production from 9.3 to 10.6 billion kWh, which amounted to 14%. The production of thermal energy increased by 12.4%. In 2019, the level of electricity consumption was 9,215.7 million kWh, including the population – 850 million kWh and almost the same amount of losses in public networks. The activity of the industry enterprises is associated with the use of natural gas, coal, heating oil, diesel fuel and other resources. The industry leads in the use of water resources and waste water discharge (see Fig. 3).

The results of the calculation of the indicators determining the impact level of the industry economic growth on the environment are shown in the diagrams in *Figure 7*. A decoupling analysis of estimated water abstraction rates shows that in 2011, 2014, 2015, 2017, 2018 there is an increase in gross value added in the range of 0.7–6.0%, in other years there is a decline (2012, 2013, 2016, 2019) of 0.1–1.2%. At the same time, there is a decrease or increase in water abstraction. The combination of the states of these indicators (+ +; + –; – –; – +) determines the value of the elasticity coefficient Ke and the nature of the relationship. The diagram shows that the "points-years" are placed in different parts of the coordinate plane. We can say that in 2011, 2014 and 2018 there is a strong decoupling corresponding to the "+ –" position. The pattern of activity in 2012 leads to a recessive relationship, with Ke equal to 0.83, because the rate of ΔGVA decrease is higher than the rate of water abstraction decrease. The worst state (strong negative decoupling) occurs in 2019, when the ΔGVA decreases while water abstraction increases at a higher rate. Overall, calculations for the period 2010–2019 point to the emergence of strong decoupling of economic growth and water abstraction.

There is a weak negative decoupling (2011, 2015, 2017) in industry activity relative to *waste water discharges* due to high growth in wastewater discharges relative to the rate of ΔGVA. The very high increase in the waste water discharge in 2017 suggests that it is caused by two factors: a decrease in the use of recycled water and the fact of the transition of waste water category "partially clean, without treatment" to "polluted", requiring

Figure 7. The nature of the relationship between economic growth and environmental burden in the energy industry in the period 2010–2019 (Komi Republic)



Source: own compilation according to the data of the calculation similar to that in Table 1.

treatment before discharging into water bodies. As a consequence, an assessment of the period 2010–2019 shows that the nature of this type of environmental impact is a weak negative decoupling (W.neg.dec) and the development of the situation is determined by the position of the point "2010–2019" on the coordinate plane as a red marker in the I quarter (+ +) and the value of Ke more than 1.2.

Air pollutant emissions for the period 2010–2019 decreased by 21.4%, the change in GVA growth was 18%, which causes strong decoupling (St.dec.). During the period under consideration the state of strong decoupling is observed in 2011, 2017 and 2018, which are characterized by the growth of ΔGVA and reduction of the pollutant impact of the industry. In 2012, there is a decrease in approximately the same rate of both economic activity and air pollution, which leads to a recessive coupling condition (Rec.cou.). Further, as the rates change, this relationship is broken and turns into recessive decoupling (Rec.dec.). The diagram shows that markers 2014 and 2015 are located in the zone of weak negative decoupling, due to the growth of air pollutant emissions, where the coefficient Ke > 1.2. Markers 2016 and 2019 are located in the zone of strong negative decoupling

(St.neg.dec.) due to a decrease in economic performance with a simultaneous increase in the air pollutant emissions.

The type of relationship between economic activity and production *waste generation* during the study period 2010–2019 is also characterized by decoupling variability: strong (2011), strong negative (2012, 2013), strong (2014), weak negative (2015), recessive (2016), weak negative (2017), strong (2018), strong negative (2019). It is worth noting that the energy industry generates about 277 thousand tons of industrial waste, which is 5.5% of the total volume in the industry (excluding overburden waste of hazard class V). There is no statistical data on the structure of waste by industry, so a comparison of the polluting impact of industries is possible only by quantitative indicators. Because of this, it is difficult to assess the true negative impact on the environment.

The development of environmental protection activities is largely determined by the conditions of its financing, the level of technological development of industrial production, and the innovative activity of enterprises. *Table 2* shows the cost of environmental protection and rational use of natural resources by the main types of economic activity, the volume of payments for negative impact on the environment (NEI).

According to Table 2 for the period 2010–2019, the proportion of the extractive industry in current environmental control costs decreased from 34.4 to 10%. In the manufacturing industry, the dynamics of this indicator is also declining, the proportion of current costs decreased by half (to 21.5%). The growing dynamics of current environmental costs in the energy industry draws attention, their proportion has increased by more than 4-fold. As a whole for the Komi Republic, current environmental costs as a percentage of GRP decreased from 0.70% to 0.53% (similar indicators of 2019 for NWFD – 0.34%, the Russian Federation – 0.36%) for the period under review.

The largest volume of investment in fixed capital environmental protection at the regional level was directed in the period 2013–2016 (1.4–1.9% to GRP), but in subsequent years investment decreased to 0.7%. The mentioned period of high results is provided at the expense of investments in

Table 2. Environmental protection costs and rational use of natural resources by industries in 2010–2019 (Komi Republic)

Indicators	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Current environmental control costs										
Komi Republic, million rubles	2,330	1,757	1,621	2,085	2,019	2,038	2,611	3,178	3,457	3,787
Extraction of mineral resources, %	34.4	32.5	10.5	9.0	11.1	7.6	15.7	15.0	13.1	10.0
Manufacturing industries, %	45.0	40.2	31.9	39.6	32.2	32.9	24.6	22.4	23.0	21.5
Production and distribution of electricity, gas and water, %	9.0	15.7	38.4	47.0	39.6	43.3	44.2	44.1	46.6	38.9
Investments in fixed capital aimed at environmental protection and rational use of natural resources										
Komi Republic, million rubles	1,519	384	2,717	6,963	6,844	9,937	8,723	5,867	9,609	5,117
Extraction of mineral resources, %	10.8	25.3	68.7	96.1	90.1	93.8	85.8	56.1	18.2	8.0
Manufacturing industries, %	86.6	66.7	25.1	2.6	8.5	4.9	6.2	38.7	80.7	79.3
Production and distribution of electricity, gas and water, %	-	-	0.1	0.06	0.8	0.2	0.29	0.35	0.25	0.95
Payments for negative environmental impact										
Komi Republic, million rubles.	212.8	248.5	485.1	883.1	1,316.6	677.9	588.2	99.6	67.4	65.4
Komi Republic, % to the volume of investments	14.0	64.7	17.9	12.7	19.2	6.8	6.7	1.7	0.7	1.3
Source: compiled according to: 1 – Stat. Coll. "Industrial production in the Komi Republic" for the period 2011–2019. Komistat; 2 – reports "On the state of the environment in the Komi Republic" for the period 2010–2019.										

the extractive industry. According to quantitative indicators, the contribution of this industry to the investment of fixed capital for environmental purposes in 2012–2017 is 85.8–96.1%, in 2019 – 8%. The high proportion of manufacturing investment is in 2010–2011 and 2018–2019. Throughout the entire period, investments in the energy sector grew dynamically, but within a range of no more than 1%.

From 2010 to 2015 in the structure of investment costs of the Komi Republic is dominated by investments in the protection of the atmosphere, amounting to 57–93%, their proportion is significantly reduced in the subsequent 2016–2018 years and resources are mostly directed to the protection and rational use of water resources and waste management activities. In 2019, the proportions of costs for the three main environmental areas "water–air–waste" are the most balanced and amount to 38, 30 and 32%, respectively. We should note that the main sources of financing of investments in fixed capital aimed at environmental protection and rational use of natural resources are own funds of organizations (98%).

Since production activities involve compensation for environmental damage, Table 2 provides data on the gross receipts of payments for negative environmental impact (in total to the budgets of different levels). Relative to investments, the size of these payments decreased significantly and according to 2019 data, it is 1.3%, but this does not indicate an improvement in the environmental situation, given that the amount of excess payments is higher than the impact fee within the established standards by 3–4-fold and more. Based on the fact that the funds spent from the Komi Republic budget on environmental protection are tenfold lower than the incoming payments for NEI, we can conclude that the payments do not stimulate the process of investing in fixed capital, aimed at environmental protection and rational use of natural resources.

The dynamics of innovation indicators of basic industries and the economy in the Komi Republic as a whole is characterized by a decrease in innovation activity of the proportion of enterprises engaged in technological innovation, the proportion of innovative products. Their level is lower in comparison with similar indicators in the NWFD and the RF. At the same time, one should note that the indicator "advanced production technologies used" demonstrates double growth (2010 – 550 units, 2019 – 1156 units).

In 2015–2019 innovation activities in the Komi Republic are mainly aimed at pollution abatement. The proportion of enterprises participating in this area has increased from 80.0 to 83.3%. Along with this, the proportion of enterprises, that implement environmental innovations to reduce energy costs from 80.0% to 50.0% and material costs from 60.0% to 33.3%, to reduce the emission of CO_2 into the atmosphere from 60.0% to 16.7%, decreased. A comparison of these results with data for NWFD and RF shows that the level of participation in the Komi Republic is lower for all aspects of environmental innovation (except for the reduction of environmental pollution).

From the above it follows that approaching the sustainable decoupling state of the basic industries is possible with positive economic growth accompanied by increased environmental protection and innovation activities, ensuring the reduction of the environmental burden.

Conclusion

Summarizing the results of the study, we should note that during the period under consideration 2010–2019, the economic growth of the basic industries of the republic is characterized by instability, conditioning the variable nature of resources consumption and environmental impact. Approbation of Tapio's Decoupling Diamond method showed the possibility of using this model at the industry level to assess the state of eco-economic relations. The advantages of the model lie in the

ability to perform a more in-depth analysis revealing the following forms of decoupling: strong and strong negative – with negative elasticity coefficient (Ke); weak and recessive negative – Ke within 0–0.8; weak negative and recessive decoupling – Ke more than 1.2; expansive or recessive relationship – Ke within 0.8–1.2.

In accordance with the given gradation of the elasticity coefficient, the period under study relative to 2010 for the basic industries of the republic is characterized by environmental disadvantage in relation to wastewater discharge and is characterized by the identification of a "weak negative decoupling" effect, existing as a result of higher rates of wastewater discharge growth relative to the growth of GVA. In the energy industry, there is also a "weak decoupling" effect in the direction of production waste generation, due to their growth rate, which is lower than the increase in GVA.

Decoupling analysis of the annual period intervals revealed a recessive relationship in the extractive industry in the context of a decrease in GVA and wastewater discharges at the same rate (2014), when the elasticity coefficient is within 0.8–1.2, with a positive increase in these indicators in 2019 an expansive relationship is recorded. In other industries, no such relationship has been detected.

Analysis of the dynamics of current costs and investments in fixed capital aimed at environmental protection and the rational use of natural resources, their structure by type of economic activity and the main directions of environmental protection activities and funding sources revealed a downward trend in both current and investment costs in the mining and manufacturing industries and at the same time a slight increase in the proportion of the energy sector, not exceeding 1%. From the analysis of payments for negative impact on the environment, it follows that payments for excessive pollution are 3–4 and more times higher than charges for pollution of the environment within the established standards, which is consistent with the decoupling analysis of the unfavorable situation in the field of waste water treatment. At the same time, the funds spent from the budget of the republic on environmental protection are tenfold lower than the incoming NEI payments, which indicates the need to develop a mechanism for directing them to the maximum extent into investment in environmental protection, into the implementation of projects of transition to the best available technologies.

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Irrationality in the Behavior of Applicants as a Factor in the Imbalance of Labor Markets and Educational Services in the Region

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Abstract. One of the reasons for the imbalance of labor markets and educational services is that applicants choose the universities and the specialties that are unclaimed in the present and future labor market. The article presents the results of an empirical study on identifying behavioral patterns of applicants when choosing a direction of study and higher education institution (2021, N = 4228), which was conducted among 10th and 11th graders of the Republic of Bashkortostan. We considered the results of the survey broken down by three territorial blocks: the capital (urban district of Ufa); urban area – 8 urban districts; rural area – 54 municipal districts. The analysis revealed three irrational patterns of behavior among applicants: 1) choosing "easy" humanities and economic specialties as the subject of the Unified State Exam (USE), not allowing to enter the desired in-demand specialty; 2) desire to enter a "promising specialty" not related to the choice of the USE; 3) applying for specialties not related to the choice of the USE subject and the desire of the entrant. During the study we found that the irrationality of an applicant's behavior in a difficult situation associated with the multiparameter choice of training program and higher education organization becomes one of the causes of imbalance in the labor and educational services market in the region. We determined that further research on the behavior of applicants should be conducted in the following directions: modeling and forecasting behavior of applicants (development of a comprehensive agent-based model of the educational system of the region, allowing for computational experiments to assess the impact of various mechanisms of state influence on the behavior of agents (applicants), and the development of practice-oriented and interactive methods of vocational guidance among school students, especially in rural areas.

Key words: labor market, educational services market, behavior of applicants, irrational behavior, sociological survey, agent-based modeling, imbalance of educational services and labor market.

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Problem statement

One of the important problems in the modern economy is the imbalance of labor markets and educational services. It lies in the following contradiction: educational institutions train specialists in some programs in a volume that the economy does not require, while there is a shortage of training in other specialties. This leads to unemployment, social tension, and economic losses. The reasons for this situation are as follows: the problems of forecasting staffing needs, the time lag between the current needs of the economy and the response of the educational system, and the orientation of educational institutions to the preferences of applicants, whose behavior is not always rational.

The imbalance of labor market and educational services is one of the reasons for the loss of human capital in a number of Russian regions. For example, in the Republic of Bashkortostan, which is characterized by a positive natural increase, the decrease in population size is caused by a high value of migration loss. In 2020 the number of migrants in the Republic of Bashkortostan was 125 thousand people, i.e. 3% of the total population of the region. The main number of migrant departures

(43%) falls on the age of 15–29 years, i.e. the age at which people obtain higher education and get a job. In 2021, 40% of all high school graduates left the region in order to enter universities. These applicants are not migrants, but as the evidence from practice shows, most of them do not return to the republic.

The economic behavior of individuals (applicants) when choosing an academic path can be considered from the perspective of several economic theories: classical, behavioral, institutional (Koksharov, Agarkov, 2015). According to the classical theory, applicants make decisions based on rationality and completeness of information, considering the goal of maximizing the utility of their education, including consideration of future income (Gerard, 1956). Most applicants must choose the subject for the Unified State Exam (USE), the university and the specialty, considering the proportion of employment in the specialty and the level of wages, which does not correspond to Russian realities.

Limited rationality corresponds to the provisions of behavioral economics, which combines the achievements of psychology with the neoclassical economic theory. In this case, economic agents (applicants) may react differently to the same situations and conditions and underestimate the maximum results, which are just probable (a prestigious university, a specialty promising high wages), in favor of the average ones that can be guaranteed (an "easy" to pass USE, an average regional university, a common specialty) (Kahneman, Tversky, 1979).

Under the theory of institutional economics, the individual will be guided not by their own inner desires, but by institutional constraints and "collective interest, if this adherence serves to better achieve their individual goals" (Baldanov, Dondokova, 2015).

Factors influencing applicants' behavior have been extensively studied in contemporary foreign research. Some works analyze the behavior of applicants depending on the "well-being" of high school (Delaney, Deverew, 2020), racial and ethnic differences (Black et al., 2018), gender (Bord n et al., 2020), university ranking (Broecke, 2015), etc. For example, a study by S. Broecke proves that in-country university rankings have a statistically significant impact on the choice of applicants, especially those with better grades and from wealthy families, while black, older, and lower-performing applicants tend to avoid universities with high rankings (USA) (Broecke, 2015).

A number of researchers have developed models of the likelihood of choosing to go into higher education or a particular higher education institution, type of study, or training program (Broecke, 2015; Spiess, Wrohlich, 2010; Gibbons, Vignoles, 2012; Suhonen, 2014). In particular, they have created gravity models to consider student flows into higher education (Suhonen, 2014; Alm, Winters, 2009; Cooke, Boyle, 2011; Faggian, Franklin, 2014; Cullinan, Duggan, 2016). For example, one model proves that increasing the distance to a university by 100 kilometers decreases the probability of choosing it (Finland) by 15% (Alm, Winters, 2009). Results of another gravity model show that higher-performing students are more focused on the type of institution rather than its location, while lower-performing students pay more attention to the cost of education and the location of the institution (USA) (Faggian, Franklin, 2014).

Obviously, it is necessary to understand that conducted studies are connected with the specific features of each country. But the statement of the problem and the developed methodological approaches to modeling would be useful to consider in the context of the Russian Federation regions,

although in the Russian science the analysis of applicants' behavior rationality is not so widespread. There are authors who analyze the "collective rationality" of individuals, according to their research, "unbalanced demand for certain training programs is related to the established social values that need to be formed in the regional markets of higher education services" (Baldanov, 2015). There are works that use mathematical models to estimate the significance of rational economic expectations when applicants choose their academic path. Thus, V.A. Koksharov and G.A. Agarkov determined that the factors that ensure the formation of optimal academic paths are the expectation of high income after graduation and the possibility of reducing the cost of education or state-funded place, while success in education does not affect the choice of the optimal, in terms of economy, academic path (Koksharov, Agarkov, 2015). Various models of applicants' behavior have been developed, including agent-based (Makarov et al., 2020) and simulation-based models.

At the same time, there are not enough studies related to the empirical analysis of the rationality of applicants' behavior based on sociological surveys, which should include not only immediate (11th grade students), but also future (10th grade students) applicants. Consideration should be from the perspective of how their preferences in the choice of USE subject, university and specialty change under the pressure of the institutional environment, followed by a comparison of the survey results and the actual behavior of applicants in terms of the choice of university and specialty.

We set a goal to reveal the irrationality of applicants' behavior, influencing the imbalance of the labor market and educational services, by means of a sociological survey, covering 10th- and 11th-grade students from 62 municipal formations of the Republic of Bashkortostan.

Research methodology

We conducted a survey among 10th–11th graders from 8 urban districts and 54 municipal districts of the Republic of Bashkortostan supported by the Ministry of Education of the Republic. Because the sample included underage students, the Ministry of Education sent out letters prior to survey to get permission from the students' parents before the survey began.

The survey was conducted from May to June 2021. We developed a questionnaire consisting of 28 questions divided into several blocks. In most cases, we used single- and multiple-choice questions, and 6% of respondents expanded their answer with additional comments. The survey, developed on the Google Forms platform with the assistance of the Ministry of Education of the Republic of Bashkortostan, was sent to schools of the region via e-mail. We chose the Google Forms platform was because of two factors: 1) no admission to schools and a preference for distance forms of survey in the COVID-19 pandemic; 2) the Ministry of Education of the Republic of Bashkortostan has experience in conducting such a survey. In addition, the use of Google Forms has significantly reduced the time and effort required to process the results.

The total sample was 35,628 people. We used the quota sampling method to determine the sampling population. As quota parameters we used socio-demographic characteristics: 1) place of residence (according to statistical data on the number of schoolchildren in the municipalities of the Republic of Bashkortostan); 2) age (we identified two age groups: 16–17 and 18–19 years old). The volume of quota sampling is calculated by multiplying the number of answer choices for each of the selected characteristics (place of residence, age) by the minimum number of people in the surveyed group. The sample consisted of 4,228 schoolchildren. In

each municipal district and urban district of the Republic of Bashkortostan we interviewed students of several educational institutions. Thus, the representativeness of the sample was ensured. The sampling error with 95% confidence probability was 1%.

The results of the survey are considered broken down by three territorial blocks: 1) the capital (urban district of Ufa) – as a separate category for the study; 2) urban areas – urban districts (Agidel, Kumertau, Neftekamsk, Oktyabrsky, Salavat, Sibay, Sterlitamak); 3) rural areas – municipal districts (54 municipalities).

Main results

It is worth noting first that the study of the rationality of applicants' choice as an imbalance factor is especially relevant in the period of massification of higher education in Russia. We can agree with the opinion that "in the future possession of higher education will become a prerequisite for an individual's competitiveness and may lead to total higher education" (Maksimov, Telezhkina, 2019). In this regard, it is important for the country/region that individual academic paths (including the choice of higher education) correlate with the strategic objectives, priorities of territorial development, in accordance with which the state invests in the forms and specialties of education. The correspondence of expectations of territorial socio-economic systems and individuals affects the imbalance of the labor market and educational services.

The authors understand this imbalance as a discrepancy between the structure of vocational education and the current and future needs of the labor market in terms of qualifications and professional structure, which leads to a shortage of qualified personnel in a number of professions and specialties (Gainanov, Migranova, 2013). The factors causing the imbalance in the Republic of Bashkortostan are identical to those in Russia as a whole. A higher level of unemployment, lower wages than in Moscow and Saint Petersburg are objective imbalance factors, the subjective factors include irrational behavior of applicants.

According to classical theory, the rationality of an applicant's behavior is determined by the achievement of maximum utility of an education, considering future income and employment in the specialty (Gerard, 1956). R.M. Melnikov assessed the rationality of behavior from this point of view. He identified gender differences from the position of unemployment and income level. Thus, the probability of men's unemployment does not depend on the interaction variables of educational level and profile, in contrast to women, whose "probability of unemployment decreases with higher education in the medical field and in information and communication technology" (Melnikov, 2018). The author determined that in terms of future income for men the most effective academic path is to get an education in information and communication technology, for women – higher medical education.

Accordingly, the reverse situation, when applicants' choice of training program does not depend on the expected level of income and employment, and reflects the irrationality of applicants' behavior. Such irrationality is initially associated with the choice of education: university and specialty, as well as the USE subject for admission to a particular university for a particular specialty, so-called "bifurcation points" of the applicant's behavior, in which the choice and a certain phase transition occurs.

Considering the above, we analyzed the results of the survey at the following points: 1) the choice of the USE subject; 2) the choice of the university and then the specialty or first the specialty and then the university; 3) the final choice and applying for university admission.

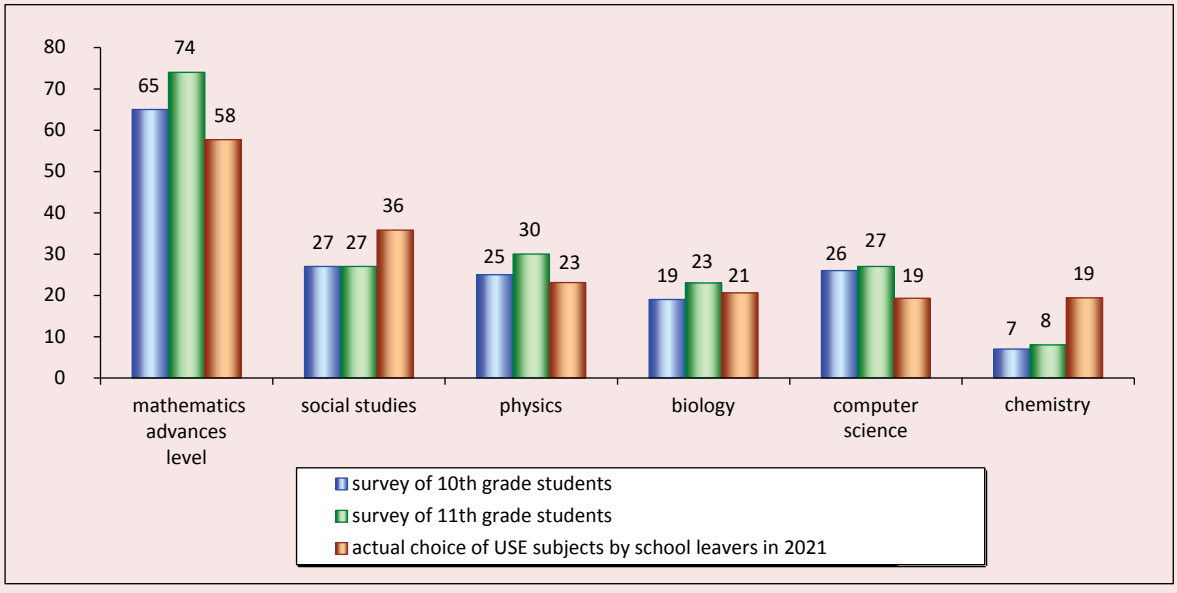
Choosing a subject to take the USE

In the Russian educational system, the academic path of an applicant begins with the choice of a subject for the Unified State Exam in order to enter a higher educational institution in the future. Examinations in such subjects as Russian language and mathematics are compulsory for all school leavers. Passing these examinations is necessary in order to receive a high school diploma. In order to be admitted to university, applicants must take some optional subjects. Accordingly, the questionnaire included questions concerning the choice of non-mandatory USE subjects. On average, the distribution of answers to the question "What USE subjects are you planning to take?" is as follows: mathematics (advances level) – 69% of respondents, physics – 28, social studies – 27, computer science – 25, biology – 21, chemistry – 8%.

In order to determine the difference in the choice of the USE subject depending on the "remoteness" of the deadline for passing the subject, we divided the answers of students of the 11th and 10th grades *(Fig. 1)*. At the moment the results of the USE for 2021 are already known, so they are also presented in Figure 1.

Comparison of the survey results with real data on passing the USE confirmed the first point of irrationality in the academic path of applicants. Thus, 74% of surveyed students of the 11th grades planned to take the Unified State Exam in mathematics (advanced level), in fact in 2021 this subject was chosen by only 58% of students, 30% – physics, in fact it was taken by only 23%, 27% – computer science, in reality – 19%. On the other hand, the proportion of students who eventually chose chemistry more than doubled, from 8% to 19%. Also, students changed their choice with respect to humanities subjects: the proportion of students who actually took social studies increased to 36%, compared to the planned 27%.

Figure 1. Planned and real choice of subjects for the USE by students in the Republic of Bashkortostan, %



Source: Ministry of Education and Science of the Republic of Bashkortostan: Official website. Available at: https://education.bashkortostan.ru/; survey results.

At the same time, the deviation from reality with respect to six subjects is smaller in 10th grades (6.5% vs. 8.8% for 11th grades). Perhaps students who have a longer time lag before actually choosing a subject are more rational in assessing their abilities in contrast to 11th graders, who are influenced by the external institutional and psychological environment in their final year.

It is quite possible that 11th graders initially choose the subjects needed to enter more prestigious universities for more in-demand professions. For example, when taking the USE in physics and computer science (taking into account the mandatory USE in Russian language and mathematics (basic level)), the applicant can choose from almost 80 different areas[1]. If they take "humanities" subjects (social studies and history), the range of choices is narrowed to 20–30 areas. The choice of physics and mathematics subjects increases the chances of getting a state-funded place: according to a number of studies, a combination of subjects "mathematics + Russian + physics" is allocated 43.14% of state-funded places[2], the combination of "mathematics + Russian + computer science" – 12.11%, while the combination "mathematics + Russian + social studies" – only 8.33%, "mathematics + Russian + history" – 7.14%.

But by the time the real deadline approaches, applicants do not think about the vector of their academic path and are guided by short-term goals – to successfully pass the USE, hence choosing an "easier" subject according to their subjective perception.

It is interesting to consider the territorial distribution of USE subject choice. When analyzing the data by territory, the following regularities can be identified: applicants more often choose to take mathematics (advanced level) and computer science in the capital, in rural areas these subjects are less popular. The ratio "mathematics (advanced level) : computer science : physics : social studies" for the capital of the region is "74% : 31% : 28% : 28%", for the other seven urban districts of the republic – "69% : 25% : 32% : 25%", for the 54 municipal districts – "66% : 21% : 26% : 27%".

In general, the first factor in the irrationality of the applicant's behavior is the desire to take an "easier" subject. We can agree with the opinion that "one of the reasons of disproportions toward the humanities in universities can be considered the higher difficulty of passing the USE in mathematics, physics and other non-humanities subjects" (Baldanov, Dondokova, 2015), and "difficulty" is determined by subjective perception and the psychological environment in which the school student is studying.

Choosing an educational institution

The analysis of students' answers about the choice of university characterizes the growing problem associated with the threat of the loss of human capital in the Republic of Bashkortostan. Almost half of the surveyed students (42.9%) are planning to enter universities in other regions, 40.4% – universities of the Republic of Bashkortostan, 10% – vocational education institutions and technical colleges, 6.5% – plan to work. And the problem has a pronounced territorial character: 70% of applicants from Ufa want to enter universities in other regions, from other urban districts and municipal districts – 52% and 55% respectively. Thus, 55.2% of those who graduated with a gold medal and 44.7% with a silver medal are planning to leave.

[1] Graduates chose social studies, history, physics, and literature as their USEs. *Rossiyskaya Gazeta – Nedelya*, 22(7485). Available at: https://rg.ru/2018/02/01/vypuskniki-predpochli-sdavat-ege-po-gumnitarnym-predmetam.html

[2] Where it is easiest to get a state-funded place and the best set of USEs. Available at: https://tabiturient.ru/article/1/

The choice of university in terms of its location and, as a consequence, the threat of the loss of human capital of the region is not the focus of our study, so next we will consider the choice of specialty.

Choice of a training program

The results of the choice of specialty according to the survey are presented in *Table 1.*

As we can see, the leading engineering specialties, which in the questionnaire for students were listed as architecture, computer science and computer engineering, electronics, photonics, nuclear energy and technology, weapons and weapon systems, aviation and rocket and space technology, nanotechnology and nanomaterials. This is a large enough range of professions of a very different nature, which determined their leadership. Moreover, while 10th graders have not yet fully determined their choice (their three leading specialties range from 20.3% to 26.1%), eleventh graders have a clear preference for engineering specialties (29%).

The vast majority of 11th grade students in Ufa (36.4%) choose engineering specialties (the gap with the specialties of the "social sciences" direction is 15.9 p.p.). A similar situation occurred in other urban districts – slightly less than a third of students (the gap with "social sciences" is 15.2 p.p.). In rural areas the proportion of students planning to enter engineering specialties is 22.8% (the gap with "social sciences" is only 1.2 percentage points).

When choosing a specialty, respondents pay attention to the following factors: 72% of 10th–11th graders – wage level, 64% – prestige, 36% – novelty of specialty, 31% – difficulty of education, 30% – opinion of parents (relatives).

Table 1. Results of the student survey on the choice of education specialty, 2021, %

	Hum	Med	Eng	Art	Nat	Soc	Ped	Agr
Choice of specialty by 10th and 11th graders								
Choice of specialty by 10th graders (N = 1843)	10.0	14.2	26.1	4.8	20.3	21.0	2.6	0.9
Choice of specialty by 11th graders (N = 1785)	9.3	14.3	29.0	4.2	18.0	20.6	3.1	1.5
Choice of specialty by 11th graders, depending on place of residence								
Students of Ufa (N = 635)	7.7	10.4	36.4	3.6	17.2	20.5	2.8	1.4
Students from other seven city districts (N = 242)	8.7	13.6	32.6	3.7	19.8	17.4	2.9	1.2
Students from 54 municipal districts (N = 908)	10.6	17.3	22.8	4.7	18.1	21.6	3.3	1.7
Choice of specialty by students of the 10th and 11th grades, planning to study in the Republic of Bashkortostan								
Choice of specialty by 10th graders (N = 788), %	7.2	14.6	26.9	3.0	24.0	19.3	3.3	1.6
Choice of specialty by 11th graders (N = 940), %	7.7	13.2	34.5	2.2	18.5	17.3	5.6	1.0
Choice of specialty by students of the 10th and 11th grades, depending on family income								
Lower than average income (there is not enough money even to buy food; there is only enough money to buy food); (N = 70)	5.7	14.3	22.9	7.1	27.1	20.0	2.9	0.0
Average income (there is enough money to buy necessary food and clothes, larger purchases have to be postponed); (N = 593)	8.6	12.8	29.5	2.9	20.4	19.4	4.9	1.5
High income (there is enough money to buy durable goods and not deny oneself anything); (N = 646)	7.6	14.1	32.8	2.2	19.3	18.4	4.6	0.9

Hum – humanities (linguistics and literary studies, history and archaeology, philosophy, ethics and religious studies, physical education and sports); Med – health and medical sciences; Eng – engineering, technology and technical sciences (architecture, informatics and computer engineering, electronics, photonics, nuclear energy and technology, weapons and weapon systems, etc.); Art – Arts and Culture; Nat – Mathematics and Natural Sciences (mathematics and mechanics, physics and astronomy, chemistry, biology); Soc – Social sciences (psychological sciences, economics and management, law, sociology and social work, political sciences and regional studies, mass media, etc.); Ped – education and pedagogical sciences; Agr – agriculture and agricultural sciences.
Source: own compilation according to the conducted survey.

Students were also asked about career choice factors *(Fig. 2)*.

In general, the three key factors in choosing an occupation include salary, career opportunities, and job content.

Admission to a specialty in a higher education institution

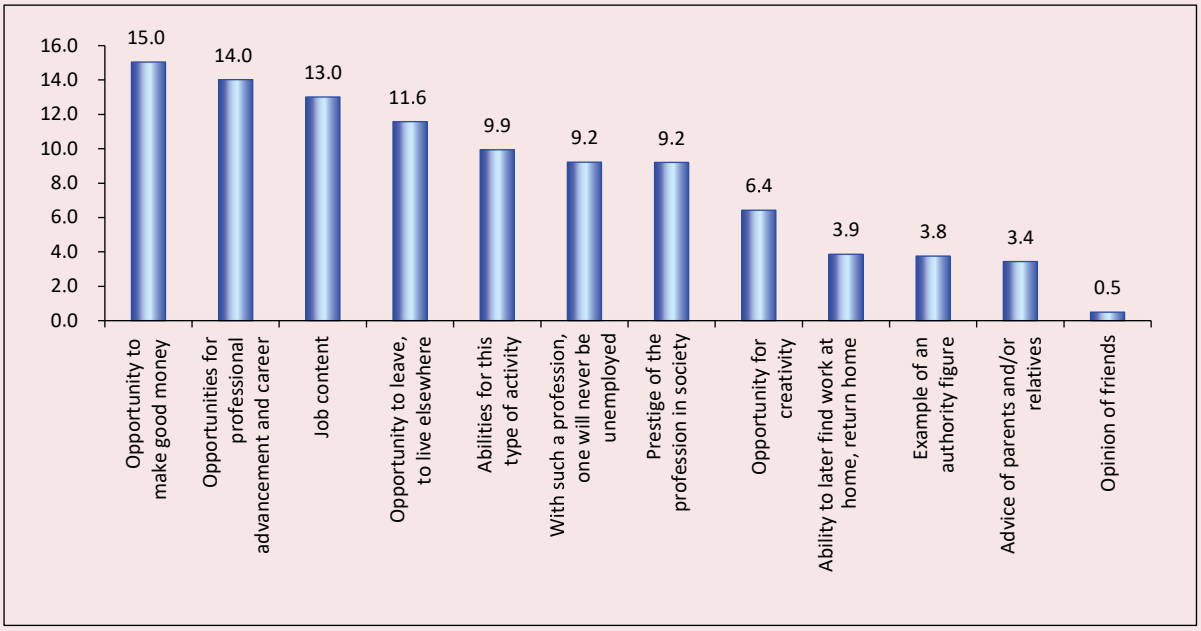
At this stage we can identify the last point of irrationality in the behavior of applicants: the application and enrollment in specialties not related to the choice of the USE subject and the initial desire.

The difference between the desire of school students to get a certain profession and reality can be determined by comparing the choice of specialties by students of 11th grades, who have decided to stay in the republic and enter the regional universities, according to the survey and the actual distribution of admission by training programs (considered admission for 2020, as data for 2021 are still being processed by the Ministry of Education and Science of the Republic of Bashkortostan).

The traditional public perception is that students choose "economics and law" rather than technical specialties. At first glance, the situation is reversed: the proportion of those who chose engineering specialties and actually enrolled is more than twice as high as the proportion for social specialties, for which expectations and reality virtually coincide. However, one must take into account the fact that the "engineering, technology and technical sciences" area includes 19 training programs, while the "social sciences" area includes only 7 training programs.

On average, students' expectations for the engineering specialties (enlarged direction "engineering, technology and technical science") are met, while for the social ones they are not. For example, when choosing engineering specialties, the level of salary is important for almost all respondents, and this expectation for this field is higher than

Figure 2. Factors influencing the choice of profession, according to respondents, %



Source: own compilation.

for all others. And it is reasonable, as the average salary for the employees of these specialties in the region is the maximum. At the same time, for those wishing to enter the enlarged field of "social sciences" (psychological sciences, economics and management, law, sociology, political sciences, etc.) the wage factor is also important (3rd place among all enlarged fields), but in fact the employees in this field receive wages 10% lower than the average for all eight presented fields *(Tab. 2)*.

The desire to enter the social sciences specialties is largely due to their "prestige" and "popularity", which is confirmed at the moment – of the top 30 most ranked specialties 18 are in economics and law. At the same time, the future prestige of most professions is questionable and was not assessed in this study.

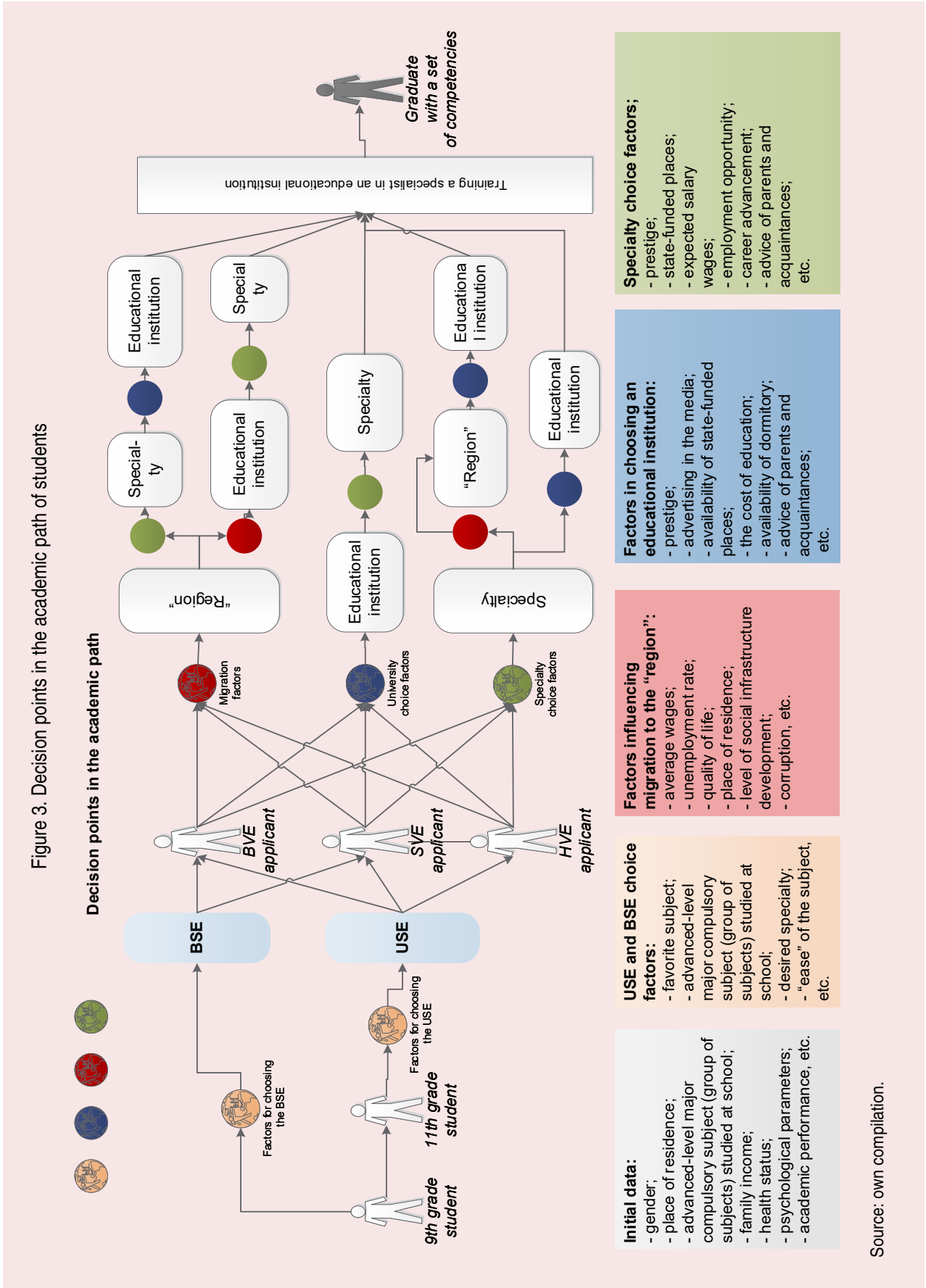
A significant number of students who want to study mathematics and the natural sciences (mathematics and mechanics, physics and astronomy, chemistry, biology) are changing their mind. This is partly due to the fact that students choose exactly those USE subjects that are necessary for admission to specialties in these areas: mathematics (advanced level) was planned to be passed by 74% of the surveyed 11th graders of the Republic of Bashkortostan, in fact 58% passed; physics – 30%, only 23% passed; computer science – 27%, in fact 19% passed.

Changes in choice are characteristic of "education and pedagogical sciences" (a change in the behavior of applicants led to an increase in the proportion of choice and actual admission by half), "agricultural sciences" (an increase of three times), "humanities" (an increase of two times). In the first two cases, the change in choice can be explained by the number of state-funded places allocated to these areas (1st and 2nd place among all the enlarged areas in the Republic of Bashkortostan).

Table 2. Results of a survey of students on the choice of education specialty, 2021

Enlarged training area	Choice[1], %	Actual enrollment[2], %	Factor influencing the choice of specialty					
			Wage level		State-funded places		Popularity / prestige	
			Expect[3], %	Act[4], rub	Expect[5], %	Act[6], units	Expect[7], %	Act[8], units
Nat	18.5	5.1 (6)	75.0	34,759	83.5	146	62.5	1
Eng	34.5	38.1 (19)	82.4	38,986	89.8	221	66.6	7
Med	13.2	8.5 (3)	65.7	29,597	92.0	235	69.1	2
Agr	1.0	3.2 (2)	61.8	23,366	89.3	253	38.2	0
Soc	17.3	17.3 (7)	73.7	29,170	83.4	70	63.5	18
Ped	5.6	11.5 (12)	48.4	28,386	92.4	1,596	59.0	1
Hum	7.7	15.2 (15)	59.4	29,110	85.8	41	56.1	1
Art	2.2	1.0 (1)	55.6	26,044	76.5	32	47.5	1

[1] The choice of specialties by 11th graders planning to study in the Republic of Bashkortostan. (N = 940).
[2] Actual admission to full-time, part-time, extramural bachelor's and specialist programs in the Republic of Bashkortostan, 2020.
[3] Students' expectations were defined as the sum of the proportions of "strongly" and "very strongly" responses for the factor "the expected level of wages" for graduates of a given specialty when choosing each specialty.
[4] The actual values were determined as the average salaries in the region by training programs, obtained with the help of the match matrix "VED-Training programs", compiled by the authors.
[5] The expectations of students were defined as the sum of the proportions of responses "important" and "very important" for the factor "anticipated number of state-funded places" when choosing each of the specialties.
[6] The actual values were defined as state-funded places per training program in the Republic of Bashkortostan in 2020.
[7] The expectations of students were defined as the sum of the proportions of responses "important" and "very important" for the factor "anticipated number of state-funded places" when choosing each of the specialties.
[8] The actual values were determined by the number of specialties from the top 30 ranking specialties of universities in Russia in 2020. Available at: https://moeobrazovanie.ru/specialities_rating_vuz/.
Source: the results of the survey and official statistics.



Source: own compilation.

In lieu of a conclusion

The widespread digitalization, the rapidly changing labor market and the long-term demand for a whole layer of specialties, the COVID-19 pandemic, which has affected the quality of education and uncovered many problems – these and other factors are once again drawing attention to the training system. The behavior of applicants is also changing: the increase in the amount of available information about the quality of education in Russian universities and career prospects, the availability of Internet resources that provide recommendations for admission based on the personal preferences of the applicant, the opportunity to get an education at any university in the world without leaving home, combined with the demographic decline determine new factors of the struggle of universities/cities/regions for the future human capital.

As a result of the study we have revealed three irrational points in the academic paths of applicants in the Republic of Bashkortostan: 1) choosing "easy" humanities and economic specialties as the USE subject, not allowing to enter the desired in-demand specialty; 2) desire to enter "promising specialty" not related to the chosen USE subject; 3) application and admission to specialties not related to the chosen USE subject and the initial desire.

The conclusions from the survey of students in the Republic of Bashkortostan are typical of most regions that have their own educational potential, which is not attractive to local applicants. Formally, they confirm the hypotheses that by the end of schooling students change their choice from the subjects that they need to enter their desired specialty to the "easier" ones. Accordingly, the range of specialties for which they can enter is narrowed and applicants enter where they are able to enter (availability of state-funded places, low cost of education, etc.). Considering that the very set of current specialties in most universities (especially in the regions) is rapidly becoming obsolete and there is already a demand in the market for specialists who are not trained in universities. This, obviously, will affect the strengthening of the disproportion between the labor market and educational services.

In general, in conducting further research on the behavior of applicants, it is advisable to pay attention to two aspects.

1. Modeling and forecasting the behavior of applicants.

In methodological terms, the socio-economic and educational causes of irrationality in the behavior of applicants choosing an academic path *(Fig. 3)* can be assessed on the basis of *simulation modeling*.

The most preferred tool for scenario experiments to predict the choice of specialty and the level of educational migration is *agent-based modeling*. It is based on the formation of agent groups interacting with each other and with the external environment, possessing the properties of autonomy, heterogeneity, limited intelligence and location in space (Makarov et al., 2020). This type of modeling is based on the simulation of the development of socio-economic and educational systems, in which their overall dynamics are determined by the interaction of a set of private agents (applicants) (Makarov et al., 2016). The implementation of a comprehensive agent-based model of the regional educational system will allow computational experiments to assess the impact of various mechanisms of state influence on the agents' (applicants') behavior in order to reduce the imbalance between the labor markets and educational services (Gainanov et al., 2020).

2. Guidance counseling.

Part of the professional-qualification imbalance in the labor markets and educational services of the region is formed as a result of the guidance counseling carried out by the authorities. In the Republic of Bashkortostan, as well as in other constituent entities of the Russian Federation, quite a lot of guidance counseling is currently carried out. In the region it is practiced to create specialized classes of universities on the basis of schools (M.S. Pinsky Engineering Lyceum 83 at USPTU; pre-university schools, 5 basic schools of RAS, USPTU Youth Technopark, etc.) (Khusainova, Konnova, 2019). Nationwide guidance counseling events are held.

Schools implement activities dedicated to self-determination of students: quizzes, tests, various thematic games. In the current survey, students of the Republic of Bashkortostan were asked what guidance counseling activities are carried out at school. Among those surveyed 64.4% noted conversations about the professions, 38.4% attended open house at various educational institutions, 28.1% – activities related to meeting with representatives of various professions, 24.4% – days of guidance counseling for young people, 21.8% – independently studied information materials of educational institutions, 18.3% – took a tour of the city's enterprises, 13.6% – named parties, competitions, quizzes. Only 5% of respondents said that such activities do not take place in their school.

However, students actually learn about universities and specialties from social media (39.0% according to the survey), television commercials (30.0%), from university employees who come to school (22%), and only 8% through tours during open house days.

It is necessary to take into account the characteristics of today's "digital" youth (Generation Z), so new directions of guidance counseling should be associated with the creation of "trend content" in social networks and the media, the launch of social videos aimed at raising the prestige of professions and professions in demand in the regions. Also, of particular interest to today's applicants are practice-oriented and interactive methods of guidance counseling: plans to visit companies in the city, virtual tours of universities, physical and virtual sites for guidance counseling, Internet resources for guidance counseling. All of the above activities should be regular and systematic.

Thus, the irrationality of the applicant's behavior in a difficult situation of multi-parameter choice of training program and higher education institution is one of the causes of imbalance in the labor market and educational services in the region. At the same time, monitoring the labor market and forecasting staffing needs are general economic tasks, which obviously cannot and should not be solved only by the efforts of schools or universities, it is a region-wide problem of human capital formation. The task of regional state authorities is to minimize the professional-qualification imbalance, not only for the current moment, but also for the long term.

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Satisfaction with the Work-Life Balance: Working Women's View (Regional Aspect)

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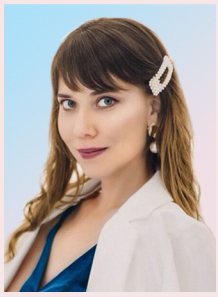

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Abstract. One of the employee's objective needs is an appropriate balance between work and private life. The article presents a comparative study of satisfaction with the work-life balance among working women with and without children. Based on the materials of a questionnaire survey of the Vologda Oblast working-age population, conducted in 2018, we investigate the features of perception of the following aspects of work and family life: satisfaction with the ability to combine work and family responsibilities, the impact of work on various aspects of daily life, the ability to organize recreation, the presence of problems related to one's close environment, qualitative characteristics of work. We have revealed that working women with and without children have predominant positive or neutral impact of work on daily life, and there are no significant differences in the number of working days per month and the actual length of the working day. We have found that women without children often perform extra work, are less able to organize their

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leisure time, and are harsher in relation to their close environment. However, there are no significant differences in satisfaction with the work-life balance among women with and without children. The paper determines that working women (regardless of parental status) who satisfactorily assess the ability to combine work and family responsibilities are characterized by better indicators of labor activity (fewer delays and disruptions in work, less failure to fulfill plans, etc.), a higher level of realization of physical, personal and professional abilities in work. The similarity of the subjective perception of the work-life balance among working women with and without children may indicate women's high adaptability to multitasking and time allocation. We highlight the importance of improving the policy on family and employment, in particular in terms of developing flexible employment formats.

Key words: woman, work-life balance, subjective assessment, sociological survey, satisfaction, working day, leisure, labor potential.

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Introduction

Despite technological and social changes (employment intensification, spread of flexible forms of employment, digitalization of life, empowerment of women's rights and possibilities, etc.), a departure from the unambiguous distribution of roles between a man as a "breadwinner and earner" and a woman as a "home keeper", in the public consciousness and scientific discussion, the problem of combining a woman's work and family responsibilities does not lose relevance. "The gender contract of the "working mother" is still dominant, which implies that women combine permanent employment with family and household responsibilities" (Antoshchuk, Gewinne, 2020; Tiomkina, Rotkirch, 2002, p. 8). According to Russians, a man under 30 should get an education (65%), get married (56%), make a career (52%) and have children (40%), while a woman should get married (77%), have children (75%), get an education (60%), learn to cook (52%), and only 19% believe that she should make a career. Along with this, the predominant share of respondents notes that at the birth of a child, a woman should devote herself to the upbringing (up to 3 years – 44%, before school – 20%) and only after that return to work[1]. Gender is manifested in the division of household responsibilities: a woman is more engaged in household chores (50% of respondents believe so; 62% is among women and 35% among men), in children upbringing (47%; 54% is among women and 38% among men), while the family's financial support falls on the shoulders of men (53%)[2].

These stereotypes manifest themselves in "gender segregation of labor, in which men work in more paid and prestigious economic sectors

[1] Levada Center survey*. It was conducted on August 7–10, 2015 on a representative All-Russian sample of urban and rural population among 800 people of 18 years old. The statistical error does not exceed 4.1%. See: 30-year milestone: gender roles and stereotypes. *DemoskopWeek*ly, 2015. Available at: http://www.demoscope.ru/weekly/2015/0653/opros03.php (accessed: June 22, 2021).

* It is entered in the register of foreign agents.

[2] VCIOM-Sputnik survey. It was conducted on March 10, 2019. The survey method is a telephone interview based on a stratified two-base random sample of landline and mobile numbers of 1,600 respondents aged 18 and over. The sampling error does not exceed 2.5%. See: Gender equality in Russia: Myth or reality? *DemoskopWeekly*, 2019. Available at: http://www.demoscope.ru/weekly/2019/0811/opros01.php (accessed: June 22, 2021).

than women" (Lytkina, 2004, p. 86). According to the ILO, "globally, women's work is paid about 20% less than men's work, even when they do the same job"[3].

Despite the existing views, women are currently very active in the field of economics. So, in Russia in 2017, female employment rate was 60% (against 71.5% for men), including women aged 20–49 with children under 18 years old – 77.9%, women with children under 3 years old – 48.9%[4], which indicates a noticeable involvement in labor relations of women with children. But due to the presence of a dependent burden of children, and the responsibilities of motherhood, women have to face the task of optimizing the combination of professional employment and family responsibilities. In Russia, as well as all over the world, the problem of finding the work-life balance is called one of the main problems faced by women working in paid jobs[5]. This problem is mentioned significantly more often (35%) than "low salaries" (22%), "difficulties in promotion" (19%) and "lower earnings than male colleagues" (19%) (Kochergina, 2017, p. 185). Unsatisfactory distribution of time between work and private life, suboptimal combination of professional development and family responsibilities can have serious consequences for women (tension, stress, deterioration of health, decreased work efficiency, etc.), which can lead to conflicts in the family, problems at work, and decrease in life satisfaction in general.

A review of scientific journalism shows that many researchers consider the problems of the work-life balance by either through the study of families with two working adults, or through the comparison of women without children and mothers. At the same time, the conclusions quite clearly indicate that "the search for the work-life balance is considered as a female problem" (Chernova, 2012, p. 296) and often leads to negative effects: "combination of employment and parenting turns out to be a very difficult and painful period of women's working life" (Nekrasova, 2013, p. 82), "women with children have lower productivity on average and prefer employment in jobs requiring less responsibility and intensity of work" (Arzhenovskii, Artamonova, 2007, p. 67), "other things being equal, family responsibilities make women a less competitive workforce, as a result of which women are forced to choose between children and work, or put up with the need to combine household responsibilities and work"[6].

In our opinion, in modern conditions, prolonged systemic discrimination of women with children in work is largely leveled, and, moreover, women (with and without children) have a high adaptability of behavior in the labor market. At the same time, for every working woman, the optimal ratio between professional and private life is purely individual. Therefore, we pay attention to the analysis of the subjective perception by working women of the work-life balance including in the presence/absence of a dependent load of children. In accordance with this, the purpose of the article is a comparative study of satisfaction with the work-life balance among working women with children (i.e. mothers) and without children, which will allow assessing the employment opportunities and limitations of women with different daily workloads and life priorities.

[3] Women Workers' Initiative: An impetus for equality. ILO. Geneva, 2018. Available at: https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---relconf/documents/meetingdocument/wcms_630128.pdf (accessed: June 22, 2021).

[4] *Women and men of Russia. 2018: Stat. Coll. Rosstat.* Moscow, 2018. Pp. 106–107. The collection is published every 2 years.

[5] Towards a better future for women and work: Voices of women and men. Gallup, Inc.; The International Labour Organization (ILO). 2017. Available at: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_546256.pdf (accessed: June 22, 2021).

[6] Roshchin S. Are women equal to men? Part 2. *DemoskopWeekly*, 2005. Available at: http://www.demoscope.ru/weekly/2005/0221/tema01.php (accessed: June 22, 2021).

Research on the work-life balance: female aspect

The work–life balance construct[7] was introduced into scientific circulation in the 1970s when studying the problem of combining the career and private life of a woman who could successfully realize herself in professional activity, without forgetting about her marital and maternal responsibilities (Barnett, Baruch, 1985). In fact, this is an artificial category designed to help understand the relationship between work (paid employment) and other areas in a person's life. In the scientific literature, the work-life balance is most often considered either as the degree of satisfaction of an individual with a combination of work and non-work activities (Isupova, 2019; Greenhaus et al., 2003), or as the ratio of a person's work and non-work roles in terms of conflict (Mospan et al., 2016; Clark, 2000), or as an individual's ability to optimally allocate their own resources (time, knowledge and skills, material resources, etc.) in the spheres of life (i.e. from the point of view of control) (Koltsova, 2014; Voydanoff , 2005).

To assess the balance, we use options for direct subjective assessment by individuals of the ratio of work and private life, which is obtained during questionnaires or interviews. A number of studies apply one key question identifying subjective satisfaction with the work-life balance: "How satisfied are you with the ratio of the time you spend at work and the time you devote to other aspects of your life?" (Strebkov, Shevchuk, 2019), "Are you satisfied or not satisfied with the balance between your work or main activity and family life?" (Saltzstein et al., 2001); "Do you have enough time left after work to fulfill family and other social obligations?" (Antai et al., 2015). In other studies, the authors focus on an integrated approach and analyze several aspects of balance, often with an assessment of psychological attitudes. In particular, the three-component approach of J. Greenhouse et al. (time balance, spent on work and family life, psychological involvement in them and satisfaction from work and family life) (Greenhaus et al., 2003); subjective-structural approach of A.N. Mospan et al. (perception of the work-life relationship, self-assessment of the importance of spheres and the time and effort spent on them, satisfaction with the state of affairs in each sphere) (Mospan et al., 2016). In foreign practice, there are also studies of the "time-use survey", for example, the "OECD Family Database" compiled by the Organization for Economic Cooperation and Development, which records "working hours, time for rest and personal needs, travel time to work, satisfaction with time distribution"[8].

In the context of the chosen issues, studies of the distribution of family's responsibilities show that after a labor day, a working woman begins the so-called "second shift" in the form of household chores (parenting, cooking, cleaning, etc.). The phenomenon of women's "dual employment" or "double responsibility" is interpreted as a combination of paid work by women with the workload of home and child-rearing. Household responsibilities can be classified as manual, physical, monotonous labor, but the scientific literature does not provide optimal standards for its measurement (Gruzdeva, 1994). At the same time, as foreign studies show, working married couples who try to share household responsibilities equally are more satisfied with both family and professional life, and, in the end, with life in general[9].

[7] In the empirical part of the study, we use the translation of the English term "work-life balance" as "баланс труда и семьи". In our opinion, this formulation is more harmonious in the context of the study, as we consider the ratio of only family and professional (labor) spheres of life of working women (i.e. we do not take into account health, self-development, social life, etc.).

[8] The labour market position of families (LMF). *OECD*. Available at: http://www.oecd.org/social/family/database.htm (accessed: June 22, 2021).

[9] Groysberg B., Abrahams R. Manage Your Work, Manage Your Life. *Harvard Business Review*, 2014, no. 3. Available at: https://hbr.org/2014/03/manage-your-work-manage-your-life (accessed: August 06, 2021).

There are widely presented studies of balance among women engaged in both "feminized" activities (education, healthcare, etc.) (Rozhdestvenskaya, 2019; Kumari, Devi, 2015) and in traditionally male industries (Isupova, 2019; Podol'skaya, 2019). This problem is also considered in the context of family policy and social stereotypes (Chernova, 2012), from the perspective of the possibilities of the digital economy and the remote labor market (Baskakova, Soboleva, 2018).

A separate layer consists of works on studying strategies for combining female professional and family responsibilities (housewife, working mother, business woman, etc.). In particular, the research shows that the younger a woman is, the more often she chooses to combine career and parenting (Nekrasova, 2013), and strategies of full dedication to either career or motherhood are much less attractive (Savinskaya, 2013). We have found that, on average, Russian women spend about 30 hours per week on basic household chores, while men spend 13 hours (Evstifeeva, 2013). However, women, working on an equal footing with men, perceive housework and motherhood as a natural process and are ready to devote themselves to both professional and family life (Mikhailova, 2017). This conclusion is confirmed by a sociological study by T.M. Karakhanova and O.A. Bolshakova on the combination of work and family activities, according to which 56% of the women surveyed replied that "a woman should distribute her time equally, not to the detriment of either the first or the second" (Karakhanova, Bolshakova, 2018). At the same time, only 6% of respondents adhere to the opinion that a woman should have professional activity in the first place, and then – family, household, children" (Karakhanova, Bolshakova, 2018).

Summarizing the foregoing, we note that the problems of "dual employment", the search for work-life balance, the choice of a strategy for combining professional and family (including parental) responsibilities are widely covered in the scientific literature. For the most part, it is considered as a female problem, as a feature of women's gender strategy. At the same time, the issue of women's subjective well-being, their perception of their existing combination of work and family, primarily maternal, responsibilities, has been poorly studied.

Materials and methods

In this study, we consider the work-life balance as the degree of satisfaction of an individual with a combination of work and non-work responsibilities, as in the research (Isupova, 2019; Greenhaus et al., 2003). The assessment of the degree of satisfaction with the balance is carried out within the framework of a subjective approach (as, for example, in (Strebkov, Shevchuk, 2019; Antai et al., 2015; Wepfer et al., 2015)) by determining the subjective attitude of working women to the following aspects of work and family life:

1) satisfaction with the ability to combine work and family responsibilities is a summary characteristic of the work-life balance, typical of the subjective perception of balance between these areas. The question "Are you personally satisfied with the opportunity to combine work and family responsibilities?" is used. The answers "satisfied" and "rather satisfied" correspond to satisfaction, the answers "unsatisfied" and "rather unsatisfied" correspond to dissatisfaction, the answer "Hesitate to respond" corresponds to a neutral position;

2) the degree of influence of work on various aspects of daily life is assessed by the question "How does work affect [family; leisure, hobbies, interests; maintaining health, communicating with friends and relatives, spending holidays]?". The answers "positively" and "rather positively" are interpreted as "positive influence", the answers "negatively" and "rather negatively" are interpreted as "negative influence", the answer "does not affect" corresponds to a neutral position, the answer "Hesitate to respond" indicates the respondent's uncertainty;

3) the ability to organize leisure characterizes an integral aspect of daily life (leisure) and is evaluated by the question "To what extent do you have the "ability to organize your leisure, rest"?". The respond options "in full", "sufficiently" are described as a good skill; the answers "generally sufficient", "little, insufficient" are described as a bad skill;

4) psychological markers of the work-life balance in the form of the presence/absence of issues with inner circle are assessed by the question "Have you ever felt guilty because of [insufficient attention to parents (mother, father); poor attitude to children (your own or others')]?".

Additionally, we will analyze the features of labor activity among working women with varying satisfaction degrees with the work-life balance. To achieve this goal, we will consider the following indicators:

1) indicators of labor activity – considering them in the context of satisfaction with the ability to combine work and family responsibilities will allow tracing the balance impact on labor activity. They are evaluated by the question "Which of the following characterizes your work activity?" (non-compliance with production standards, delays, disruptions in work, rationalization proposals);

2) labor potential and its realization rate. We use the analysis of two-dimensional distributions between satisfaction level with the ability to combine work and family responsibilities and labor potential quality index, indices of realization rate of the qualitative characteristics of labor potential. The indices are calculated according to the methodology, used at the Vologda Research Center of RAS (Wepfer et al., 2015; Leonidova et al., 2018). According to it, the structure of labor potential quality is a multi-level system, based on eight basic components: physical and mental health, cognitive and creative potentials, communication, cultural and moral standards, and achievement need. They form structural elements of a higher level, and at the top of the "tree" there is an integral indicator – social capacity which characterizes the general state of labor potential quality. The indicated elements are calculated based on the respondents' subjective assessment of the development degree of a particular qualitative characteristic, each of which corresponds to its own set of questions in the questionnaire, and are expressed as an index (the upper limit is 1, and the lower one is in the range from 0.200 to 0.333). In turn, realization rate of labor potential quality is determined by mathematical processing of sociological data, obtained when respondents answered the question about the intensity of the use of accumulated opportunities during the performance of labor duties (Leonidova et al., 2018).

The information base of the study is a sociological survey of the working-age population "Labor potential quality", conducted in 2018 in the Vologda Oblast by the Vologda Research Center of RAS. The sample size is 1,500 people. The survey was conducted in Vologda and Cherepovets, in urban and rural areas of Babaevsky, Velikoustyugsky, Vozhegodsky, Gryazovetsky, Kirillovsky, Nikolsky, Tarnogsky, Sheksninsky districts. The sampling method is zoning with proportional placement of observation units. The sample type is quota by gender and age. The method of collecting empirical data is individual handout questionnaire. The sampling error is no more than 3%. Data processing was carried out in the SPSS Statistics program.

The methodological feature of the analysis was the exclusion from the number of male respondents and those who answered the question about employment "I do not work (including on parental leave, etc.)". Thus, the subsample for analysis included only women working at the time of the survey who have children, i.e. mothers, and women without children (a total of 535 people).

The socio-demographic profile of working women with and without children is similar *(Tab. 1)*. Among mothers, 44% have one child, 45% have 2

Table 1. Sample characteristics

Characteristic	Women		Women without children				Women with children			
	without children	with children	16–25 y.o.	26–35 y.o.	36–45 y.o.	46 years and older	16–25 y.o.	26–35 y.o.	36–45 y.o.	46 years and older
Interviewed working women, people	111	424	31	39	11	30	11	146	149	118
Category share, %	21	79	28	35	10	27	3	34	35	28

Note. Children's age was not specified in the questionnaire.
According to: Data from the sociological survey of the employed population of the Vologda Oblast, VoIRC RAS, 2018.

children, 9% have 3 children, and the remaining 2% of mothers have 4–5 children. Most of the mothers are married (67%), the rest are either single (26%) or live together outside of an official marriage (7%). Among working women without children, the majority are single (56%), the rest are either married (27%) or live in domestic partnership (17%). Among women without children, the proportion of those who indicated incomplete higher education is higher (12% vs 1% among mothers), i.e. these are working students. Women are mostly mid-level specialists (39% of women without children and 38% of mothers). They are less likely to be employed as highly qualified specialists, and there are more of them among mothers (16% and 23%, respectively). Managers of various levels are 13% of women without children and 14% of mothers. Women with children work mainly in state and municipal enterprises (40% compared to 25% among women without children), perhaps because the public sector is a more stable place of work with better compliance with social guarantees. Women without children are more likely to indicate an individual or private enterprise as a place of work (27% vs. 22% among mothers).

The majority of women (57% of women without children and 56% of mothers) have sufficient material resources to buy the necessary products and clothing, but larger purchases are difficult. About a third of women are in distress: they either have money only for food (24% of women without children and 34% of mothers), or they do not have enough money even for food products and have to get into debt (7% of women without children and 2% of mothers).

Results and discussion

Satisfaction with the ability to combine work and family responsibilities. For women without children, the actual duration of a normal working day is 8.6 hours, for women with children it is 8.3 hours; the average number of working days per month for the former is 19.4 days, for the latter – 19 days (*Tab. 2*). As we can see, the differences are insignificant, although "mothers of children under 14 years old can work part-time at will"[10].

Women with no children are more likely to perform additional work (17% vs. 12.5% among women with children), the duration of which is about 2 hours a week, which is slightly more than that of mothers. Both female groups take home work (*Tab. 2*). The main reason is the profession features, which is more typical for women without children (60% vs. 46% of mothers). Women with children are more likely to note interest in work (21% compared to 10% of women without children), improper personal time planning (12%) and poorly planned work processes (5%; women without children did not specify these reasons).

The summary characteristic of the work-life balance – satisfaction with the ability to combine work and family responsibilities – is on average the same in the groups of women under consideration (51% among women without children, 48% among

[10] Female labor activity: rights, guarantees, benefits. Garant. Available at: http://base.garant.ru/57236617/#friends (accessed: June 22, 2021).

Table 2. Duration of work and satisfaction with the ability to combine work and family responsibilities, % of the number of respondents

Indicators	Women without children	Women with children
*Duration of work**		
Actual duration of normal working day (average value), hours	8.61	8.32
Average number of working days per month, days	19.39	18.97
*Extra work **		
Have extra work	17.1	12.5
Average value, hours	1.94	0.95
*Work at home****		
Yes, I have to take work home	18.0	15.6
Satisfaction with the ability to combine work and family responsibilities		
Satisfied + rather satisfied	50.5	47.6
Hesitate to respond	34.2	34.4
Unsatisfied + rather unsatisfied	15.3	17.9
For reference: Chi-square criterion (parental status) * satisfaction with the ability to combine work and family responsibilities)	0.489****	

* The question is "How much time do you spend on your main job?"
** The question is "How many hours on average do you spend on extra work?"
*** The question is "Do you have to take work home?"
**** The Chi-square criterion value close to zero (0.489), with a significance level of 0.783 and 0% of cases with an expected frequency of less than 5, indicates the absence of a relationship between the variables under consideration.
According to: Data from the sociological survey of the employed population of the Vologda Oblast, VoIRC RAS, 2018.

mothers; *Tab. 2*). Mothers aged 26–35 (45%) and 36–45 (53%) are more likely to be satisfied, compared with women in the same age groups with no children (39 and 36%, respectively). Probably, mothers choose jobs with a more optimal schedule, which allows better combining different spheres of life. Women aged 46 and older (63%) who have no children are more satisfied with the work-family balance than the rest, who, most likely, have already realized themselves in the profession and managed to establish a harmonious private life. The greatest dissatisfaction with the combination of work and family responsibilities is demonstrated by women of 36–45 years old who do not have children (36%), which may be due to the psychological characteristics of middle age, the conflict between the achievements of working life and the typical way of life of a woman (marriage, family, parenting).

An interesting pattern can be traced when considering this indicator from the perspective of overall life satisfaction. For instance, among women with no children who are dissatisfied with life in general, compared with mothers of this group, there are noticeably fewer of those who are unsatisfied with the possibility of combining work and family – 64% vs 75%. The revealed feature may indicate both the concealment by mothers of their negative attitude to the need to combine work and family responsibilities, and the possible lack of awareness of the presence of such dissatisfaction.

The degree of influence of work on various aspects of daily life. Women tend to evaluate the work impact in a positive or neutral way. To a greater extent, they say that there is no influence of work on communication with friends and relatives (46% of women without children and 44% of mothers think so), vacation (42% and 45%), leisure and hobby organization (41% and 46%), private and family relationships (40% and 43%). Also, according to the listed aspects of daily life, the proportion of women indicating a positive impact of work is higher than the proportion of those noting a negative impact (regardless of parental status).

The perception of the impact of work on maintaining health is less clear. Equal proportions of the surveyed women (without children and with children) give positive ratings (28% and 30%) or hesitate to respond (10% each). Women with children are more confident in the absence of the impact of their work on health (39%) and less likely to indicate a negative impact (21%). Women without children are not so specific in their perception: 32% note the lack of influence, 30% has negative influence. At the same time, the largest proportion indicating a negative effect of work on health is observed in women of the middle age (36–45 years) without children (55%), as compared to mothers of the same age (19%), and with other female groups. The observed patterns show that women with children either pay sufficient attention to their health, or because of dual employment (work and family) they have "no time to be sick" and no time to assess their health in a balanced way.

The ability to organize leisure and rest is more pronounced in women with children (68%, of which 44% have this ability to a sufficient extent, for 24% – in full) than in women without children (59%, of which 36% – sufficiently, for 23% – in full). Moreover, for the latter, poor development of this skill reduces satisfaction with the ability to combine work and family responsibilities: among women without children who are dissatisfied with this combination, most (53%) characterize their ability to organize a vacation as bad and a smaller part as good (47%). At the same time, for women with children, sufficient development of the considered skill does not provide a proportionate increase in satisfaction with the work-family balance: for the majority (57%) of mothers dissatisfied with the balance, good leisure management skills are characteristic, for a smaller part (43%) – poor. In other words, for women with children, a harmonious perception of the balance of work and family is determined by a combination of successfully implemented skills and roles in daily life.

Psychological balance markers. Guilt and remorse due to insufficient attention to their own parents are more often experienced by women without children (60% vs 39% of women with children), due to a bad attitude toward children (their own or others') – equally both groups (35% each), while mothers worry much more (27% vs 18% of women without children). Subjective perception of the possibility of combining work and family responsibilities affects the circle of close communication of working women. Women who are satisfied with the work-family ratio do not allow situations of insufficient attention to parents, and there are more of them among mothers (64% compared to 52% among women without children), as well as situations of bad attitude toward their own or other people's children (75% of mothers and 82% of women without children). We can assume that for mothers, the values of family and positive relationships between people are expected to be higher.

Labor activity characteristics of women without children and with children are very similar, although there are some differences. In particular, women without children are less likely to fail to fulfill work plans (39% vs 44% in the other group), and mothers are more disciplined and do not allow lateness, absenteeism or leaving work ahead of time (71% vs 65% of women without children). The majority of women in both study groups are engaged in submitting innovation proposals (69% of women without children, 67% of mothers). Women with children offer similar improvements often (21% compared to 12% among women without children), while women without children – from time to time (57% compared to 46% among mothers).

Women who are satisfied with the combination of work and family responsibilities, regardless of the parental status, have high labor productivity, frequent submission of rationalization proposals; they are also less characterized by non-compliance with production standards, lateness and absenteeism, various disruptions in work (*Tab. 3*).

Table 3. Satisfaction with the ability to combine work and family responsibilities and labor activity characteristics, % of the number of respondents

Labor activity characteristics	Women without children		Women with children	
	Satisfied	Unsatisfied	Satisfied	Unsatisfied
Failure to comply with the working standard (plans), I do less than I am required to				
It often happens	1.8	0.0	4.0	5.4
Sometimes it happens	28.6	41.2	26.7	64.9
It does not happen at all	69.6	58.8	69.3	29.7
Lateness, absenteeism, leaving work ahead of time				
It often happens	0.0	2.6	2.5	10.8
Sometimes it happens	26.8	42.1	16.3	33.8
It does not happen at all	73.2	55.3	81.2	55.4
Disruptions in work: accidents have happened through your fault, equipment has been idle, mistakes in documentation, managerial, etc. have been made				
It often happens	0.0	5.3	4.0	4.1
Sometimes it happens	21.4	31.6	16.3	43.2
It does not happen at all	78.6	63.2	79.7	52.7
Submission of innovation proposals, suggestions for improving work in the workshop, department, etc.				
It often happens	14.3	0.0	32.7	8.1
Sometimes it happens	58.9	47.1	44.1	43.2
It does not happen at all	26.8	52.9	23.3	48.6
Average value of labor productivity on a 10-point scale	8.38	7.41	8.48	6.59
According to: Data from the sociological survey of the employed population of the Vologda Oblast, VoIRC RAS, 2018.				

Consequently, working women (with and without children) who satisfactorily assess the work-life balance are characterized by better labor activity indicators.

Work-life balance and labor potential realization rate. The differences in the calculated labor potential indices between women without children and with children are minimal, with some advantage toward the latter. At the same time, the labor potential quality and realization rate of the qualitative characteristics of working women in labor activity significantly correlate with satisfaction with the ability to combine work and family responsibilities: in female groups with predominant positive assessments of this combination, the labor potential quality index and realization rate indices of its qualitative characteristics are noticeably higher (*Tab. 4*). In other words, women who satisfactorily assess the work-life balance, more fully realize their professional, personal and physical abilities at work.

Conclusion

In the conducted study, we have assessed the work-life balance through subjective feelings of satisfaction from the realization of some aspects of work and family life. According to the results, women without children are more likely to perform extra work, are less able to organize their leisure time, and are harsher in relation to their close environment. For women with children, i.e. mothers, a well-developed ability to organize recreation does not provide a commensurate increase in satisfaction with the work-life balance. Also, among mothers dissatisfied with life in general, compared with women without children, there are noticeably more those who are not satisfied with the possibility of combining work and family (75% vs 64%).

At the same time, satisfaction with the possibility of combining work and family responsibilities, the predominance of positive or neutral influence of

Table 4. The ability to combine work and family responsibilities and labor potential indices

Female groups according to the values of the index "The ability to combine work and family responsibilities"	Realization rate of qualitative characteristics of labor potential (%)								Labor potential quality index
	PH	MH	CP	CrP	PS	CS	MS	AN	
Women without children									
Positive assessments (level above 0)	65.3	71.9	58.0	47.8	68.8	68.7	71.9	57.8	0.7179
Neutral assessments (equal to 0)	54.1	56.1	43.4	35.5	53.9	46.6	54.5	47.0	0.6453
Negative assessments (level below 0)	53.5	59.4	42.0	28.3	56.6	52.5	55.6	40.2	0.6237
Women with children									
Positive assessments (level above 0)	63.2	71.3	57.1	48.1	70.1	67.8	74.3	56.8	0.7188
Neutral assessments (equal to 0)	56.9	59.9	45.8	36.7	59.8	54.8	59.2	46.7	0.6697
Negative assessments (level below 0)	53.7	55.4	41.1	32.2	60.6	52.5	57.0	38.4	0.6300

Note. PH – physical health; MH – mental health; CP – cognitive potential; CrP – creative potential; PS – people skills; CS – cultural standard; MS – moral standard; AN – achievement need.
According to: Data from the sociological survey of the employed population of the Vologda Oblast, VoIRC RAS, 2018.

work on various aspects of daily life are on average the same for both female groups. Working women (with and without children) who satisfactorily assess the work-life balance are characterized by a positive perception of the circle of close communication, better indicators of labor activity and a higher realization rate of abilities in work. Consequently, we can talk about a weak recognition by working women of the presence of any discomfort from the combination of work and family responsibilities.

Answering the natural question "Why is it so?" we venture to assume that this is the influence of formed social stereotypes. The fact is that taking care of children is only one of the family responsibilities, which are mainly performed by women. A woman, even without being a mother, is more responsible for the family than a man, is more involved in solving daily household tasks (Kalachikova, Gruzdeva, 2019a; Kalachikova, Gruzdeva, 2019b; Mezentseva et al., 2009), perceives housework as a natural process (Mikhailova, 2017), and, consequently, is more adaptive to multitasking and time allocation.

We should note that work-life balance increases job satisfaction (Nilawati et al., 2019). However, in Russia it is not a priority of family and employment policy – institutional forms of support for working parents and remote work formats are practically not developed, targeted flexible employment programs for mothers are poorly developed (Chernova, 2012; Baskakova, Soboleva, 2018). Therefore, systematic work is needed within the framework of social and labor relations to solve these problems. As Doctor of Sciences (Economics) I.E. Kalabikhina notes, in relation to women, this work should include at least three areas: increasing the prestige of fatherhood and the development of the "care economy"; public assistance in child care (through public, private and public social organizations); socially responsible (friendly) employer and flexible employment regimes[11]. The main work should be carried out "locally" and include those practices that will facilitate the combination of work and family life,

[11] Kalabikhina I.E. Work-life balance in demographic and family policy. *DemoskopWeekly*, 2016. Available at: http://www.demoscope.ru/weekly/2016/0671/nauka01.php (accessed: December 22, 2020).

and which organizations will be able to introduce in addition to legislative requirements. Among them are an extraordinary vacation; child care services provided by the employer (or compensation for such costs); flexible working time schemes and expansion of remote employment opportunities.

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Reproductive Attitudes of Modern Youth toward Multi-Child Parenting: Patterns and Contradictions

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Abstract. In the context of depopulation and reduction in the number of young people at the most active reproductive age, it becomes relevant to determine the features of their attitudes related to having children. Currently, quite a large number of studies are being conducted, which cover various aspects of the problem, combining some of the stable relationships identified in reproductive attitudes, which can be considered as patterns. At the same time, the younger generation is characterized by contradictions in their judgments concerning various aspects of life. We can assume that similar contradictions manifest themselves in reproductive choice, as well. The problem regarding the attitudes of modern young people toward multi-child parenting needs to be researched more thoroughly; therefore, the purpose of the study is to detect patterns and contradictions in the reproductive attitudes of modern youth toward having many children. To achieve this goal, a sociological survey was conducted in the form of a questionnaire among students in 20 cities of Russia. As a result, we have revealed that the reproductive attitudes of modern youth toward multi-child parenting, on the one hand, represent a number of natural and expected judgments, and on the other hand, reflect contradictory opinions regarding the large family model. The opinions are as follows: for example, reproductive plans can be more optimistic provided that living conditions are improved; there can be regional differentiation according to the planned, desired and ideal number of children; young people can follow their parents' reproductive behavior patterns; besides, young people can focus on having many children, although they do not perceive a large family as an ideal model; they may not want to have many children while acknowledging that a family with three or more children is

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the most optimal one; it may also happen that young people want to have many children, but at the same time show an increasingly negative attitude toward other multi-child families. Thus, these contradictions can be considered as a kind of barrier that can restrain the implementation of young people's reproductive plans; therefore, they should be leveled within the framework of socio-demographic policy.

Key words: multi-child parenting, reproductive attitudes, attitude toward having many children, depth of multi-child parenting, parental family, youth, survey, regions of Russia.

Introduction

In Russia's contemporary history, the issues of demographic development are particularly acute. The demographic situation remains complicated. After a short period of natural growth in 2013–2015, natural population decline continued, amounting to 702 thousand people in 2020, which corresponds to the indicators of the 1990s – the first half of the 2000s. It is obvious that the COVID-19 pandemic has made a certain contribution to the indicators of the natural population movement in the previous two years strengthening depopulation processes. Given its "protracted" nature, we can assume that the effects will manifest themselves in the long term. The more urgent are the issues of increasing the birth rate and increasing the number of children of families in the country.

The objective factor influencing the fertility dynamics is the number of population at reproductive age, primarily women. Recently, there has been a tendency to reduce the number of women in active reproductive age. Even if we take into account the fact of an increase in the mothers' average age at birth and consider the period 20–34 years as the active reproductive age, the number of women in this group decreased by 3.8 million people over the eleven years from 2011 to 2021 and amounted to 13.7 million people in 2021. Such dynamics significantly complicate the achievement of the key goal of the country's demographic policy – transition to natural growth and population increase, since an increasing number of children are needed to cover the growing mortality. Consequently, the issue of increasing the number of multi-child families in the country and children's birth of high priority is particularly significant.

In such a situation, it is important to determine reproductive attitudes of numerically shrinking youth's cohort. This task can be solved by conducting a sociological survey. The results will help in identifying possible vectors of demographic development in Russia, as well as in improving the measures of demographic and family policy of the state.

Research in the field of reproductive intentions is conducted regularly. For the first time, this issue was raised in the 1930s in the United States, when the American Institute of Public Opinion published the results of a survey on the ideal number of children in American families (Newport, Wilke, 2013).

Currently, the Federal State Statistics Service of Russia provides analytical reports on the survey results, the purpose of which is to identify the reproductive plans of population[1]. The research

[1] Analytical report on the results of selective observation of reproductive population plans. Available at: https://rosstat.gov.ru/search?q=%D0%90%D0%BD%D0%B0%D0%BB%D0%B8%D1%82%D0%B8%D1%87%D0%B5%D1%81%D0%BA%D0%B8%D0%B9+%D0%BE%D1%82%D1%87%D0%B5%D1%82+%D0%BF%D0%BE+%D0%B8%D1%82%D0%BE%D0%B3%D0%B0%D0%BC+%D0%B2%D1%8B%D0%B1%D0%BE%D1%80%D0%BE%D1%87%D0%BD%D0%BE%D0%B3%D0%BE+%D0%BD%D0%B0%D0%B1%D0%BB%D1%8E%D0%B4%D0%B5%D0%BD%D0%B8%D1%8F+%D1%80%D0%B5%D0%BF%D1%80%D0%BE%D0%B4%D1%83%D0%BA%D1%82%D0%B8%D0%B2%D0%BD%D1%8B%D1%85+%D0%BF%D0%BB%D0%B0%D0%BD%D0%BE%D0%B2+%D0%BD%D0%B0%D1%81%D0%B5%D0%BB%D0%B5%D0%BD%D0%B8%D1%8F (accessed: October 30, 2021).

results show how many children respondents expect and would like to have under all necessary conditions. The emphasis in the publications is on identifying gender differences in reproductive plans, as well as the relationship of the social status and economic well-being with the desired and expected number of children.

Analytical sociological centers conduct similar studies. For example, the All-Russian Public Opinion Research Center (VCIOM) in 2020 presented a report "Demographic policy of the Russian Federation: Factors stimulating decision-making on the birth of the first and second child, as well as subsequent children" (Rodin, 2020). During the survey, indicators of the desired and expected number of children were determined; motivational incentives and barriers to birth, mainly first and second children, were identified.

In 2019, Yuri Levada Analytical Center "Levada-Center"* conducted a research "The desired and expected number of children"[2]. The presented results reflected the average desired and expected number of children by gender.

In scientific discourse, the problem of determining the desired, expected and ideal number of children is also very popular. Among Russian scientists, V.A. Belova and E.V. Darsky became pioneers in this field; they made a significant contribution to the methodology of research on reproductive, and in the 1970s conducted large-scale studies in the republics of the USSR and revealed the dependence of intentions regarding the number of children in families on the respondents' nationality, family income level and parents' education[3] (Belova, Darsky, 1972; Belova, 1975).

Currently, interest in this topic remains at a high level. Surveys are conducted among different population groups, most often people of reproductive age in general or youth whose representatives are just about to become parents. At the same time, the analysis of publications on the topic showed that in most cases the research concerns several relevant areas. First, scientists seek to discover the relationship between reproductive attitudes and the level of education of respondents. For instance, in the course of a study of the female reproductive behavior with different educational status, V.N. Arkhangelsky, S.G. Shulgin and Yu.V. Zinkina have identified an inverse relationship between education level and the desired and planned number of children (Arkhangelsky et al., 2020).

Second, often the work is aimed at identifying the relationship between reproductive attitudes and families' material well-being level. For example, the study of E.V. Churilova and S.V. Zakharov to a certain extent has confirmed the preservation of the inverse relationship between the financial situation and the expected number of children in the family (Churilova, Zakharov, 2019). V.N. Arkhangelsky, T.K. Rostovskaya and E.V. Vasilyeva elaborated on this thesis, revealing the presence of feedback between the desired/expected number of children and women's income level, while male responses demonstrated a direct relationship between these parameters (Arkhangelsky et al., 2021).

Third, the researchers focus on the impact of implementation of state demographic policy measures on Russians' reproductive choice. In particular, L.A. Popova and M.A. Shishkina note: if the activation of pro-family policy measures in Russia since 2005 has had a stimulating effect on the reproductive choice of representatives of the generation born in 1989–1993, who are the main "recipients" of these measures, then the cohort representatives born in 1999–2000 do not perceive the currently implemented programs as stimulating. The authors conclude that in order to improve the

[2] The desired and expected number of children. Yuri Levada Analytical Center "Levada-Center"*. Available at: https://www.levada.ru/2019/11/25/zhelaemoe-i-ozhidaemoe-chislo-detej/ (accessed: October 30, 2021).

* Entered in the register of foreign agents.

[3] Darsky L.E. (2006). The expected number of children among women of different nationalities and fertility prospects in the population of the former USSR. *Demoskop Weekly*, 191–192.

demographic situation in the country, it is necessary to expand the list of measures of state support for families with children (Popova, Shishkina, 2016).

Fourth, studies are often conducted in a regional context, regional peculiarities of respondents' reproductive attitudes are revealed. For example, E.M. Dumnova analyzed the factors influencing the reproductive attitudes of Novosibirsk students (Dumnova, 2009). A.G. Yaschuk, A.V. Maslennikov, I.R. Rakhmatullina and N.A. Ishmuratov have conducted a research of Ufa youth's reproductive behavior. As a result, the authors have revealed low readiness for parenthood and postponement of childbearing to a later date (Yaschuk et al., 2019). E.V. Volchenkova compared the reproductive attitudes of young people in Kirov, Nizhny Novgorod and Samara, and found out that the implementation of even the most optimistic reproductive plans of residents will not allow reaching the level of simple reproduction. Moreover, the situation in Kirov is the most alarming (Volchenkova, 2014). K.N. Obukhov identified that young people consider a two-child family to be the most preferred family model in the Udmurt Republic (Obukhov, 2021). O.N. Kalachikova compared reproductive attitudes of the Vologda Oblast students living in urban and rural areas. In the course of the study, the researcher confirmed the hypothesis about the orientation toward the birth of a larger number of children among young people living in rural areas, compared with urban youth (Kalachikova, 2012).

Fifth, the problem of voluntary childlessness, or "childfree" model, occupies a special place in the scientific discourse. For instance, D.V. Belinskaya tried to make a social portrait of a voluntarily childless woman. The research results showed that a typical "childfree" is a young woman with higher education, above average income, living in a big city (Belinskaya, 2018). E.I. Garayeva focused on the causes and motives of voluntary childlessness. In the author's opinion, this phenomenon is determined by liberalization of higher education, female emancipation and gender equality. In addition, the conducted research shows that modern young people associate the lack of desire to have children with financial difficulties, uncertainty about the future and themselves (Garayeva, 2018; Garayeva, 2020).

The topic of reproductive attitudes and dynamics of the desired, expected and ideal number of children is popular among foreign scientists. At the same time, there are regional differences in the research directions. For example, while studies of reproductive attitudes and characteristics of women's reproductive behavior living in developed countries, such as European countries, the USA, Australia and others, are focused on identifying the causes of low fertility and refusal to have children[4] (Johnstone et al., 2021), studies of fertility and patterns of reproductive choice among women living in African states, in particular in sub-Saharan countries, record that high fertility rates persist at the present time. Scientists identify factors contributing to a later onset of childbearing and a decrease in the total number of children born to one woman (Atake, Gnakou, 2019; Baschieri et al., 2013; Gunter, Harttgen, 2016; Molla, Muluneh, 2019; Yaya, Osanyintupin, 2018). Scientists are concerned about the decline in the birth rate in Arab countries, for example in Iran. There is a decrease in the need for children. In this regard, we propose to conduct conversations with future spouses and find out their reproductive plans (Lotfi et al., 2017).

Studying the childfree phenomenon in Western countries has remained relevant for several decades. At the same time, scientists note the formation of a more tolerant attitude in society toward people who choose childless lifestyle (Koropeckyj-Cox et al., 2018). In addition, nowadays, new justifications for voluntary childlessness are emerging in the

[4] Doepke M., Kindermann F. (2016). Why European women are saying no to having (more) babies. VOXeu CEPR. 3 May. Available at: https://voxeu.org/article/why-european-women-have-few-babies

context of globalization. E. Nakkerud speaks about the relationship of such a model of reproductive behavior with the respondents' desire to preserve a clean environment (Nakkerud, 2021).

Thus, the analysis of publications has shown that there is a fairly wide range of research areas of reproductive attitudes. Nevertheless, many of them are united by the approach, used to group respondents according to the desired and planned number of children. In the vast majority of cases, scientists identify groups of people, focused on the birth of one, two, three or more children. A group of respondents who want or plan to have four or more children is rarely considered separately. It means that the issue of population orientation to children's birth of high priority remains poorly studied.

The conclusions of various researchers reveal the existence of a number of stable relationships concerning the reproductive intentions, which can be considered as patterns. These are, for example, more optimistic reproductive plans of respondents in the presence of all the conditions necessary for children's birth, compared to the planned number of children, orientation to the birth of more children among respondents in rural areas, compared to urban residents, etc. Based on the above, within the framework of our research, we have put forward a hypothesis about the existence of certain stable patterns in the attitudes of modern young people toward multi-child parenting.

At the same time, the works of scientists on the attitude of modern youth to various phenomena of public life (see, for example, Zubok, 2020; Zubok, Chuprov, 2020) show that judgments abound with peculiar contradictions; it means that youth's opinion often depends on the surrounding conditions (context), actors and other reasons and can combine multidirectional judgments. In this regard, we can assume that there are also some contradictions in the reproductive attitudes of young people to having many children. Their identification within the framework of our study is of particular interest, since this antinomy can be considered as a certain "barrier" for the formation and implementation of more positive reproductive intentions of the cohort, which in the very near future will create families and become parents. It is likely that the resolution of contradictions will contribute to an increase in the need for a large number of children among young people, a more complete implementation of reproductive plans, and consequently, an improvement in the demographic situation in the country.

Thus, we have set a goal on the basis of a sociological survey of modern Russian student youth to identify patterns and contradictions in reproductive attitudes to having many children.

Research methodology

The research is based on the analysis of the results of a sociological survey of students studying at Russian universities. Employees of the Department of Fertility and Reproductive Behavior of the Institute for Demographic Research of the Federal Center of Theoretical and Applied Sociology of the Russian Academy of Sciences S.Yu. Sivoplyasova and E.P. Sigareva[5] have conducted a survey in the form of a questionnaire. One of the goals of the survey was to identify the youth's reproductive intentions and their attitude to having many children.

The choice of the respondents' category is non-accidental and is due to several reasons. First, modern students are people who will soon create their own families and implement their reproductive plans. Second, young people receiving higher education live in a specific environment, under the influence of which they form special requirements for living standards, influencing, among other

[5] Sivoplyasova S.Yu., Sigareva E.P. Demographic portrait of the youth of the EAEU countries: plans, assessments, judgments. Certificate of state registration of the database no. 2021621951 Federal Service for Intellectual Property dated September 14, 2021 (volume 768KB).

things, life strategies and reproductive attitudes; therefore, in the near future, Russia's demographic development depends on their matrimonial and reproductive behavior.

The survey was conducted in twenty cities of Russia (Moscow, Serpukhov, Khanty-Mansiysk, Stavropol, Budennovsk, Ulan-Ude, Vologda, Yoshkar-Ola, Murom, Sevastopol, Belgorod, Karachaevsk, Makhachkala, Kizlyar, Vladivostok, Ufa, Maykop, Kursk, Kaliningrad, and Pskov). Territories (cities) were selected, which made it possible to identify the specifics of youth's ideas and compare their reproductive intentions in the metropolis and province, in various regions of the country, located in all federal districts (within the borders of federal districts until November 3, 2018), as well as in entities of different types of administrative-territorial entities.

Respondents filled out paper questionnaires containing 24 questions, divided into logical blocks. The first block included the questions of the address part concerning the structure of the respondents' sample. The second block was devoted to the evaluation of demographic policy measures and socio-psychological components of attitudes toward different family types. The third block consisted of questions, related to youth's ideas about the signs of belonging to the middle class as the basis for socio-economic and demographic well-being. A total of 2,135 questionnaires were processed. Among the respondents, 61.5% are girls, 38.5% are boys. The largest share of respondents was formed by young people aged 19–20 (35%), 28% were students aged 16–18, 21% – aged 21–25, 9% – under 16 years old. The rest of the respondents are aged 26–30. The sample was disproportionate and was based on a simple random, non-repetitive selection. Representativeness was within the limits of statistical error (Sivoplyasova, Sigareva, 2021).

In the course of the research, students were asked a number of questions, the answers to which allow judging the planned, desired and ideal number of children (Sigareva, Sivoplyasova, 2021): "How many children are you going to have?", "How many children would you like to have if all the necessary conditions were available for this?", "How many children is it best to have nowadays in Russia?". The questions were open, which made it possible to analyze the depth of the large number of children that the respondents were focused on. Sometimes there were interval responses. When processing the results, the largest number from the interval was taken into account. However, given that there was a small number of such questionnaires, it is safe to say that the conclusions drawn from the research results are reliable.

One of the purposes of the survey was to determine the depth of transformation of the youth's attitude to the families of their friends, relatives, acquaintances in the event of the birth of another child. The question was formulated as follows: "Will your attitude toward the families of your acquaintances, friends, and neighbors change after the birth of another child in them?" There were three possible respond options: "it will change for the better", "it will change for the worse", and "it will not change in any way". The answer had to be given for each next child. This approach made it possible to trace the change in attitude in dynamics.

In addition to the survey results, statistical data of the All-Union Population Census of 1989, the All-Russian Population Census of 2002 and the All-Russian Population Census of 2010, as well as the survey results of multi-child families (mothers) "Lifestyle of multi-child families in Russia", conducted by the Department of Family Sociology and Demography of the Faculty of Sociology of Moscow State University (the head is A.I. Antonov) in 2007–2008 were analyzed.

Research results and discussion

Before talking about reproductive attitudes of modern students to having many children, it is

important to determine which family will belong to this category. It seems paradoxical that the concept of "multi-child family" has not yet been defined in Russian legislation at the federal level. The only regulatory legal act of the federal level concerning exclusively multi-child families remains the Presidential Decree of the Russian Federation no. 431 "On measures for social support of multi-child families", dated May 5, 1992[6]. However, even it does not contain an unambiguous interpretation of this concept. The republics' governments within the Russian Federation, the executive authorities of krais, oblasts, autonomous entities, cities of federal significance are invited to independently determine family categories that belong to multi-child families and need additional social support taking into account national and cultural characteristics, territory's socio-economic and demographic development. Thus, today each region chooses which families to classify as having many children, based on the real scale of this phenomenon, as well as its budgetary capabilities, since the recognition of a multi-child family entails a certain set of social support measures.

In the overwhelming majority of Russia's entities, families with three or more children under the age of 18 are considered multi-child families. We will use this interpretation in the framework of the article.

It is possible to estimate the number of multi-child families in Russia using statistical data from the All-Russian Population Censuses. For instance, according to the 2010 census, the share of households with three or more children in the total number of households was 3.1% (*Tab. 1)*. Compared with 2002, their share increased by 0.5 p.p., but still have not reached 1989 level.

If we consider households' child structure analyzing households with children, the share of multi-child families will be 7%, with two children – 27.2%, with one child – 65.5% *(Fig. 1)*. Compared with 2002, in 2010, the share of households with three or more children increased by 0.4 p.p., but compared with 1989, it is 2.5 p.p. lower.

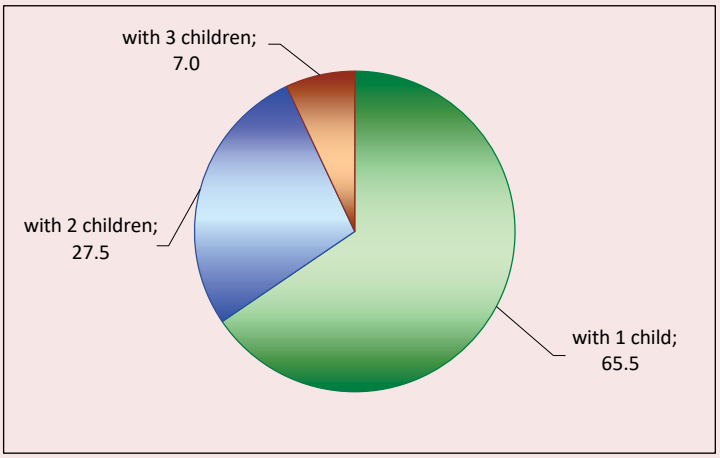
The households' structure by the number of children is heterogeneous in the regional context *(Tab. 2)*. According to the Russian Population Census of 2010, the largest share of households with three or more children was observed in the North Caucasian Federal District (14.6%), the smallest one was in the North-West (1.7%). It is interesting to note that the share of households with one child and two children does not have such a significant differentiation. In the first case, it ranges from 24.8% in the North Caucasian Federal District to 31.0% in the Far East, in the second – from 9.9% in the Central Federal District to 19.4% in the North Caucasus.

Table 1. Structure of Russian households by the number of children in 1989, 2002 and 2010, %

Household type	1989	2002	2010
Childless households	53.4	59.9	55.9
Households with 1 child	23.7	28.2	28.9
Households with 2 children	18.3	11.3	12.1
Households with 3 and more children	4.6	2.6	3.1
According to: USSR population (1990): according to the All-Union Population Census of 1989. USSR State Committee on Statistics. *Information and Publishing Department*. Moscow: Finansy i statistika, 45 p.; Information and Publishing Department Russian Population Census of 2002, Russian Population Census of 2010. Federal State Statistics Service. Available at: https://rosstat.gov.ru/vpn_popul			

[6] On measures for social support of multi-child families: Presidential Decree of the Russian Federation no. 431, dated May 05, 1992. *Legal Reference System Consultant Plus*. Available at: http://www.consultant.ru/cons/cgi/online.cgi?req=doc&cacheid=D1E4C0F7C7E2BB01E7DD241EDF2C38E5&SORTTYPE=0&BASENODE=1-1&ts=YO88dnSMk5zihbvF1&base=LAW&n=41141&rnd=CCF372F29B0CD448E3CDF4C01531DAFC#IEL8dnS996CWdImT

Figure 1. Distribution of households by number of children under aged 18 in 2010, %



According to: All-Russian Population Census of 2010. Federal State Statistics Service. Available at: https://rosstat.gov.ru/vpn_popul

Table 2. Share of households with children in the total number of households in 2010 by federal districts, %

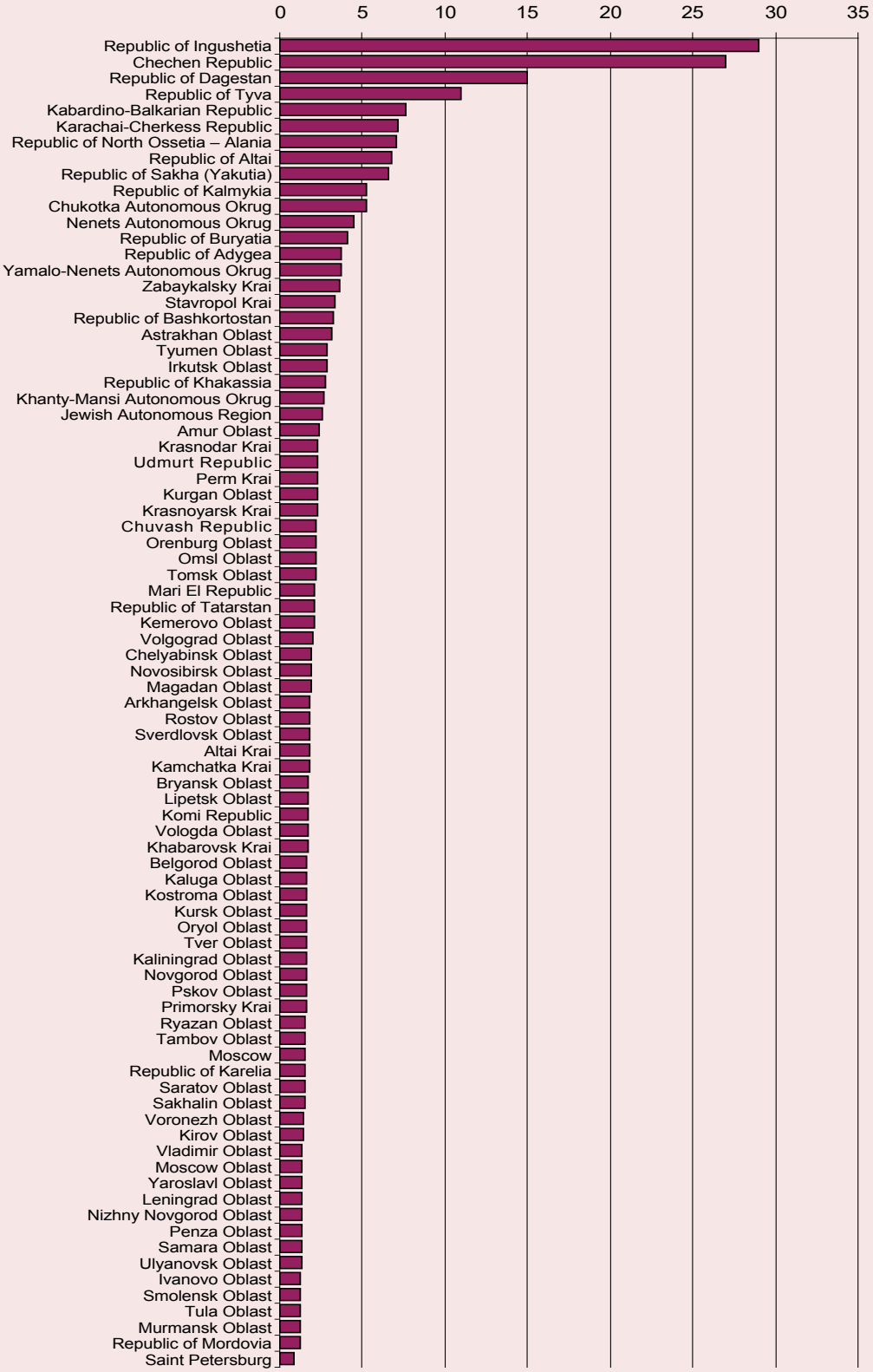
Household type / Federal district	With 1 child	With 2 children	With 3 and more children
Central Federal District	28.2	9.9	1.8
Northwestern Federal District	30.0	10.1	1.7
Southern Federal District	28.2	13.0	3.0
North Caucasian Federal District	24.8	19.4	14.6
Volga Federal District	29.4	12.5	2.5
Ural Federal District	28.6	14.7	2.9
Northern Federal District	29.9	13.1	3.3
Far-Eastern Federal District	31.0	12.7	3.1
According to: Russian Population Census of 2010. Federal State Statistics Service. Available at: https://rosstat.gov.ru/vpn_popul			

Multi-child families' level varies significantly across the country's regions. According to the 2010 Census, the differentiation of the share of multi-child families in the total number of families ranges from 29% in the Republic of Ingushetia to 0.9% in Saint Petersburg *(Fig. 2)*. However, the 2002 Census data indicate that at the millennium beginning, the differentiation was even greater – from 39% in the Republic of Ingushetia to 0.9% in Saint Petersburg.

The period after the previous population census in 2010 was the main stage of the implementation of demographic policy measures. The result was an increase in the birth rate in the country. The number of not only second, but also third births has increased. For instance, according to the estimates of the Ministry of Labor and Social Protection of the Russian Federation, by 2017, compared with 2010, the number of multi-child families in Russia increased by 25% and amounted to 1.556 million[7]. According to the children's ombudsman A. Kuznetsova, by 2021 their number has become even greater. As of January 1, 2021, the number of multi-child families reached 1.96 million. Only

[7] Astakhov P. Support of the state: The number of multi-child families in Russia has grown by 25% in six years. *RT in Russian*. Available at: https://russian.rt.com/russia/article/372844-chislo-mnogodetnyh-semei-rossiya (accessed: October 01, 2019).

Figure 2. Share of multi-child families in the total number of family units in 2010 by Russia's regions, %



According to: Russian Population Census of 2010. Federal State Statistics Service. Available at: https://rosstat.gov.ru/vpn_popul

in the pandemic year alone, the growth was 6.1%. Currently, 6.5 million children are brought up in multi-child families[8].

At the same time, as noted earlier, the gender and age structure of the country's population has tended to change negatively in recent years, which is associated with a reduction in the number of female cohorts of active reproductive age; therefore, more births are required for stabilization and positive development of the demographic situation, and of a high priority.

The survey results to determine the characteristics of reproductive attitudes of modern young students, to identify patterns and contradictions inherent in them, showed that the majority of representatives of modern students plan to become two-child parents (49.5% of respondents; *Fig. 3*). 14.8% of respondents would like to have one child. A third of respondents (32.7%) plan to have many children. However, about 3.0% of students plan to remain childless.

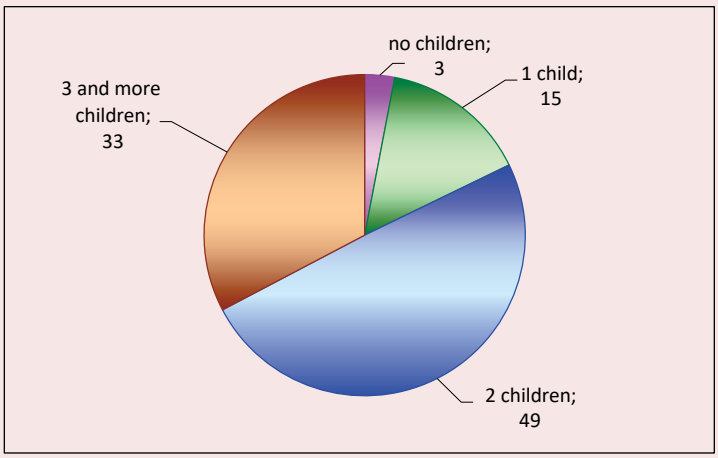
Reproductive plans of modern youth differ significantly by region *(Fig. 4)*.

If respondents living in the North Caucasian republics traditionally plan to become parents with many children, then in other entities no more than a third of students would like to have three or more children.

The largest share of young people planning to have three or more children is noted in Karachayevsk, Makhachkala and Kizlyar, the smallest one is in Pskov (15.9%). At the same time, it is worth noting that in Ulan-Ude, Karachayevsk, Makhachkala, Kizlyar and Maykop, the share of the option "I plan to have three or more children" is leading. In other cities, the most common answer is "two children".

No more than a fifth of respondents plan to remain single-child parents (the exception is Kursk, where 25.3% of respondents plan to become single-child parents). However, in Serpukhov, Khanty-Mansiysk, Stavropol, Budennovsk, Ulan-Ude, Makhachkala, Vladivostok and Maykop no more than 10% of students chose this answer, and in Karachayevsk and Kizlyar there were no young people planning to have such a small number of

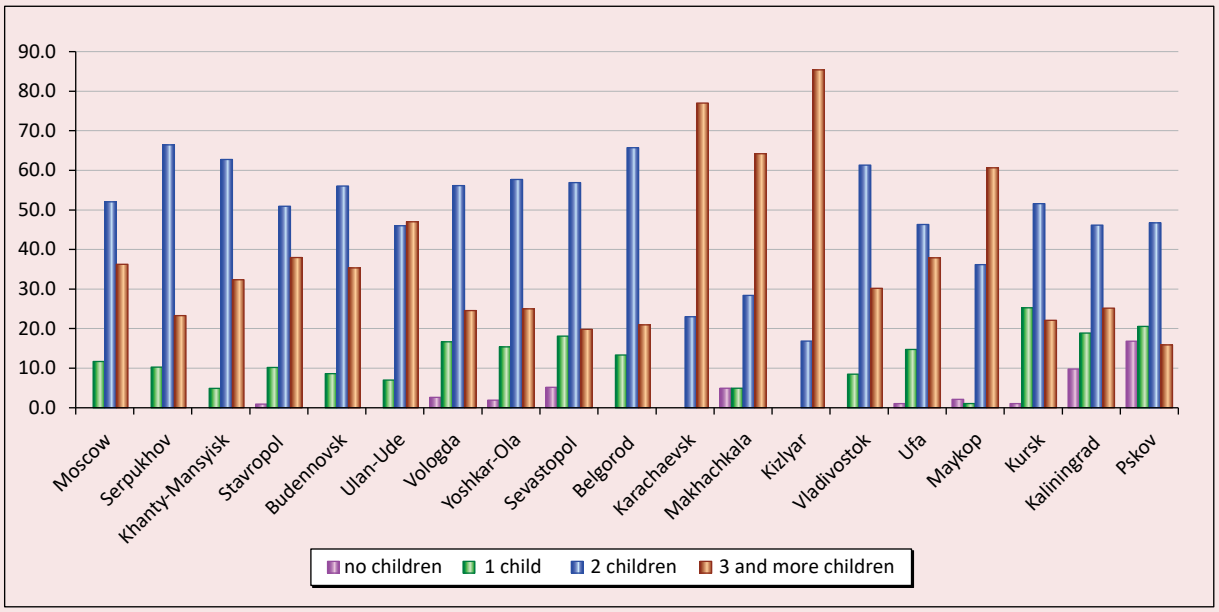
Figure 3. Distribution of respondents by planned number of children, %



Source: hereafter, unless otherwise indicated, it is own compilations.

[8] Guryanov S. It's time to decide: Russia may adopt a law on multi-child families. *Izvestia*. Available at: https://iz.ru/1182619/sergei-gurianov/pora-opredelitsia-v-rossii-mogut-priniat-zakon-o-mnogodetnykh-semiakh (accessed: September 03, 2021).

Figure 4. Distribution of respondents by planned number of children by region, %



children, while in Vologda, Yoshkar-Ola, Ufa, Kursk, Kaliningrad and Pskov the proportion of such students exceeded 15%.

It is interesting to analyze the students' answers to the question about the planned number of children in Pskov. This is the only city in which the share of respondents who do not plan to commit themselves to parenthood exceeds the share of young people who plan to become parents with many children (16.8% vs. 15.9 respondents, respectively).

Many factors influence people's reproductive plans. As the conducted research has shown, most often they have an economic nature, so it is important to understand how much the birth rate can increase if all the conditions necessary for the birth of children are created for families.

Analysis of respondents' answers to the question about the desired number of children in the presence of all necessary conditions proved that young people demonstrate more optimistic reproductive intentions *(Fig. 5)*. The proportion of respondents wishing to become parents with many children is noticeably higher than the proportion planning to have three or more children.

Half of the respondents would like to have three or more children if they have all the necessary conditions. At the same time, in nine out of twenty cities (Moscow, Khanty-Mansiysk, Stavropol, Budennovsk, Ulan-Ude, Karachayevsk, Makhachkala, Kizlyar and Maykop), the proportion of respondents who chose this answer option exceeded 50%. The maximum is noted in Kizlyar (90.0% of respondents); the minimum is in Pskov (22.7%). It is important to note that in Pskov, even with all the necessary conditions, 11.3% of respondents would like to remain childless.

In addition to determining the planned and desired number of children, the researchers were faced with the task of identifying the "ideal", according to respondents, the number of children in modern Russian families. The question was "How many children is it best to have in a family nowadays in Russia?"

Figure 5. Comparison of the proportions of respondents planning and wishing to become parents with many children, %

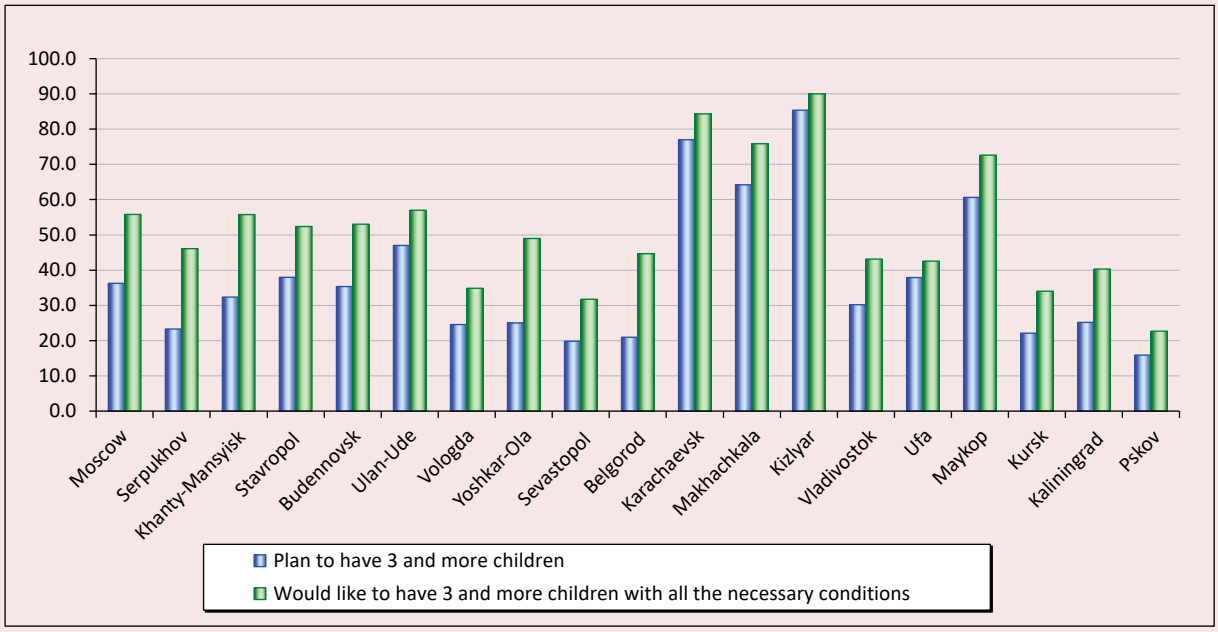
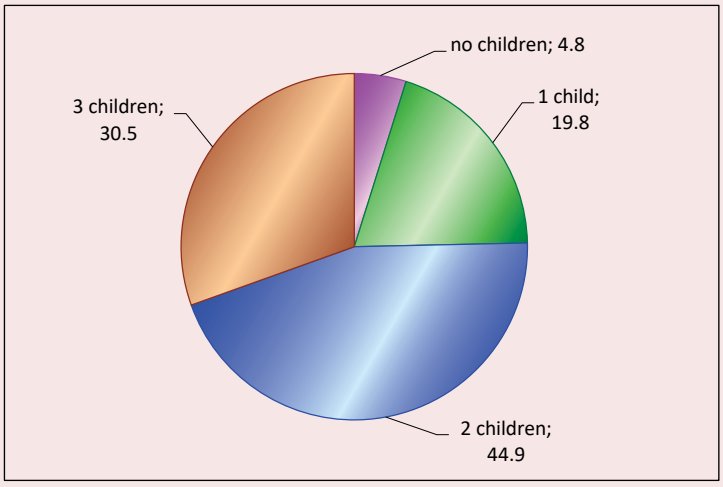


Figure 6. Distribution of respondents by the "ideal" number of children, %



The majority of students believe that it is currently best to have two children in Russia (44.9%; *Fig. 6*). At the same time, 19.8% of respondents called a family with one child an ideal model, and a multi-child family is considered ideal by 30.5% of respondents. Thus, according to young people, modern conditions contribute to the formation of a family with few children (according to the classification of demographers) rather than a multi-child one.

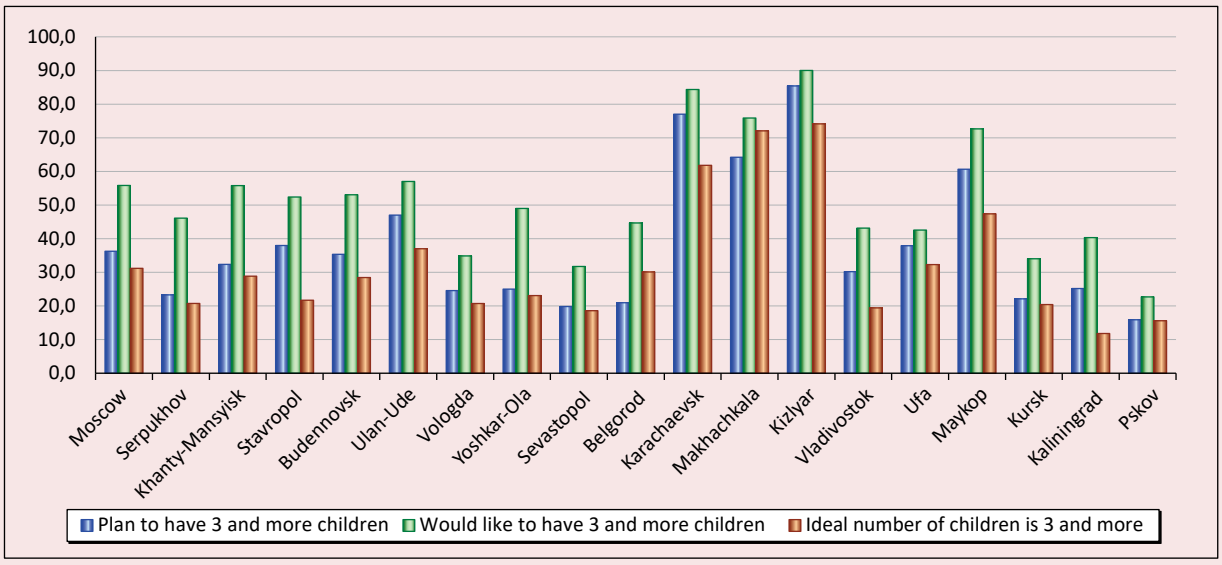
There are regional differences in youth's ideas about the ideal childhood model. Respondents in the North Caucasian republics demonstrate the most positive views. The proportion of students

in Karachayevsk, Makhachkala, Kizlyar and Maykop who chose the option "three or more children" when answering the question about the ideal number of children exceeded the proportion of respondents who chose other answer options. Students in Kaliningrad and Pskov demonstrated the most pessimistic views regarding the ideal childhood model. The proportion of respondents who chose the option "zero children" in these cities was the highest, compared to the responses in other cities, amounting to 16.7 and 26.6%, respectively.

Thus, comparing the students' answers about plans, desires and ideal viewpoints about having many children, we can note that there are no conditions for the full realization of youth's reproductive intentions in any of the considered settlements *(Fig. 7)*. At the same time, in Moscow, Serpukhov, Khanty-Mansiysk, Vologda, Yoshkar-Ola, Sevastopol, Ufa, Kursk, Pskov, respondents strive to implement an ideal family model; according to their opinion, it is a multi-child family. The differences in the number of students planning the birth of three or more children and calling this number of children the best are insignificant. At the same time, in Budennovsk, Ulan-Ude, Karachayevsk, Kizlyar, Vladivostok, Maykop, Kaliningrad, the difference between these two indicators is statistically significant. Moreover, the proportion of young people who plan to become parents with many children is higher than the proportion of students who see a multi-child family as an ideal model. It means that they deliberately "break stereotypes" and are ready to form an "unpopular" family model. However, the situation is different in Belgorod and Makhachkala. The proportion of respondents planning the birth of three or more children is significantly lower than those who consider a multi-child family to be the best model. Based on this, we can conclude that the youth of these cities are prone to some restraint in the implementation of reproductive plans and do not seek to give birth to more children, for which, in principle, conditions exist.

In order to determine what is the most likely, as well as the possible demographic future of Russia, we have compared the average planned and desired number of children. On average, in the cities considered, student youth plans to have 2.25

Figure 7. Comparison of the proportions of respondents who plan, want to have three or more children and represent a multi-child family as an ideal model, %



children. At the same time, if all the necessary conditions are in place, this number will increase to 2.66 children. Such a birth rate will allow the country to reach the simple reproduction rate. Thus, the expansion of socio-demographic policy measures will help to fully implement the reproductive plans of modern young people, which will contribute to improving the demographic situation in Russia.

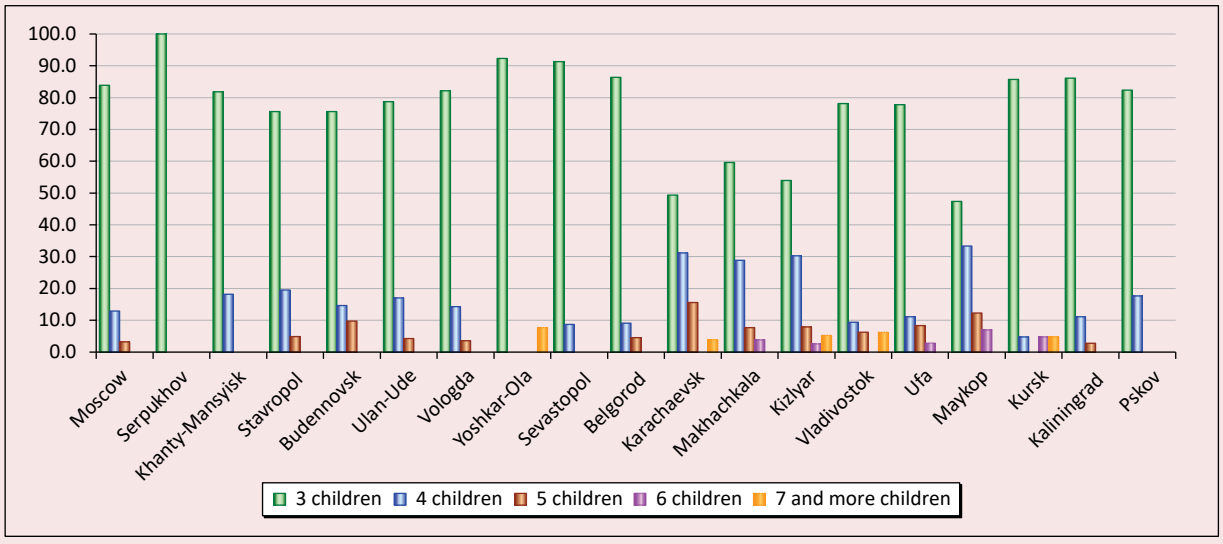
For the purposes of the study, it is not just to determine the proportion of young people who want to become parents with many children, but also to reveal the depth of the planned multi-child family *(Fig. 8)*.

The analysis of respondents' answers showed that young people planning to become parents with many children most often want to have three children (72.2% of the number of people planning to become parents with many children). However, the indicator is highly differentiated by the country's regions. So, in Serpukhov, among students planning to have many children, all respondents strive for the birth of three children, and in Maykop, the share of such young people is only 47.4%.

Plans for the birth of children of a higher priority are expressed by a noticeably smaller number of respondents, compared with those who plan to become parents of three children. In the North Caucasian republics, about a third of respondents want to have four children in their families, about 10% – five children. It means that the depth of planned multi-child families in the southern regions of the country is greater than in other regions.

As we have noted earlier, with improved conditions, youth's reproductive plans will change for the better. This positive trend is also evident among students planning to have a multi-child family. It means that with the improvement of living conditions in the families of modern students, children of a higher priority may appear. At the same time, if in Moscow, Serpukhov, Budennovsk, Yoshkar-Ola, Sevastopol, Belgorod, Karachayevsk, Vladivostok, Kaliningrad and Pskov, the depth of multi-child families will increase due to the fourth births, then in Khanty-Mansiysk, Ulan-Ude, Vologda, Makhachkala, Kizlyar, Ufa and Maykop due to the fifth.

Figure 8. Distribution of respondents planning to have a different number of children, % of those planning to become parents with many children



Previous studies have repeatedly proved that the child generation often repeats the model of reproductive behavior of their parents (Grishina, 2006; Karpova, 2019; Dobrokhleb, Zvereva, 2016; Sivoplyasova, Sigareva, 2018), therefore, one of the tasks of the analysis was to determine the similarities and differences between the childhood of the respondents' parental family and their own reproductive plans.

According to the research results, the younger generation, who grew up in multi-child families, tends to "copy" the reproductive behavior of their parents *(Fig. 9)*.

However, the situation varies depending on the respondents' region of residence. We have selected four cities for visualization, in which the reproductive plans, desires and ideas about the ideal family model of students corresponded to the orientation of a multi-child, medium-sized and small (and childless) family. Such cities included Makhachkala, Maykop, Moscow and Pskov *(Tab. 3)*.

The survey results show that in almost all analyzed cities (except Maykop), the proportion of the students, who plans to have three children, is greater than the proportion of parental families with three children. In this regard, there may be an "illusion" that the demographic situation is currently able to improve compared to the parental generation. However, it is worth noting that in these cities at the same time youth's proportion who want to give birth to children of a higher priority is decreasing, which will negatively affect the dynamics of the country's demographic development.

A different situation is noted in Maykop. Plans for the birth of three children among the younger generation are declining compared to parental families amid a significant increase in the proportion of students who want to have four, five and six children. The differentiation ranges from 7 (in the case of six children) to 16.3 percentage points (in the case of four children).

Thus, in the settlements under consideration, young people "copy" parents' reproductive behavior, but with some negative dynamics of childhood. At the same time, according to the survey results, significant regional differentiation in decision-making regarding the choice of the future number of children will remain.

Figure 9. Number of children in the parental family and planned number of children, % of the number of multi-child families

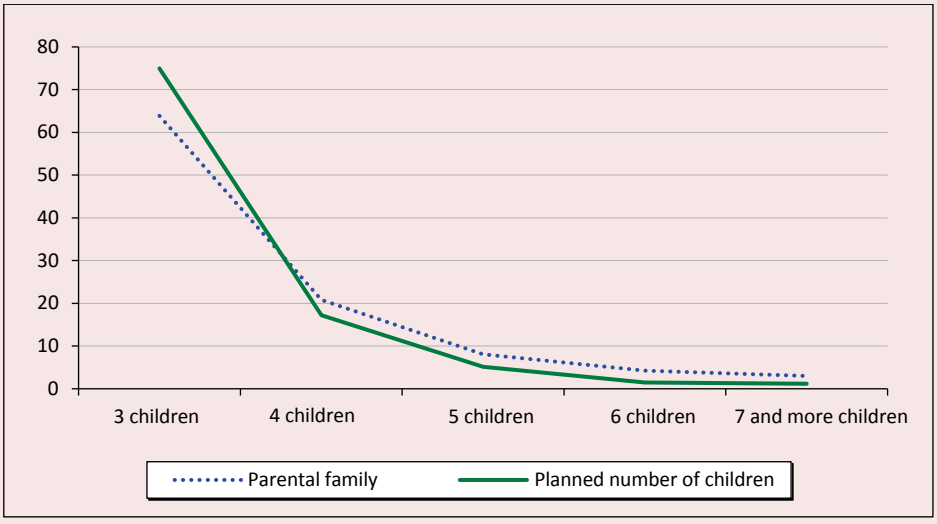


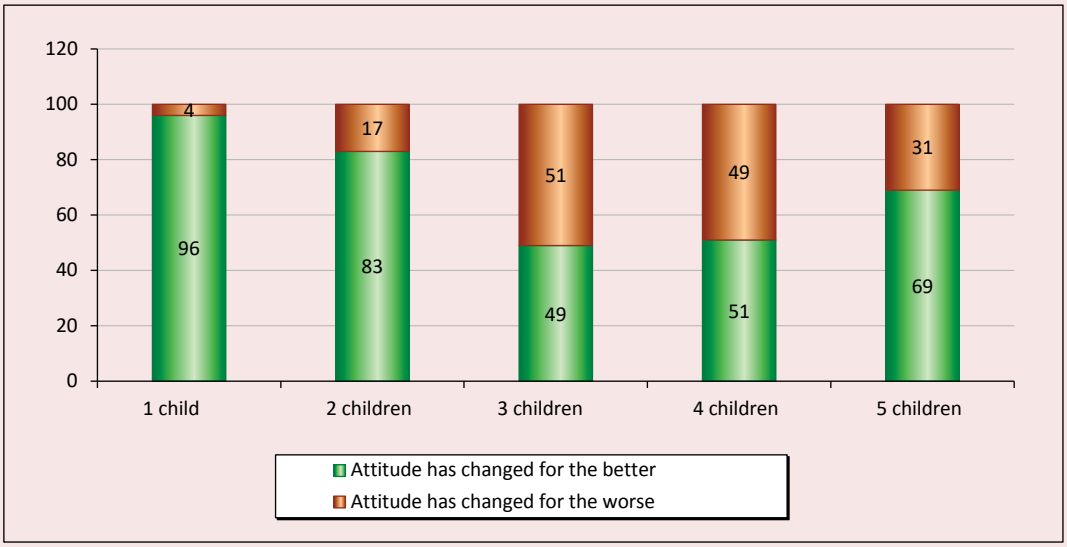
Table 3. Number of children in parental families and planned number of children of students in some cities, % of the number of multi-child families

	Makhachkala	Maykop	Moscow	Pskov
Parental family				
3 children	47.6	76.6	78.1	71.4
4 children	36.5	17.0	15.6	14.3
5 children	9.5	4.3	0.0	4.8
6 children	4.8	0.0	0.0	9.5
7 and more children	1.6	2.1	6.3	0.0
Planned number of children				
3 children	59.6	47.4	83.9	82.4
4 children	28.8	33.3	12.9	17.6
5 children	7.7	12.3	3.2	0.0
6 children	3.8	7.0	0.0	0.0
7 and more children	0.0	0.0	0.0	0.0

The choice of reproductive behavior model depends on the influence of various factors. One of the key ones is moral and psychological, in particular, the formation of an ideal family image from the point of view of its childhood among young people is largely due to the widespread perception of families with different numbers of children in society.

The survey of multi-child families (mothers) "Lifestyle of multi-child families in Russia" conducted by the Department of Family Sociology and Demography of the Faculty of Sociology of Lomonosov Moscow State University (The head is A.I. Antonov) in 2007–2008 showed that with the family transition to multi-child family status, the feeling of negative attitude from others increases sharply *(Fig. 10)*.

Figure 10. Subjective feeling of changing attitudes on the part of others at the birth of another child in the family (survey of mothers with many children), %



According to: Lifestyle of multi-child families in Russia. Preliminary results of the All-Russian survey of multi-child families in 2007–2008. *Natural Birth*. Available at: http://www.naturalbirth.ru/public/chelleng.php

For instance, at the birth of the third child, 51% of the surveyed mothers with many children feel a change in the attitude of others for the worse. At the birth of the fourth child, about half of the respondents also feel the negative attitude of others. MSU researchers see the reasons for this transformation of relations in the attitudes and personal conflicts of the surrounding people themselves, as well as in parents' behavior with many children, in particular mothers, who expect hostility from the environment and thereby attract it to themselves.

At the same time, families with five children do not experience such a sharp negative attitude. The share of respondents who feel the deterioration of attitudes from others was 31%. This change is explained by the parents' ability with many children to get along with people and avoid negativity.

In our study, we have made an attempt find out, first, whether such a negative comes from the younger generation, and second, how the attitude toward families of relatives, friends, relatives will affect the formation of their own preferences among children. The survey results showed that if the birth of the first and second children is approved by young people, then the birth of the third and subsequent children does not meet with pronounced emotions (the attitude of about 60% of respondents "will not change in any way"; *Tab. 4*).

At the same time, with the birth of the next child, the negative assessment of parents' reproductive behavior increases. In the families of friends, 12.9% of respondents demonstrate a negative attitude to the birth of the fifth and subsequent children. The positive attitude is sharply reduced (from 56.0% at the birth of the first child to 27.1% at the birth of the fifth and subsequent children).

Based on this, we should note a peculiar phenomenon: modern young people tend to have more children with improved living conditions. At the same time, the increase occurs against the background of an increase in negative attitudes toward the large number of people around.

Conclusion

Summing up, it is worth noting that the reproductive attitudes of modern youth toward having many children, on the one hand, represent a number of logical and expected judgments, and on the other hand, reflect contradictory opinions regarding the multi-child family model.

So, the most popular family model in the view of modern youth is a two-child family. At the same time, almost a third of respondents would like to become parents with many children. This value is significantly higher than the current indicators of the statistics of multi-child families in Russia.

With the improvement of socio-economic living conditions and the formation of psychologically comfortable environment, modern youth is ready to implement much more optimistic reproductive plans. At the same time, the ideal family model in the view of young people differs from the desired one for the "worse" from the point of view of childhood. Moreover, almost half of the respondents already want to have more than the ideal number of children in the current conditions. The probable reason for such a contradiction may be the use of different grounds in forming students' judgments about these two issues. When answering the question about

Table 4. Changing attitudes toward families of relatives, friends, acquaintances at the birth of another child, %

	It will change for the better	It will change for the worse	It will change in no way
First	56.0	0.7	43.3
Second	50.5	1.3	48.2
Third	38.7	3.8	57.5
Fourth	28.7	8.6	62.6
Fifth and subsequent	27.1	12.9	60.0

their own reproductive plans, the whole complex of reproductive choice factors is considered including respondents' economic living conditions, parental family's experience, families of friends and relatives, dissemination of the image of a prosperous family in the media, etc. The answers about the ideal family model may be more influenced by the assessment of the economic situation in the country and the region/city of the respondents' residence in terms of possibility of maintaining and raising children. This situation can act as a deterrent to the birth of more children and make it difficult for the state to get out of demographic crisis.

In Russia, there is a significant differentiation of regions in terms of fertility (crude birth rate, total fertility rate, etc.), which, according to the research results, will continue in the future. Similar regional differences are observed in youth's orientation to having many children.

Modern students tend to "copy" reproductive behavior of their parents. However, the "depth" of having many children turned out to be less in comparison with the childhood of parental families. Young people focused on having many children tend to become three-child parents rather than have more children.

Despite their relatively optimistic reproductive plans, young people demonstrate an increase in negative attitudes toward large number of children around them. This phenomenon can be considered as a possible barrier to a more complete implementation of reproductive plans, which it is advisable to level out within the framework of state family policy. Possible reasons for the negative attitude toward the surrounding multi-child families may be a special behavior model of such parents and children in society. However, it is often formed due to the unsuitability of the environment for the life of families with a large number of children. Consequently, by changing the space, logistics schemes, making them more comfortable for large families, it is possible to reduce the negative attitude of others.

In addition, the growth of negative attitudes toward multi-child families may be caused by more active support of such families from the state in comparison with one- and two-child families. In particular, the survey revealed that despite the predominance of the respondents' approving attitude toward more active support for multi-child families, there is a statistically significant proportion of people who deny this idea and speak out for equal rights. In this regard, it is advisable, without reducing and to some extent expanding support for multi-child families, to pay more attention to the problems of other types of families, in particular with one child and two children. Of course, this is not a complete list of possible reasons for the negative attitude toward a large number of children around. This issue requires further, longer and possibly interdisciplinary study.

Thus, if the reproductive plans of modern students are fully implemented, the demographic situation in the country as a whole may improve somewhat. Trends toward having many children make it possible to maintain positive dynamics. Consequently, there are objective reasons to believe that state demographic policy programs, aimed at supporting families and increasing the birth rate, should be continued and expanded.

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Classification of Non-Political Participation Practices of Urban Youth: Forms, Motivation, Barriers

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Abstract. The article explores civic (non-political) participation practices among young people, which are understood as voluntary, public, and altruistic individual or collective actions. They are viewed as a condition for allowing young people to exercise their right to the city and are aimed at transforming urban space. The role of citizens in modern urban centres is increasing; they are becoming not only users, but also co-authors. Local activities that transform the territory in which young people live lead to an increase in their self-esteem and confidence, the acquisition of soft skills, and the formation of norms of interpersonal interaction. This study's main aim is to identify types of youth civic participation in a large industrial city. Drawing on data from an online survey (quota sampling, n = 800) of young people in the large industrial city of Yekaterinburg (Russia) conducted at the end of 2020, we suggest a typology of civic participation practices. The types were identified through the experience of participation in activities aimed at exercising a right to the city, a willingness to collaborate with other people, the degree of the institutionalisation of civic practices, and motivation to participate or not participate in civic practices. The article argues for building a constructive dialogue with government authorities to meet the needs of young people in transforming urban space. Studying specific do-it-yourself urban design practices in different cities and territories to find the most successful models for potential replication may be a promising direction for further research.

Key words: city, right to the city, civic participation, urban youth.

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Introduction

Over recent decades, the relevant research literature has focused on a wide range of issues, including urban youth participation. Young people are viewed as engineers of the future. Their engagement in the city's agenda and participation in urban life are considered prerequisites for developing urban space (Pancer et al., 2002). The importance of young voices being heard has been stressed. As actors in civic participation, young citizens are a fundamental resource in the intellectual and innovative development of a region. Their unique "mission" is to pioneer social transformation. Based on the analysis of sociological sources (Lisovskiy, 2000; Gribanova, 2012; Trotsuk, Sokhadze, 2014; Shchemeleva, 2019), civic participation is seen as a social quality of an individual, their activities aimed at transforming the environment and changing the personality itself.

The French researcher Michel de Certeau notes that, as a rule, citizen initiatives and practices are not included in urban planning and management strategies (Certeau, 1990). However, urban communities often act as a source and driving force in civic participation and attracting additional resources. Young citizens form groups, create movements, and mobilize resources to promote their ideas and projects for improving urban space.

Participation in city development gives individuals an opportunity to immerse themselves in activities that connect them with the world, which carries both individual and social significance (Nakamura, 2002). Local activities that seek to transform the territory in which young people live lead to an increase in their self-esteem and confidence, the acquisition of soft skills, and the formation of norms of interpersonal interaction.

Such activities may also increase civic competence through cooperation and discussion of key challenges and participation in public hearings. These actions enable young people to promote their interests within democratic principles (Youniss et al., 2002, p. 121).

The intensification of interactions between youth and local government, the development of dialogue with the representatives of government agencies, and the improvement of communication channels and management procedures in urban space development are conditions for making a city attractive to young proactive people who strive to change the city with their participation practices.

As such, the degree of a local government's openness to grassroots initiatives may become a critical issue. As noted by N. David and A. Buchanan (David, Buchanan, 2020, p. 9), the institutionalization of youth participation in local governance and the prioritization of such participation in city planning strategies are still low. Similarly, R. Saito (Saito, 2006, p. 69) found that young people face various barriers, including access to information resources. Other researchers emphasize a gap in civic participation between people with different socio-economic statuses (Schlozman et al., 1999). Thus, the social segregation of urban space may decrease the number of local youth initiatives. Today's youth strive to take leadership roles and participate in the life of their cities and communities, but they do not always succeed in implementing their initiatives (Mclaughlin, 2019) or fully exercising their right to the city (Lefebvre, 1996).

When transforming the city to realize their life plans and intentions, young people also themselves change, acquiring new social characteristics, roles, and statuses. Changing the city and changing themselves, young people gain social experience through learning norms and values, thus reaching social maturity.

Theoretical framework

Civic participation in the functioning, development, and management of cities is the focus of numerous discussions in the research literature (Lefebvre, 1991; Purcell, 2002; Harvey, 2008; Soja, 2010). The actions of an urban population are determined by their needs and ideas about the image of the city in which they want to live, study, work, and spend their free time. Civic participation practices are becoming an essential part of urban life (Sedova, 2014; Faehnle et al., 2017). The role of citizens in modern urban centers is increasing; they are not only users, but also co-authors. Civic participation in spatial transformations results in qualitative changes in the individual: increasing their emotional attachment to a city, the affirmation of territorial identity, and developing responsibility (Antonova et al., 2020, p. 389). Therefore, the city becomes a valuable resource for its residents.

Currently, there is a wide range of civic participation practices. We define them as voluntary, public, altruistic, and non-political individual or collective social actions. They are viewed as a condition for allowing young people to exercise their right to the city and are aimed at transforming urban space. Among the new types of civic participation, one can find do-it-yourself urban design (Gordon, 2014), 'guerrilla' urbanism (Finn, 2014), bicycle activism (Balkmar, Summerton, 2017), community gardening (Rogge, Theesfeld, 2018), and others. The performers of urban initiatives are described as "informal actors" (Groth, Corijn, 2014, p. 204), or, in emergency cases, "spontaneous volunteers" (Twigg, Mosel, 2017, p. 445). It is hardly possible to provide a complete taxonomy of such activities. Some are unique and isolated,

others have been reproduced in different places, and some are incomplete and open. These initiatives can be constructive or destructive, rational or irrational, situational (temporary) or permanent (sustainable). Thus, O. Zhuravlev (Zhuravlev, 2017, p. 129) emphasizes time as a decisive factor in the classification of such initiatives.

Practices of local civic participation act as an expression of a civic position and reflect a civic strategy of participation in the production of urban space. As M.N. Koroleva and M.A. Chernova note, "the local civic activism is the result of a conscious choice, a kind of civic strategy" (Koroleva, Chernova, 2018, p. 94). The government ignoring the needs of citizens and the "invasion" of territory "appropriated" by residents (courtyard, house, borough) are drivers for collaboration between citizens. Such associations represent the interests of citizens and strive to address local urban problems. Based on neighborhoods, the purpose of public initiative associations is to co-manage the area of residence (Evans, 2002). As Western researchers note, a friendly neighborhood as a formed communication system determines the manifestation of proactive practices: from gifts to joint social activities, which contributes to an increase in life satisfaction (Crean, 2012; Browning, Soller, 2014).

Petitions and appeals to local government, media campaigns, protests, online discussions, and mobilization are examples of traditional civic participation practices in urban development (Fisher et al., 2012, p. 28).

The existing research demonstrates that young people are the most active actors in civic participation, making a significant contribution to the city's social capital (Ginwright, Cammarota, 2007; Gallay et al., 2020). As A.A. Zhelnina (Zhelnina, 2015, p. 47) notes, Russian cities are characterized by the "intervention" of creative urban youth in improving and transforming space. Young people adapt changing realities to their needs (Zubok, Chuprov, 2019, p. 181). The city becomes a platform for self-realization and self-expression, a stage for the manifestation of youth actions (Jacobs, 1961). The participation of youth in the production of city space helps them exercise their right to the city and strengthens their agency.

Our empirical and sociological research is focused on building a typology of the practices of youth civic participation. Reviewing the works that attempt to design such a typology, we did not find any typologies substantiated by empirical data. At the same time, we should recognize that some works contain interesting ideas and provisions concerning urban residents' political participation: researchers focus on institutional and non-institutional political actions (Hooghe, Marien, 2013), individual and collective participation (Ekman, Amna, 2012), as well as offline and online practices of political activity (Oser et al., 2013; Dombrovskaya, 2020).

The project of the Center for Civic Analysis and Independent Research/GRANI (Perm) is among the studies focused on typology of civic participation (Demakova et al., 2014). The researchers have proposed an extensive list of civic participation practices reflecting current initiatives aimed at improving the lives of different social groups: protection of public spaces, local history and urban protection, protection of interest of people with special needs etc. A.A. Beksheneva and N.N. Yagodka proposed a typology of civic associations (Beksheneva, Yagodka, 2020). G. Badescu and K. Neller analyzed the reasons for civic participation that contributes to increasing trust in society and becomes a tool for inclusion in political life (Badescu, Neller, 2007). S.M.

Moskaleva and E.V. Tykanova analyzed the realization of non-governmental organizations' projects aimed at improving the urban environment in Saint Petersburg and divided them into following trajectories: delayed trajectory, fragmentation trajectory, partial implementation trajectory and initial projects' transformation trajectory (Moskaleva, Tykanova, 2016, p. 118).

In general, the research analysis of typologies of citizen participation (social, political, civic) is focused on determining the types of initiatives and drivers of their inclusion in organizations that are actors in various kinds of innovations and transformations (Van der Meer et al., 2009; Suter, Gmür, 2018), while the basis is the coincidence of the values of the participants with the values of the organization (Clary, Snyder, 1999).

The issue regarding the typology of youth civic participation has not been in the focus of sociological community yet. The proposed research will contribute to deepening and expanding the understanding of civic participation of urban youth on the basis of a typology built on the empirical data.

Methods

This empirical sociological research was conducted at the end of 2020. The focus was the youth of the city of Yekaterinburg.

Yekaterinburg is the fourth largest Russian industrial city in terms of population. On the one hand, it is a regional city, remote from the historical capitals (Moscow and Saint Petersburg). On the other, it is one of the fastest growing urban centers in the country and the largest in the Urals. The city has hosted several significant events, including international industrial exhibitions and the 2018 FIFA World Cup. Young people aged 18–30 make up 15.1% of the population, with 9% currently studying in various educational institutions. In comparison, in Russia as a whole, students make up 2.85% of the population. Yekaterinburg can be described as a youth city: this is due not only to the large number of educational institutions, but also numerous opportunities for an engaging life beyond formal education. The city strives to be a cultural, historical, creative, entertainment, political, and sports center. In this sense, Yekaterinburg provides a developed environment for the manifestation of youth activities and is open to different kinds of initiatives.

The study's main aim is to identify the motives and factors that determine civic participation among young citizens and, as a result, build a typology of youth civic participation in a large industrial city. The research goals are the following: to consider the nature of youth civic participation (individual/group); to reveal the organizational level of youth civic participation; to characterize the motivation of young citizens for civic participation; to reveal the reasons why young citizens choose not to participate in civic practices.

The data analyzed in this article was obtained by a formal online survey (quota sampling). It consisted of 25 questions (17 closed-ended questions, 4 open-ended questions, and 4 semi-closed questions). The survey was open from November 3 to December 31, 2020, and was distributed through social media, educational institutions' websites, city information platforms, urban communities, and other channels.

By the end of the survey period, 837 responses had been collected, of which 37 were rejected according to the following criteria: age discrepancy, city of residence discrepancy, low level of survey completion (a large number of missed questions, the prevalence of the answer "I find it difficult to answer"), and compliance with quotas based on gender, age, and employment. The final sample

included the responses of 800 participants aged 18 to 30; of them, 60% were girls and 40% boys. The distribution of respondents by age is as follows: up to 22 years old – 55.6%, 23–26 years old – 27.8%, over 27 years old – 16.6%. Student youth make up 50.3%, working youth 43.6%, not working and not studying 6.1%. Every fifth participant was married; 35% of respondents identified themselves as middle class. The average time taken to complete the survey was 20 minutes. The data was analyzed using SPSS and subjected to frequency, cross-tabulation, and correlation analysis to calculate a percentage, average indicators, and correlation coefficients.

Since young people from only one city were included in the sample, our findings are not intended to be representative and cannot be generalized to the level of all Russian youth. Similarly, they may not completely coincide with previous research on youth activity in different types of cities or in cities with different levels of socio-economic development. At the same time, we believe that for Russian cities with a million-plus population the types of civic participation of the younger generation may be similar. According to the Federal State Statistics Service, there are 15 million-plus cities including Moscow and Saint Petersburg in Russia, as of January 1, 2021[1].

Results and discussion

A typology for youth civic participation activities can be developed in various ways. In this article, we consider three typologies based on the fundamentals of social action: the individual or group nature of activities, the organizational level of activities, and the motives underlying participation and non-participation.

[1] The resident population of the Russian Federation by municipalities as of January 1, 2021. Available at: https://rosstat.gov.ru/compendium/document/13282

Typology 1

We used two criteria to classify youth groups in terms of the collective forms of activities: the experience of participation in activities for exercising their right to the city and the willingness to collaborate with other people in joint actions aimed at improving city life and developing urban space. At the intersection of these criteria, four distinct groups of young people were constructed.

1. Active collaborators (41.5% of the respondents) have experience of participating in developing urban space and express willingness for collective action and cooperation with other people. This group includes a slightly higher share of men, more people aged 27–30, and those who are married and have children.

2. Active individualists (7%) regularly participate in city public life but still prefer individual activities.

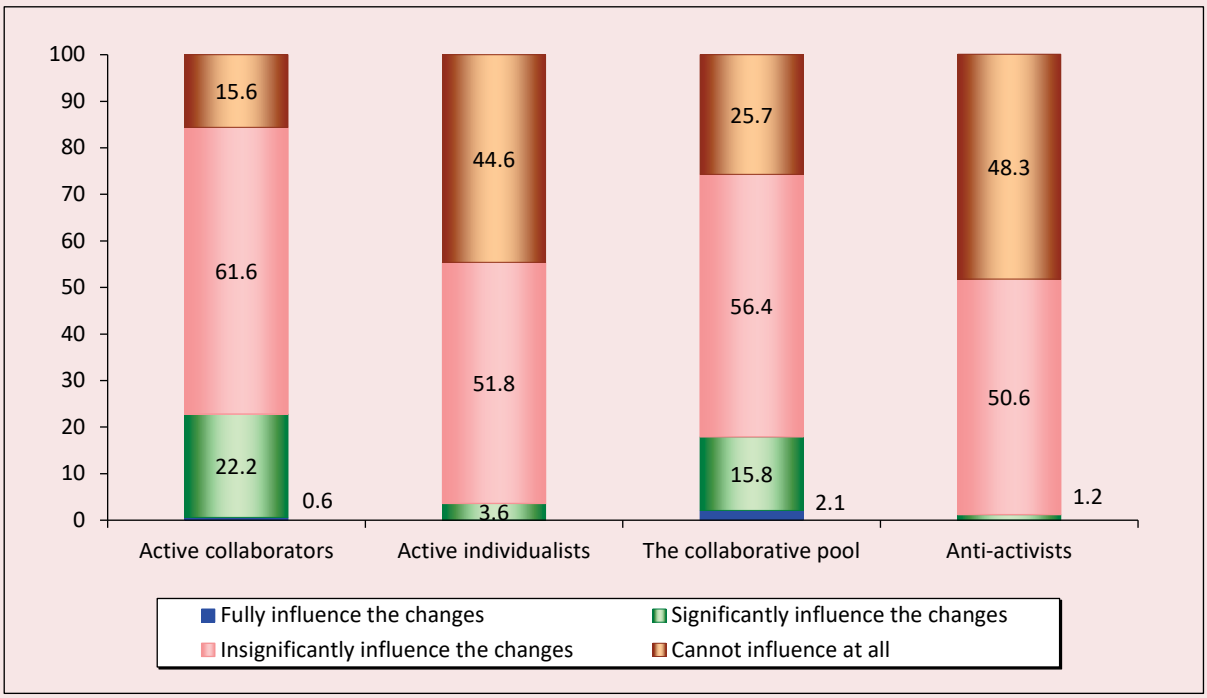
3. The collaborative pool (30%) has not yet joined in activities for developing their city but is potentially ready to cooperate with other residents.

4. Anti-activists (21.5%) have not participated and are not ready to engage in cooperation.

We have not found any pronounced differences between the socio-demographic characteristics of all these groups. Young people with absolutely identical gender, age, income, and education attributes can belong to any of the four groups. However, they differ significantly in their assessment of the role of residents in urban development. Thus, among the first type (active collaborators), 55% feel responsible for what is happening in their city and 71% – in their apartment building. Among the fourth type (anti-activists), 14% and 37%, respectively, share such a sense of responsibility.

It is also clear that the forms of civic participation are correlated with assessments of their

Figure 1. The degree of influence of different groups on city agenda, depending on the forms of activity (collective/individual), in %



Source: own elaboration.

effectiveness. Among those who chose collective forms, there are fewer people who consider such actions as incapable of influencing city life (16% among active collaborators, 25% among the collaborative pool, 45% among active individualists, and 48% among anti-activists; *Fig. 1*).

It is worth noting that although some respondents believe that residents' activities are not very effective, they do participate in such activities or are ready to do so in the future. This indicates, first, the importance of such participation and an unwillingness to be inactive, and second, their belief in the ability to change through action the attitude toward this type of activity and the potential for increasing the importance of urban youth activism. Among the surveyed, 48% took part in some kind of activity to develop urban life over the past year.

Typology 2

The second typology reflects the models of participation depending on the organizational level of civic practices. We have constructed four models.

1. Fully institutionalized forms that originate from pre-existing instruments devised by federal and local government (33% of all cases of participation in urban activities). They include written appeals, through the internet as well (13%) and oral statements in public institutions on topical issues (10%), and participation in public hearings on the development of urban space (10%).

2. Forms of citizen self-organization that are based on mutual cooperation with federal and local government (54% of the used practices). To illustrate this, young people point out participation in agreed meetings (13%), cleaning and renovating

courtyards, parks, and embankments (31%), helping the underserved population (10%), and others.

3. Fully self-organized (non-institutionalized) forms without engaging with city authorities, including within the framework of civil society institutions (73%). The most common option is participation in the activities of NGOs and non-profit organizations (25%), gathering like-minded people to address the problems of the yard, house, or part of the house (8%), and participation in various kinds of meetings (23%). These forms also include unauthorized rallies, pickets, and protests that affect urban construction, transport, and other issues (17%).

4. Non-formal online activities taking place on the Internet: on social media, in blogs, and on city forums (46% of all participation activities over the past year).

We should note that the structure of the above participation models changes with age and demonstrates a downward trend in online activity, as well as an upward trend in institutionalized practices and interest in addressing local issues (house/yard) *(Fig. 2)*.

Some respondents have experience of participating in only one type of activity. Thus, 7% participated only in cleaning and renovating the city environment, 5% only in meetings, and 12% only discussed urban problems online. According to K. Clement (Clement, 2015, p. 211), civic participation in Russia takes place through small practices and interactions. However, our research has shown that most young people combine various forms of civic participation, choosing on average three answers. Consequently, young people develop experience of participating in both situational and permanent practices. The preferred forms are non-formal offline activities, but there is also extensive cooperation with government agencies. These findings serve as a promising basis for increasing the level of trust between both parties and developing a wide range of urban residents' participation practices aimed at implementing their right to the city.

Typology 3

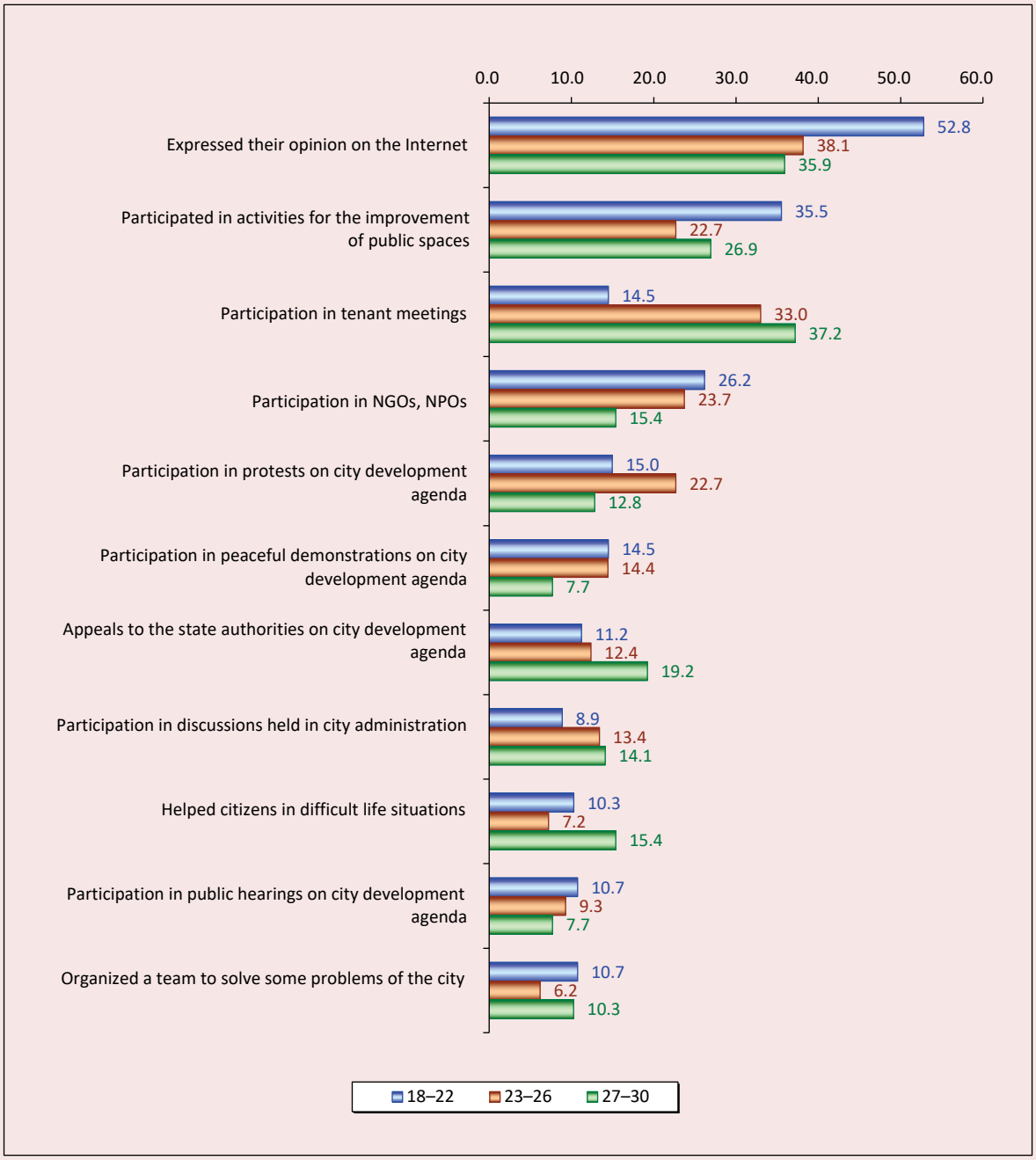
The third typology of civic participation concerns the motivation of both participants and non-participants in activities to improve urban life and space. We identified five groups of motivation factors common to these two categories and one group of motivation factors specific to non-participants. Since the purpose of civic participation is to improve the lives of citizens, three main motivation factors directly affect three levels of such improvement: the world as a whole, the city environment, and the citizen personally *(Table)*.

The first group of motives reflects the idea of improving the world as such (47% of all reasons for participation) or helping people (16%). The city here is a venue for meeting these global needs.

The second group of motives addresses the need for a comfortable living environment, an urban identity, and love for the city: 58% of survey participants strive for their city to be beautiful, clean, and modern.

Personal development and the maximum use of one's potential make up the third group of motives. On the one hand, self-interest is clearly involved when urban projects are considered a way of acquiring valuable contacts (7%), career advancement and gaining power (2%), and promoting one's ideas (7%). On the other hand, young citizens strive to make full use of their free time for public benefit (13%) and develop their personal qualities (13%).

Figure 2. Forms of civic participation depending on the age of the respondents, in %*



* % calculated on number of people who engaged in civic activity over the last year for each age sub-group

Source: own elaboration.

Typology of motives for participation and non-participation in urban activities, %*

MOTIVES FOR PARTICIPATION		MOTIVES FOR NON-PARTICIPATION	
1. Saving the world and people			
I want to help people	16	Lack of faith in the possibility of positive change	62
I want to change the world for the better	47		
2. Improving the living environment			
I want to live in a clean city	58	Lack of personal attachment to the city and city identity	12
3. Personal and career development			
I have free time that I want to use meaningfully	13	Lack of knowledge about how to influence the situation	51
I want to develop my skills	13	It may take too much time, effort, and money	33
I plan to make valuable contacts	7	Indifference and laziness	32
I want to spread my ideas	7	It is not interesting	15
I feel that I can develop personally in this area	3	Lack of necessary connections	9
I can move up the status ladder and gain access to resources and power	2	Lack of necessary skills	9
4. Alternative to government action			
The local government is unable to transform the city	34	Everything is decided by other people and the government	28
I want to represent the interests of the urban community in city management	6		
5. Communication			
I like to communicate with like-minded people	4	One can't do it alone; one needs like-minded people	31
My friends have participated	4		
6. Fears			
-		Fear of sanctions that may follow	40
		It may be dangerous	33

* % is calculated on the number of respondents to these questions. The amount is more than 100%, because each participant could name several reasons for participating/not participating in improving the urban environment.
Source: own compilation according to the results of an online survey of Yekaterinburg youth.

Of particular interest here is the fourth type of the motives, which are based on replacing the unsuccessful efforts of local government with more effective actions to address urban problems. Thirty-four percent believe that residents engage in urban activism when they understand that the city authorities are unable to transform the city, while another 6% are ready to represent the interests of the city community in urban management. In the same vein, A. Arampatzi and W.J. Nicholls found that an inability or a weak ability of the city authorities to control and address urban problems is a reason for the emergence and development of social movements (Arampatzi, Nicholls, 2012, p. 2591).

The fifth group of the motives reflects young people's critical need for communication: 8% consider collective forms of urban activism as an opportunity to spend time with friends and like-minded people.

Several distinct features have been observed in the structure of motives for non-participation in addressing urban problems. The role of motivation related to personal resources is

significantly increasing. The study's participants believe that non-participation in urban activities occurs due to a lack of required skills (9%), a lack of information on the specific ways one can influence the life of the city (51%), a lack of interest (15%), and indifference and/or laziness (32%). An additional anti-motive is the perceived significant expenditure of time, effort, and money (33%). In other words, the study's participants perceive intrapersonal reasons, i.e. low willingness to regularly practice civic participation, as the main obstacle. The role of friends who can introduce others to urban activism is growing: 31% of the respondents believe that the absence of such like-minded mediators is a significant obstacle. The motive for improving the world has retained its high importance. Thus, a lack of confidence in the possibility of positive changes and effective actions hinders civic participation among 62% of the respondents. This idea is continued by those who believe that city residents do not engage in activism since they think that ordinary citizens have little power in public decision-making; so, when they are dissatisfied with the actions of the city authorities, they are not able to influence decisions (28%).

Finally, we would like to draw attention to a specific aspect associated with fears: 33% believe that people think carrying out public activities can be dangerous, while 40% associate activism with possible adverse outcomes. This points to significant aspects in understanding the very essence of civic participation. In our opinion, there is a blurred border with political activism, which is perceived predominantly as a protest movement and leads to confrontation with the official authorities (informationally, physically, and in other ways). Equally, ideas about participation are often built on associations with individual performance and a fanatical fight for ideas by those who "have nothing else to do"[2]. Hence, one of the fundamentally essential tasks for the successful development of civic participation is raising awareness about its purpose, tasks, and forms, which, among other things, will help to remove it from the category of antisocial actions subject to authorization by the government.

Conclusions

As a result of this empirical sociological research, we have identified the following types of civic youth participation. First, based on the criterion of experience of participation in activities aimed at exercising a right to the city and the willingness to collaborate with other people, we offer the following typology: active collaborators (41.5%), active individualists (7%), the collaborative pool (30%), and anti-activists (21.5%). Second, the typology based on the level of organization of civic practices consists of fully institutionalized forms that originate from pre-existing instruments devised by the federal and local government (33%), forms of citizen self-organization based on mutual cooperation with the federal and local government (54%), fully self-organized (non-institutionalized) forms without engaging with the city authorities including within the framework of civil society institutions (73%), and non-formal online activities such as social media, blogs, city forums (46%). Third, we suggest a typology of civic participation based on young people's motivation to participate in such practices: improving the world (47%) and helping people (16%), the need for a comfortable and supportive living environment (58%), the need to communicate (8%), the need for personal

[2] Gavrilova D. Why Russians are afraid of activism and philanthropy. Available at: https://reforum.io/en/blog/2020/11/11/why-russians-are-afraid-of-activism-and-philanthropy/ (accessed: May 5, 2021).

development (13%), and constructive actions as a response to the inadequacy of government efforts (34%). Among the reasons not to participate in civic practices, a special place is occupied by the motives associated with perceived danger from participating in such activities (33%), as well as potential sanctions (40%). In general, we argue that it is important to strengthen the dialogue between authorities and young people exercising their right to the city: to increase the confidence level of young citizens in regional authorities by implementing effective ways of interaction in the course of implementation of specific projects. The presented typologies allow us to consider the phenomenon of civic participation of urban youth in different aspects and can be further used depending on the goals of theoretical, applied and empirical projects (for example, it is advisable to rely on typology 1 while creating new forms of youth participation in urban practices, and on typology 3 while creating a motivating video for youth participation).

The proposed study makes it possible to expand the modern understanding of the younger generation of a large city and its potential in civic participation. In line with the concept of the "right to the city", civic participation acts as a source and driving force for the appropriation and transformation of urban space. The identified types of youth civic participation will undoubtedly contribute to theoretical sociology and will be of interest to specialists implementing regional youth policy, as well as to practicing managers whose activities are aimed at city development. Studying specific do-it-yourself urban design practices being implemented in other cities and territories in order to find the most successful models for potential replication may be a promising direction for further research.

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Dynamics of Reading Habits of Modern Russian Students: A Sociological Analysis

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Abstract. The features of reading habits and their transformation are the subject of interdisciplinary scientific analysis, as well as of a broad public discussion about the effective response of the Russian state to the challenges of a technogenic society. The areas of sociological reflection on this phenomenon are quite broad, such as the reading crisis, interest in books, the impact of globalization, e-books and other electronic formats for reading. Sociological analysis allows finding answers to questions about the state and features of reading habits as a component of social capital, the social quality of specific geographical, social and demographic groups. Bookishness (love and respect for books) is an important feature of the Russian mentality, an indicator of socio-cultural continuity, which is why the study of reading habits of modern Russian students' culture acquires particular relevance. This article presents the results of a sociological research conducted in Astrakhan and Volgograd (2016, 2019), as well as in Moscow (2019). These empirical studies provide insights into the main trends in the dynamics of the reading habits of modern Russian students, and help to conduct a comparative analysis of these habits of Russian cities' students, among other things in terms of socio-cultural space levels (the "core – periphery" coordinate system). We identified the dominance of the axiological component of reading habits; determined that classical literature is the basis of the content structure of reading; noted that the frequency of reading habits falls with decreasing population of the settlement – people read more in Moscow, less in the province. We think it would be promising to use the results and conclusions in monitoring studies and sociological projects on similar topics in other regions, and to continue studying the obtained results in the framework of interdisciplinary analysis.

Key words: reading habits, book culture, youth, students, digitalization of society.

Introduction

The research interest in the analysis of reading habits of students is associated with the awareness of large-scale transformation processes, which cover various spheres of book and reading existence: the status of books, the value status of reading as a result of changes in the role relationship between author and reader in the era of the formation of technogenic civilization are being revised; reading strategies are being transformed due to the appearance of new book formats (e-books, audio books) and the increasing popularity of electronic communication forms (Ageeva, 2019). Reading habits in this situation are to be understood as "culturally accepted (traditional/new) ways and skills of dealing with books and other printed and electronic artifacts" (Kolosova, 2014, p. 69).

Reading habits as an actual social phenomenon are investigated by means of sociology. Sociology treats reading as a social practice, studies its role in shaping the spiritual world of an individual, analyzes the nature and essence of reading interests and needs (Vorontsov, 2009; Wood et al. 2006). Reading, on the one hand, is interpreted as a cognitive-communicative activity that changes the consciousness of a social subject (Smith, 1995). For example, a direct relationship between reading comprehension and emotional intelligence has been confirmed (del Pilar Jiménez et al., 2019), as well as between reading pleasure and reading comprehension (Rogiers et al., 2020). On the other hand, reading can be seen as work on active, purposeful transformation and subordination of text content to the needs of a social subject (Mironova, 2003).

Researchers use the concepts of "reading culture", "reader's culture" (Plotnikov, 1999),

"book culture" (Paichadze, 2000). In this context, reading habits can be interpreted as components of human culture, an important mechanism for preserving the Man of Culture. Sociological research shows a decrease in the intensity of reading habits and interest in reading, the presence of a "reading crisis", which has a negative impact on the state of society (Vorontsov, 2009; Kalegina, Kormishina, 2018; Maksimova, Garas, 2017, Seliverstova, 2012; Stefanovskaya, 2007; Chernova, 2013). This situation is probably due to the fact that the nation's classic literary heritage has been universally "set upon by Western consumerism, a system embodied in the instant gratification of momentary pleasures, from the McDonalds to the TV series" (Hutchings, 2004).

We should recall that bookishness, respect for books is a feature of the Russian mentality, so the preservation of book culture is one of the fundamental responses of Russian society to the challenges of unifying globalism of a technotronic civilization. This issue is becoming a significant, national problem, requiring both the attention of the authorities and the adoption of volitional managerial decisions. In 2011 Russian President V.V. Putin, speakung at the congress of the Russian Book Union noted: "For a long time we have been one of the most reading countries in the world. I have to say bluntly: there is a danger that we can squander that status. According to sociologists, the number of people who do not read books – neither paper nor electronic – is growing. In the interests of the country, its future, we will revive people's need for books..."1. In 2017 he endorsed the idea of promoting children's literature and recalled that in the 1990s, which were the childhood of those who are now becoming parents, little attention was paid to reading. "Today, the competition for the person, for the soul, for the attention of the young especially, is very big, I think, insane. The Internet makes it possible to get anywhere with one click", remarked the president2. And in 2020, V.V. Putin called for the promotion of book reading3.

Thus, the study of reading habits becomes fundamental in the context of analyzing the preservation of the national socio-cultural code. A number of researchers note that in the modern world there is the existence of a trend of rapid revival of interest in books and reading. According to S. Kurschus, "book culture, books as media and their benefits have never been reflected or discussed as intensely as today – paradoxically, it is the digital media revolution that has generated an increased interest in the printed book and its future. The faster such cultural changes occur and the more people feel threatened by the loss of their cultural and individual identity, the more they will cling to traditional values and symbols of those values. The printed book is one of these symbols". (Kurschus, 2015).

As T.A. Kalugina noted in 2014, Russians have been reading more books in recent years (Kalugina, 2014). In 2017, according to the results of an online survey conducted by the international market research institute GfK, Russia was in the top three most reading countries in the world in terms of the amount of time spent on reading. But it is still too early to talk about a way out of the reading crisis, because the intensity of reading practices in terms of the number of books read is significantly inferior to the level recorded a few decades ago (Zubova, 2018, p. 32). In addition, the emergence of new ways of reading urges researchers to look into such characteristics of the reading crisis as functional illiteracy, problems of understanding, perception, memorization, and reproduction of the text. Therefore, when studying reading habits, it is very important to study the reader's strategies for

[1] Available at: http://www.interfax.ru/culture/209820.

[2] Available at: https://rg.ru/2017/09/01/reg-cfo/putin-prizval-chitat-knigi-i-slushat-klassiku.html.

[3] Available at: https://www.sostav.ru/publication/vladimir-putin-prizval-reklamirovat-chtenie-45832.html.

choosing paper or electronic or digital media, and the reasons and consequences of these choices.

The need for sociological analysis of the reading habits dynamics under the influence of technogenic challenges, leading to the transformation of not only traditional, but also new reading formats, is actualized. G.M. Ageeva notes: "The paper book is indeed being superseded by the electronic book. One often hears that it is the future. But this does not mean that the book in its new electronic form will retain its former "status". (Ageeva, 2019, p. 182).

New reading formats will continue to evolve as long as paper books remain the most important, trustworthy technical means of storing and transmitting information, and book culture as a traditional form of culture remains one of the mechanisms for the formation of social identities. At the same time, the new form of culture – electronic one – is still in its formative stage and has the features of protoculture (Solov'ev, 2010). It does not offer a holistic picture of objective reality (Bollie, 1994), which makes it possible to actualize traditional forms of culture and reading habits.

The turbulence of cultural forms leads to heterogeneity of reading habits due to belonging to a particular socio-demographic group, financial situation, level and quality of education, access to traditional / new media, characteristics of the socio-cultural space, gaps in the socio-cultural space of the country. This actualizes the study of different levels of socio-cultural space, for example, in the core – periphery coordinate system. Sociological analysis also allows determining the characteristics of reading habits at different levels of socio-cultural space, which creates the basis for more effective management of book culture development processes in individual regions. As part of this analysis, it is possible to study the characteristics of the book culture of specific regions as a system of values and associations, reflecting the features of native speakers' consciousness, their ethno-confessional and territorial affiliation (Gil'yaminova, 2016; Chernienko, Kurnikova, 2015).

There is considerable heterogeneity in reading habits, including those among students (Dulina et al., 2017). Although the topic of bookishness, reading books as a fashionable hobby is actively discussed in blogs and social networks, which indicates that it is in demand among the younger generation. VCIOM data show that young people read more than other age groups, although the number of books read is significantly lower than a few decades ago. We can talk about "a tendency toward extended reproduction of reading habits: the prevalence of young people reading compared to their parents and family members has been revealed" (Kalinchuk, 2019). A. Kendall notes, that there is a stereotype that young people are often seen as passive, uncritical consumers of low-quality texts, who rarely read for pleasure and prefer magazines and television to books. In fact, the reality of young people's reading habits is more nuanced, complex, and dynamic (Kendall, 2008). The study of this reality is of particular interest for further modeling and predicting the dynamics of various spheres of society, including inculcating of spiritual and moral values and guidelines. After all, students are the vanguard of society, on which the future of the country depends.

The purpose of the study is to conduct a sociological analysis of the dynamics of the reading habits of modern Russian students.

In order to implement the purpose of the study it is necessary to solve the following ***tasks:***

1) based on the results of a specific sociological research to study the dynamics of value-reflexive attitude to books and reading as a traditional component of the mentality, social capital of the individual, specific social groups in Russian society;

2) to reveal the dynamics of reading strategies (amount of reading, structure of reading preferences, choice of traditional/new reading formats) in the context of turbulent cultural forms;

3) to conduct a comparative analysis of reading habits dynamics among students in Russian cities representing different levels of socio-cultural space in the core – periphery coordinate system. The core is seen as more involved in global information flows, which can help it adapt to the challenges of the big society. The periphery's exclusion from the "nodes" of global information flows can lead to the archaization of its socio-cultural space. But the core, as a carrier of innovation, faces threats of destruction of the traditional socio-cultural code to a greater extent than the periphery.

Research methods

In order to analyze the dynamics of students' reading habits, the results of the author's sociological study "Circle of reading fiction by Russian students" were used. We consider reading fiction to be the core of reading habits, since it is fiction that represents one of the main means of forming an idea of national culture and reflects the features of national, cultural and linguistic development (Poelueva, Indrikova, 2020; Borodaeva, 2012). Classical texts of fiction continue to fulfill the most important cultural and civilizational mission in the media socialization of modern youth to this day (Poelueva, Indrikova, 2020).

The method of collecting primary information was a questionnaire survey. The first wave of the study took place in February 2016 and covered students of universities in Astrakhan (N = 400) and Volgograd (N = 400), among whom 78.2% were students of technical specialization, 11% – socio-economic, 2.6% – humanities, 1.3% – natural sciences, and 6.9% did not indicate their specialization (results of the first wave, see, for example, Dulina et al., 2017). The second wave was implemented in June 2019 in Moscow (N = 2100), Volgograd (N = 460) and Astrakhan (N = 400). The participants included students of different professional training profiles: technical sciences – 32.8% of respondents, natural sciences – 5.9%, social-humanities – 23.7%, management sciences – 8.1%, economic sciences – 19.2%, legal sciences – 5.4%, military sciences – 0.4%.

The main thematic blocks of the set of tools that meet the objectives of the study: 1) value-reflexive attitude to books and reading (self-assessment as a Reader of fiction, self-assessment of the volume of reading fiction, the purpose of reading fiction; attitude to books and reading as a value of modern civilization, the transformation of its functions in terms of informatization); 2) reading strategies (channels for obtaining fiction, sources of information about new fiction, technical channels for reading fiction; 3) readers' preferences (genre preferences, works of fiction read over the past year, identification of a favorite work of fiction, a favorite fictional protagonist, choice of a protagonist for a personal meeting with an explanation of the reasons for the choice).

The choice of regions for analysis corresponds to the objectives of the study: Moscow is positioned as the core, included in the global information space; other regions are defined in terms of periphery, but it is assumed that the level of their periphery will be different. The Volgograd Oblast, where the administrative center is the city with population exceeding one million, Volgograd, tends more toward the core; the Astrakhan Oblast, where the administrative center, Astrakhan, has just over 500,000 inhabitants (534,241 as of January 1, 2019), demonstrates a much greater degree of peripherality. We analyzed the dynamics of the reading habits of students in Astrakhan and Volgograd, and compared the results of the study in the cities, representing different levels of socio-cultural space in the core – periphery coordinate system.

The study was of a probing nature, the task of representing the sample was not set, so the immediate results we obtained can be applied only to a targeted sample of surveyed students, or be used as a reference data. However, the total number of students interviewed allows making reasonable

assumptions, formulate working hypotheses, and draw general conclusions. They will undoubtedly be in demand by specialists in the field of education in similar future studies. The array of obtained data was processed using Vortex (2016) and SPSS (2019) software packages.

Research findings

Structural elements of readers' habits, in our opinion, are value-reflexive attitude to books, self-assessment as a Reader, motives for reading fiction. It is these elements that determine the value meaning of reading activity and the degree of involvement in those layers of spiritual culture, which have a direct influence on the formation of the individual's worldview and behavior, find expression in the moral consciousness and social practice of people (Borodaeva, 2012).

In this sense, an important indicator is the distribution of answers to the question "What category of people do you consider yourself to be?" *(Tab. 1)*. As we can see, in the assessment of the parameters of reader activity in 2019 the leading position is "I like to read and I read fiction with pleasure", while in 2016 this position was comparable in the proportion of choices with the positions "I read fiction when I have no other way to spend my leisure time" and "I read fiction only when necessary". In Moscow the greatest proportion of those who like to read (53.5%) was recorded, but the proportion of book lovers has also increased in the cities of the Lower Volga Region. The proportion of those who read out of necessity, on the contrary, decreased, to a greater extent in Astrakhan.

The leading position "I don't read much, but I'd like to read more" remained unchanged when answering the question "How would you rate your own reading of fiction?" (Tab. 2). In our view, it indicates that in all of the cities represented in the study reading is perceived by students as a value orientation – not only can they appreciate their involvement in reading as a practice, but in most they express a desire to develop their reading skills. It is noteworthy that most of these self-critical respondents were in Moscow. In 2019, Moscow led in the number of respondents who read a lot. Astrakhan, on the contrary, topped the anti-rating; it has the largest number of respondents who do not read much, but enough for themselves (and their proportion has grown since 2016).

In addition, this result may reflect bookishness as a traditional feature of Russian mentality, which is evident in half of the respondents. But there may be other explanations, namely saturation of student

Table 1. Answers of respondents to the question "What category of people do you consider yourself to be?", % of respondents

Respond options	2016			2019			
	Astrakhan	Volgograd	Total	Astrakhan	Volgograd	*Moscow*	Total
I love to read and I read fiction with pleasure	30.3	32.0	30.3	39.3	36.8	*53.5*	49.0
I read fiction when I have no other way to spend my leisure time	30.8	32.5	32.0	32.0	28.4	*22.6*	24.8
I read fiction only when necessary	27.6	26.3	27.4	22.3	24.3	*16.0*	18.2
I don't read fiction at all	8.2	7.6	7.9	5.1	7.5	*4.7*	5.2
Hesitate to respond	1.4	1.1	1.2	1.3	2.8	*2.9*	2.6
Refusal to respond	1.7	0.5	1.2	0	0.2	*0.3*	0.3
Total	100	100	100	100	100	*100*	100
Source: own compilation.							

Table 2. Answers of respondents to the question "How would you rate your reading of fiction?", % of respondents

Respond options	2016			2019			
	Astrakhan	Volgograd	Total	Astrakhan	Volgograd	Moscow	Total
I read a lot	7.5	7.0	7.1	10.7	7.7	*16.0*	14.0
I don't read much, but enough for myself	23.6	26.6	25.0	28.4	22.6	*20.0*	21.5
I don't read much, but I'd like to read more	45.2	46.1	45.8	44.9	49.0	*50.7*	49.7
I don't read much	18.8	15.7	17.3	15.5	18.1	*10.7*	12.5
When I finish studying, I'll quit reading	1.9	0.5	1.2	0.5	1.5	*1.0*	1.0
Hesitate to respond	2.2	1.1	1.6	0.0	0.6	*1.3*	1.0
Refusal to respond	0.8	3.0	2.0	0.0	0.4	*0.3*	0.3
Total	100	100	100	100.0	100.0	*100.0*	100.0
Source: own compilation.							

life areas. Therefore, reading does not take priority in the daily routine, which is also typical of students from other countries due to the intensity of classes, busy social life, and other factors (Erdem, 2015).

The analysis of the goals of reading fiction shows that among the students of Astrakhan since 2016 the proportion of the answers "preparing for classes", "information", "learning about the world around us", "pleasure" has increased *(Tab. 3)*. Overall, according to those surveyed, in 2016 students were most likely to read works of fiction for information and to prepare for classes, while in 2019 the priority goals were to get information and read for pleasure. Moreover, among students of Moscow universities in the hierarchy of reading goals, the option "preparing for classes" takes only the fifth place, whereas in Volgograd and Astrakhan – the first and second, respectively. In Moscow, the option "reading for self-education" is a higher priority, although in the cities of the Lower Volga Region the proportion of choices has increased. We should note that the demand for the educational ("self-education") function of reading activity is an indicator of the educational process efficiency in terms of the adequacy of the created conditions for individual and personal development. In a daily or weekly routine, Moscow university students also find more time to read for pleasure or leisure.

Table 3. Distribution of students' answers to the question "For what purposes and how often do you read fiction?", % of respondents who chose the answer option "once a day and more often" / ranks

Respond options	2016			2019			
	Astrakhan	Volgograd	Total	Astrakhan	Volgograd	*Moscow*	Total
Information	25.5/2	26.6/1	25.9/2	35.5/1	25.2/2	*31.4/1*	31.0/1
Pleasure	18.0/5	22.5/4	20.2/4	25.6/3	24.5/3	*31.1/2*	29.3/2
Preparing for classes	27.6/1	24.9/2–3	26.5/1	32.7/2	25.8/1	*27.0/5*	27.6/3
Self-education	18.5/3–4	14.6/6	16.8/5	24.1/4	21.5/4	*28.1/3*	26.6/4
Leisure time and entertainment	18.5/3–4	24.9/2–3	21.6/3	21.6/5	20.4/5	*27.8/4*	25.8/5
Self-development and self-understanding	13.5/6–7	16.0/5	14.6/6	15.2/7	15.5/6	*24.3/6*	21.7/6
Learning about the world around us	13.5/6–7	13.0/7	13.3/7	18.0/6	14.0/7	*18.9/7*	18.0/7
Average	**19.3**	**20.4**	**19.8**	**24.7**	**21.0**	***26.9***	**25.2**
Source: own compilation.							

The least demanded is the cognitive function. Less and less books are read for learning about the world around us, for self-development and self-understanding. Although in the not too distant by historical standards, the Soviet past, the notion of the prevailing social function of reading was ingrained: "Reading is not entertainment, but education and enlightenment" (Kalegina, Kormishina, 2018, p. 128). In the modern world, the main sources of information are most often social networks, various Internet resources, saturated with simulacra and in many ways alienating from the knowledge of the real, physical world of nature, the self, and sociality.

The intensity of comprehension of all purposes of reading fiction is the highest among students of Moscow universities. This result increased by 5.4% among Astrakhan students, while among Volgograd students it remains within the statistical discrepancy.

As for the dynamics of the value-reflexive attitude toward books, the proportion of respondents who consider books a source of spiritual development and those who believe that the art of reading should be taught has increased *(Tab. 4)*. At the same time, the proportion of students who fully agree with the statement "A book is a means to improve the educational level" decreased. The influence of electronic culture was manifested in the growing number of respondents who believe that e-books will replace paper books, and that the home library is no longer a necessity. In 2019, the proportion of those who strongly agree that the home library is no longer a necessity was 17.8%, 23.7% chose the answer option "rather agree", 18.9% – "rather disagree", 17.4% – "strongly disagree", and 20.9% hesitated to answer. That is, more than a third believe that a home library is necessary, every fifth hesitates to respond, and more than 40% believe that it is not necessary. We should note that according to VCIOM data for 2018, "87% of Russians have a home library, but of varying sizes. Small libraries with less than 100 books prevail (44%), they are more common among young people from 18 to 24 years old (57%). The largest libraries with books more than 1,000 pcs have the older generation from 60 years old (8%)" (Zubova, 2018, p. 33).

We also analyze the dynamics of students' reading strategies in terms of their choice of technical channels, sources of obtaining fiction, and sources of information about new fiction.

It is worth noting that the proportion of references to all the sources of access to texts of fiction presented in the questionnaire: the Internet, bookstores, home and public libraries, friends, colleagues, acquaintances, who make up the

Table 4. Students' value-reflexive attitude toward books, % of respondents who chose the answer option "Strongly agree" when answering the question "Do you agree with the following statements?"

Respond option	2016			2019			
	Astrakhan	Volgograd	Total	Astrakhan	Volgograd	*Moscow*	Total
A book is a means to improve the educational level	73.3	65.3	69.3	65.7	59.8	*61.6*	61.8
A book is a source of spiritual development	58.4	52.0	55.2	60.9	59.1	*59.1*	59.4
The art of reading should be taught	19.0	13.0	16.0	36.8	34.0	*32.4*	33.2
A book is a source of aesthetic pleasure	32.9	29.0	30.9	36.8	30.1	*29.1*	30.3
E-books replace paper books	13.7	12.7	13.2	19.3	20.2	*17.3*	18.0
Home library is no longer a necessity	10.8	14.4	12.6	18.3	18.3	*17.6*	17.8
Source: own compilation.							

Table 5. Answers of respondents to the question "Where do you get books to read?", % of respondents

Respond options	2016			2019			
	Astrakhan	Volgograd	Total	Astrakhan	Volgograd	*Moscow*	Total
I get them from the Internet	55.0	66.7	60.1	73.0	77.6	*65.3*	72.2
I buy them	21.2	20.1	20.5	39.6	40.6	*61.6*	47.3
I have a large library at home	22.6	24.9	24.2	33.1	28.8	*40.9*	34.3
I take them from friends, relatives, etc.	15.6	13.0	14.2	23.2	24.9	*29.6*	25.9
I go to the library	20.0	17.9	19.6	25.3	25.2	*18.9*	23.1
Average	**26.9**	**28.5**	**27.7**	**38.8**	**39.5**	***43.3***	**40.6**

Note: the sum of the responses exceeds 100%, as it was possible to give more than one response.
Source: own compilation.

interpersonal circle of communication has significantly increased *(Tab. 5)*. On average, the intensity of the practice of receiving or acquiring works of fiction is highest among university students in Moscow. They are more likely than students in the Lower Volga Region to buy books, turn to their home library, relatives, and acquaintances, but less often to the Internet and the public library. Most likely, the influence of material status on reading strategies manifests itself here. And book culture under these conditions of social stratification can acquire features of elitism.

According to the results of our study, the main sources of information about new works of fiction are the Internet, relatives and friends, which correlates with the results of other studies of students' reading habits (see, for example, Akulich et al., 2018, p. 45; Pimenova, Khakimova, 2018, pp. 182–184). But the study of this issue in dynamics shows a significant increase in the intensity of reference to such sources of information about new works as the Internet, friends, teachers, relatives *(Tab. 6)*. It is also noteworthy that students in Moscow more often turn to friends and relatives than students in Astrakhan and Volgograd; Volgograd students somewhat less often turn to friends and relatives and much less often to university professors.

Table 6. Answers of respondents to the question "From what sources do you mostly get information about new works of fiction?", % of respondents

Respond options	2016			2019			
	Astrakhan	Volgograd	Total	Astrakhan	Volgograd	*Moscow*	Total
Internet	68.8	75.9	71.7	85.1	85.2	*84.1*	84.8
Friends	36.5	35.2	35.8	53.5	49.9	*65.1*	56.2
Lecturers	20.9	22.2	21.7	36.4	23.7	*33.4*	32.4
Relatives	14.2	15.2	14.7	21.2	18.9	*28.9*	23.0
TV	9.1	9.2	9.6	9.1	9.9	*7.8*	8.9
Newspapers, journals	5.3	5.1	5.4	5.3	6.5	*8.0*	6.6
Librarian	2.4	1.9	2.2	4.8	4.3	*3.3*	4.1
Radio	1.9	2.7	2.5	3.3	1.5	*3.1*	2.6

Note: the sum exceeds 100%, as it was possible to give more than one response.
Source: own compilation.

When answering this question, respondents could give their own answer. Among the responses received in this way were the following: "I only read fanfiction", "From book stores", "I go shopping and if a book interests me by its cover, title and abstract, I take it", "Books on universes are of interest to me", "I don't get information on new works", "I don't read and I am not interested in new fiction", "I don't read new works. I like classics: Tolkien, Defoe, Twain", "I don't read books published less than 30 years ago, with some exceptions", "I just go to bookstores. Also, sometimes on the back of a book there is some information about cool books from other series", "My boyfriend has a good social circle, they can always advice me a good piece of work. For example, I recently read Dale Carnegie, and now I am reading George Peterson's just-translated *12 Rules for Life*"[4].

When analyzing reading practices, it is important to examine strategies for choosing paper or electronic media. Thus, a comparative analysis conducted by other authors shows that reading speed does not depend on the format, while understanding cause-and-effect relationships and memorization is more effective using paper books (Singer, Alexander, 2017; Clinton, 2019). At the same time, young people are well aware of increased fatigue, decreased concentration when reading from a screen, and that text on paper is remembered faster and better than on electronic media (Lebedeva et al., 2020; Li et al., 2011; Baron, 2013). Research results also show that when reading a complex and long academic text (which is important when interpreting our results), preference is given to a paper-based media, while for short and entertaining one – digital media (Kurbanoğlu, Špiranec, Grassian, Mizrachi, Catts, 2014).

The results of our study to examine the picture of reading strategies in relation to the choice of format for acquaintance with the work of fiction remains unchanged: about half of student youths acquainted with the full text of a fiction work on paper, every three-fourth – on electronic media *(Tab. 7)*. This correlates with the results of other empirical studies of students' reading habits, according to which approximately one in three people prefers an e-book (Anisina, 2016; Drozhina, 2011, 113). One in five does not read the full text,

Table 7. Answers of respondents to the question "What sources do you use for reading works of fiction?", % of respondents

Respond options	2016			2019			
	Astrakhan	Volgograd	Total	Astrakhan	Volgograd	*Moscow*	Total
The full text of a work of fiction on paper	52.2	46.3	49.6	47.5	45.2	*55.9*	53.1
The full text of a work of fiction on electronic media	26.2	33.6	29.7	33.2	34.4	*25.1*	27.6
Excerpts from the text in a chrestomathy	1.0	1.9	1.3	2.5	1.1	*2.3*	2.2
Summary of a work of fiction	11.3	9.2	10.2	9.1	10.8	*8.1*	8.6
Adaptation of a work of fiction in the cinema or on the TV	7.2	6.5	6.7	7.4	7.1	*6.5*	6.7
Staging a work of fiction in the theater	2.1	2.5	2.5	0.3	1.5	*2.2*	1.8
Total	100	100	100	100	100	*100*	100
Source: own compilation.							

[4] In the respondents' editorial.

but only reads fragments from the textbook and a summary of the work, and prefers screen adaptations and theatrical productions. In general, there is a preference for paper books, which correlates with the results of other empirical studies (Asfandiyarova, 2019; Drozhina, 2011; Maslenkova, 2015; Woody et al., 2010).

According to the results of our study, as in other empirical studies (Schijns, Smit, 2010), girls are more likely than young men to choose the full text of a fiction work on paper. Whereas young men are more likely to prefer the full text on electronic media, digests, and film version. Among university students in Astrakhan, the proportion of those who read the full text of a fiction work on paper has decreased. In 2019, the proportion who chose this answer option in Moscow is much higher than in Astrakhan and Volgograd. While among Astrakhan residents there are more of those who prefer the full text of a work of fiction on electronic media.

In the structure of reading habits, we can identify a content component – reading preferences in the choice of books of fiction by genre, specific authors. When analyzing the dynamics of this component, we can note some changes in the structure of reading preferences of fiction genres *(Tab. 8)*. Works of classical literature are most read in Moscow, while in Astrakhan and Volgograd people are still interested in fantasy. Among all respondents, interest in crime fiction has increased, and most of all among Astrakhan residents. Approximately every third of all respondents continue to read adventure novels. Interest in psychological novels has increased significantly in all cities, with the greatest preference

Table 8. Answers of respondents to the question "What works of fiction do you prefer to read? (more than one answer is possible)", % of respondents / ranks)

Respond options	2016			2019			
	Astrakhan	Volgograd	Total	Astrakhan	Volgograd	*Moscow*	Total
Works of classical literature	37.7/2	36.9/3	37.2/2	35.1/3	37.4/2	*51.3/1*	41.3/1
Fantasy	40.9/1	41.7/1	41.0/1	40.2/1	41.3/1	*29.3/6*	36.9/2
Crime fiction	25.5/5	34.1/5	29.9/5	34.8/4	36.8/3	*37.2/2-3*	36.3/3
Adventure novels	36.8/3	34.7/4	35.5/3	38.4/2	30.1/6	*33.9/4*	34.1/4
Psychological novels	21.9/8	22.0/7	21.5/8	28.0/6	26.9/7	*37.2/2-3*	30.7/5
Science fiction	25.0/6	40.9/2	32.0/4	32.6/5	34.0/4	*24.7/8*	30.4/6
Romantic novel	31.3/4	16.5/9	23.8/7	25.8/7	30.8/5	*32.6/5*	29.7/7
Drama	22.8/7	25.5/6	23.9/6	19.2/8	21.7/8	*25.1/7*	22.0/8
Comedy	20.7/9	19.5/8	20.1/9	16.7/9	20.9/9	*18.3/9*	18.6/9
Thriller	9.9/14	13.0/11	11.4/14	15.7/10	16.1/10	*13.6/13*	15.1/10
Poetry	13.7/13	11.9/13	12.5/12	12.1/11	15.7/11	*16.8/11*	14.9/11
Historical fiction	17.8/10	12.2/12	14.7/10	10.1/16	12.9/12	*18.1/10*	13.7/12
Humorous literature	14.4/12	14.4/10	14.2/11	10.6/14-15	12.7/13	*14.8/12*	12.7/13
Epic novel	8.9/15	8.9/15	8.8/16	10.9/13	11.0/15	*12.1/14*	11.3/14
Folklore, fairy tales, mythology	16.1/11	7.3/16	11.9/13	10.6/14-15	11.4/14	*11.6/15*	11.2/15
Action	7.0/16	11.1/14	9.0/15	11.4/12	9.2/16	*4.9/18*	8.5/16
Plays	5.0/17	5.4/17	5.2/18	6.8/17	6.9/17	*8.1/17*	7.3/17
Memoirs	4.3/18	6.8/17	5.4/17	3.5/18	5.6/18	*8.7/16*	5.9/18
I don't like to read	2.6	1.6	2.1	3.8	3.4	*2.6*	3.3
Source: own compilation.							

for this genre in Moscow. Astrakhan residents interest in science fiction has increased, while in Volgograd the situation is opposite. The audience for romance novels in Astrakhan decreased, while in Volgograd it doubled. Among Astrakhan residents there was a slight increase in interest toward thrillers, but a decrease in interest toward folklore. Results of our analysis of the structure of reading preferences correlates with the results of N.V. Kalinchuk's empirical research, according to which foreign and Russian classics rank first in popularity among students, about half read fiction, every third reads crime fiction, every fourth reads romance novels and fantasy (Kalinchuk, 2019, p. 26).

Students also answered open-ended questions: "What is the author and title of three works of fiction that you have read this year?" and "What is your favorite work of fiction? (Write the author and title)". It is worth noting that when we asked 2,960 students about works read over the past year, 1,750 students named three works, 1,880 students named two works, and 2,070 students – one work, which is 59%, 63%, and 70% of the total number of respondents, respectively. This question thus received 5,500 responses. The favorite work of fiction was named 2,140 times, which is 72% of the number of responses. Thus, the proportion of active readers and big fans of fiction is almost identical. During the analysis the answers to open-ended questions were grouped by genre *(Tab. 9)*.

The most read authors are Leo Tolstoy and Fyodor Dostoevsky (5.6% and 5.1% of the answers, respectively). The works of Mikhail Bulgakov, Aleksandr Pushkin, and Nikolay Gogol over the past year gained 3.9%, 3.1%, and 1.6% of respondents' answers, respectively, and these Russian writers are also among the most famous and most read. In general, when answering the question about the works read during the last year, the national literary classics were recorded in every third of the presented answers. The most read works were *The Master and Margarita, War and Peace, Crime and Punishment* (3.9%, 2.5% and 1.3% of answers respectively).

Russian classics in the list of favorite works makes up 46.1%. The authors of the most favorite works are Mikhail Bulgakov (11%), Leo Tolstoy (6.9%), Fyodor Dostoyevsky (6.3%), Aleksandr Pushkin (4.5%), Mikhail Lermontov (2.4%), Nikolay Gogol (2.3%), Ivan Turgenev (0.9%), Aleksandr Griboyedov and Anton Chekhov (0.8% each). Among the most favorite works the first three places are *The Master and Margarita, War and Peace*, and *Crime and Punishment*.

It is notable that in the list of the most read works foreign classics are as popular Russian classics (36.2% and 33.6% of responses, respectively). The most popular authors were Erich Maria Remarque (5.2%), Ray Bradbury and Stephen King (2.6% each), Jack London (1.6%), Francis Scott

Table 9. Distribution of students' answers by genre preference (% of all answers)

Genres	"Name the author and the title of THREE works of fiction that you have read this year"	"What is your favorite work of fiction?"
Russian classics	33.6	46.1
Foreign classics	36.0	32.2
Books about war	8.5	5.6
Science fiction	6.0	2.4
Anti-utopia	5.8	4.9
Horror	3.0	1.8
Fantasy	3.9	5.5
Crime fiction	1.9	2.5
Source: own compilation.		

Fitzgerald and Jane Austin (1.1% each), father and son Dumas (1%). The most read books of foreign classics were the works of Erich Maria Remarque. One of them, *Three Comrades*, scored more than 1% of responses (1.7%).

Every third respondent listed as favorite works of foreign classics. Among the most favorite writers are Erich Maria Remarque (3.4%), Ray Bradbury (2.3%), the Bronte sisters and Oscar Wilde (1.9% each), Stephen King (1.7%), Francis Scott Fitzgerald (1.6%), Father and Son Dumas (1.4%), Jack London (1.2%), John Tolkien (0.8%). Most like *Pride and Prejudice, Three Comrades* and *Martin Eden*.

The questionnaire included the question "What fictional character would you like to meet in real life and why?" There were 869 detailed answers to this question. Among the most popular characters were characters from both Russian and foreign classics: Sherlock Holmes, Woland, Rodion Raskolnikov, Evgeny Bazarov, Grigory Pechorin, Behemoth, Alexander Chatsky, Evgeny Onegin, Natasha Rostova.

Choosing a communication partner from among the literary characters, the respondents simulate a virtual meeting scene and project their own expectations onto their imaginary interlocutor. Some readers look for a literary character as a friend and partner: *"Ilya Muromets, he's kind" (man, Moscow), "Ilya Oblomov! Let's talk! There are misunderstandings" (woman, Moscow), "Sometimes I really miss Sonia Marmeladova, to come and save me from all the horrible things in this world. Amen" (woman, Moscow), "Robinson Crusoe, to hang out together" (woman, Moscow)*. Others see the literary hero as a teacher, a wise mentor: *"Alyosha Karamazov, because I want to learn to be an open and understanding person"* (woman, Moscow), *"Woland: to gain wisdom, to see justice"* (woman, Volgograd), *"Zarathustra, I would like to learn his philosophy from the horse's mouth"* (man, Moscow). Finally, part of the respondents perceived the literary character as a crony, someone they knew well from their childhood or youth: *"Hey, Pechorin, what's up?", "Mefody, show me your plait?"* (woman, Moscow). The desire to maximize the intimacy of the scene of an encounter with a literary character is observed in those cases where respondents use colloquialisms in their responses.

Some respondents expressed a desire to actively influence events described in the text and to change their trajectory: *"Sonechka from The Storm, to dissuade her from throwing herself into the river"* (woman, Moscow), *"The protagonist of The Catcher in the Rye, to talk the night away"* (woman, Moscow), *"Mephistopheles from Goethe's Faust. I'd be glad to make a covenant"* (man, Volgograd), *"Matroskin the Cat, to have philosophical conversations sitting in the kitchen"* (woman, Moscow), *"Golden Fish, to fulfill my wishes"* (man, Moscow). Respondents often explain their choice of a literary character for a personal meeting by the similarity with him, without specifying the criteria for this similarity: *"Alexander Andreevich Chatsky, because there is a lot to learn from him and we are similar"* (woman, Moscow), *"Elizabeth Bennett, because she is a lot like me"* (woman, Moscow).

All answers to open-ended questions are marked with an emotional-evaluation aspect, and in a significant part of the statements the respondents' personality assessment comes to the forefront and is emphasized especially strongly: *"Anna Karenina, in my opinion, is an example to follow"* (woman, Volgograd), *"Pushkin, he is cool"* (woman, Moscow), *"Chatsky, to shake his hand and admire his sharp wit and unsurpassed ability to debate"* (man, Astrakhan), *"Danko – because of admiration for his sacrifice"* (man, Moscow), *"Nasreddin Hodja, for he is the wisest man!"* (woman, Astrakhan), *"Pierre Bezukhov, because he is not corrupted by power, money, etc. and I am sure that keeping company with him is much more pleasant than with*

the majority of the country's population today" (man, Moscow), "Andrei Bolkonsky, because he is a man of honor" (woman, Moscow), *"Mr. Darcy, as a man who overcame his principles and prejudices; Tyrion Lanister, because he likes to drink"* (woman, Volgograd), *"Vasily Terkin (in any situation he never gets confused)"* (man, Volgograd), *"Andrei Sokolov. He is a man of will, with an inner core, who even after the war and the death of loved ones did not lose his humanity"* (man, Astrakhan), *"Dick from the novel The Fifteen-Year-Old Captain. He is brave and quick-minded"* (male, Moscow), *"Dorian Gray, he's really handsome"* (woman, Moscow), *"Dunno – mischievous, funny and always copes with difficulties"* (woman, Moscow). Personality assessment is expressed either by listing the main qualities of the character, real or imaginary, through the use of attributive vocabulary (smart, beautiful, kind), or by pointing out the character's achievements (copes with difficulties, never gets confused).

The respondents see themselves as participants in an imaginary meeting scene, ascribing to themselves a certain role, an active communicator or observer, from which we can conclude that the reader does not perceive the symbolic world of the fiction text in a detached way, but thinks of themselves as part of this world. Only in those few cases when respondents refuse to choose a character for an imaginary meeting, their desire to distinguish between the fictitious world of fictional characters and actual reality is manifested: *"I've never thought about it. I seriously don't know. THERE ARE TOO MANY OF THEM. And for what purpose would I pull them out of the canon world?"*, *"No one, let them stay in the pages of the books"* (man, Astrakhan)[5].

Generally, the analysis of the answers to the open-ended questions allows concluding that the majority of the respondents in the three cities show similar tendencies: the majority tends to choose a character from the classics (both Russian and foreign) as their desired meeting partner; in the modeled meeting scene the respondents assign themselves a certain role; the literary character is personified and given a certain status; all statements are marked with emotionally-evaluative vocabulary and specific syntax. In addition, each such answer to an open-ended question, while unique, is a kind of "snapshot", a reflection not only of the respondent's inner world, but also of the relationship of this world to the social world. These answers reflect what the respondent values highly. One cannot help but wonder what the respondent values in Anna Karenina as a role model? What values are significant for those respondents who are willing to make a deal with Mephistophile, with Woland as the measure of wisdom and justice?

Conclusion

The relevance of reading habits as a social practice is not in doubt. Sociological science has accumulated experience in understanding various aspects of this social phenomenon: the role of reading in the formation of the spiritual world of personality and the features of reading practices in specific Russian regions are actively studied, the transformation of reading needs and interests in the context of such aspects as reading crisis, interest in reading, variability of reading practices under the influence of various factors (man-made challenges, new text reality) are analyzed in detail, some structural elements of reading practices (value-reflective, motivational) are analyzed, etc. The study of reading habits of modern Russian students is relevant because of the socio-demographic characteristics of this social group and its role in society. The results of empirical studies conducted among the students of Moscow, Volgograd and Astrakhan universities allow drawing conclusions about the dynamics of reading habits of culture, identifying similarities and differences in its actualization, including through the analysis of levels of sociocultural space in the core – periphery coordinate system.

[5] In the respondents' editorial.

The prevalence of the axiological component of reading habits is characteristic of the majority of respondents – they noted their love of reading and confirmed that they read fiction. The leading positions among young people's reading goals are preparation for classes and obtaining information, with self-education and self-development following in this ranking. The proportion of those who like to read has increased significantly over the past four years. Students are quite critical about their own reading and admit that they "don't read much", but most say that they "would like to read more". Respondents determine the frequency of their reading using the phrases "once a day and more often" and "once a week". The features of reading preferences revealed in the study can be explained, first of all, by the main type of their activity – intensive studying at the university.

The content structure of the reading preferences of this group of young people can be defined as follows: classical literature is the most preferred, with a continuing interest in other genres. As an important conclusion, we should point out that the range of reading among Russian students is diverse. It is worth noting that a fairly large percentage of respondents did not list a single work as their favorite or read. This fact can be explained by the study load and, as a consequence, the lack of free time, as well as the availability of other types of entertainment, mainly in the virtual environment of the Internet.

A comparative analysis of the data obtained in the surveys in Moscow, Volgograd, and Astrakhan also reveals differences in the reading habits of students in these cities. The main indicators for the students of Moscow universities are higher than for the students of Astrakhan and Volgograd. The values and activity components of reading are lower for respondents from Volgograd, the city with population exceeding one million, than for those from Astrakhan.

The results and conclusions presented in the publication allow expanding the possibilities of sociological analysis of the reading habits of students as a socio-demographic group that occupies a special place in the social system – as the vanguard of society, the future professional elite. Therefore, the results of the study can serve as a basis for public discussions and scientific research concerning the preservation of the Man of Culture, the specifics of cultural development of Russian society, the preservation of a common civilizational code with regional diversity, and the succession of generations. The findings from the two study waves can serve as a basis for studying trends in students' reading habits (as well as in comparing other socio-demographic groups) at different levels of sociocultural space – cross-country, regional, etc.

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On the Results of the 16th All-Russian Research-to-Practice Conference "New Trends in Socio-Cultural Evolution in Russia's Regions"

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As part of the 6th All-Russian Sociological Congress, dated November 12, 2021, the 16th All-Russian Research-to-Practice Conference "New trends in socio-cultural evolution in Russia's regions" was held. The organizers were the Vologda Research Center of RAS, the Institute of Philosophy of RAS, and Tyumen State University.

The conference was attended by representatives of seven regions of the Russian Federation (Moscow, Kursk, Tyumen, Perm, Vologda, Ufa, Yekaterinburg) and Poland. Reports were delivered on the research results within the framework of the interregional program "Problems of socio-cultural evolution of Russia and its regions", devoted to the topics of building the regional socio-cultural portrait, studying youth and their life world including rural youth, human capital development, social identity, effectiveness of various institutions and tools for managing territories. In the reports, the speakers touched upon the impact of the current

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situation with the coronavirus pandemic on the problems under study. Fifty nine people took part in the discussion of the results during the conference. The listeners actively engaged in a heated discussion about the state of the healthcare system, trust between the population and the authorities, and other problems that worsened during the COVID-19 pandemic in Russia's regions.

In the introductory speech, Director of Vologda Research Center of RAS, Doctor of Sciences (Economics), Associate Professor ***A.A. Shabunova*** has spoken about the results of the work of Vologda Research Center of RAS as coordinator of the program "Problems of socio-cultural evolution of Russia and its regions" in 2020 and 2021. This is the updating of data in the Modernization information system, the formation and filling of the program website for the exchange of up-to-date information with participants and creation of a project history. Important research results have also been presented: the publication of a series of articles on the study of extreme inequalities, obtaining a certificate of state registration of the database "Family of centile coefficients of income inequalities of the macrostrate population", work on the multi-volume *Regions of new Russia*.

Scientific Director of Vologda Research Center of RAS, RAS Corresponding Member, Doctor of Sciences (Economics), Professor ***V.A. Ilyin*** has noted the importance and relevance of the program "Problems of socio-cultural evolution of Russia and its regions" in strengthening traditional Russian spiritual and moral values, preserving the cultural and historical heritage of Russian people; he reflected the main historical milestones of Vologda scientists' participation in it, urged those present to support and develop the traditions of the Society "Knowledge"; it means that he set a task for the wide dissemination of scientific knowledge, based on reliable information about objective processes existing in our society.

L.A. Belyaeva (Doctor of Sciences (Sociology), Leading Researcher, CIS Institute of Philosophy of RAS) has made a report "Youth in modern Russia: What do we know about it?". She has stressed that the uneven, asymmetric development of Russia's regions and territories generates the effect of unequal conditions for youth's development; the author has noted that close human relations retain an enduring value for young people. However, young people are wary of other people, believing that the desire to take care only of themselves dominates in the relationship between people. She is quite unanimous in ranking the problems that bother her, mainly related to personal well-being – material and psychological. Family's conflicts, a break with loved ones worry more than 50% of respondents. The majority of modern adult youth have a fairly high self-esteem, optimism increases from the younger to the older group.

A.A. Shabunova (Doctor of Sciences (Economics), Associate Professor, Director, VolRC RAS) turns to the analysis of the modernization asymmetry of Russian territories. The material for the analysis was obtained using the updated content of the IP "Modernization"[1]. The stage of primary modernization in Russia is fully completed; the secondary one is only 78% complete. The reason is the decline in the index of innovation in knowledge due to low funding for R&D and insufficient inventive activity of the population (the latter indicator has almost doubled compared to 2000, the former one has decreased from 47.8% in 2000 to 43.9% in 2017), economic quality index (66.2%). The Integrated Modernization Index increased significantly from 2000 to 2017, amounting to 71.8% in Russia as a whole. Low research and development costs and patent activity of the population are also constraining factors.

[1] State registration certificate of intellectual property no. 2012661285, dated December 11, 2012.

Significant progress was made in the indicators of modernization balance. In 2017, there were no districts left in the group with a low level of balance (in 2000 there were 6 macro-regions in it), and 5 out of 8 districts were in the group with a high and above average level. The pace of modernization in the Central District decreased with their initially high value in the 2000s. Other macro-regions have shown significant progress in this direction. However, the asymmetry in the regions' development is not decreasing, but growing: the gap in the index of integrated modernization has increased from 16.6 p.p. in 2000, up to 20.2 p.p. in 2017. Aleksandra A. Shabunova has devoted the second part of the report to the changes in society during the pandemic, namely, the impact of the "coronacrisis" on the development of small and medium-sized businesses, transformation of production chains and consumption patterns, aggravation of digital inequality problem, deterioration of the financial situation and psychological well-being of the population.

R.M. Valiakhmetov (Candidate of Sciences (Sociology), Associate Professor, Dean, Bashkir State University), ***G.R. Baymurzina*** (Candidate of Sciences (Economics), Director, Bashkir Branch of the Federal Research and Development Center of RAS) have noted that the conceptual basis of Russia's national projects is the idea of human development, which focuses on the main goals, objectives and priorities of social policy: improving the standard of living and quality of life, saving the nation and strengthening its health, building human capital, which is a reflection of humanistic goals and at the same time a response to modern challenges. The low living standard of Russians and related demographic problems pose a significant threat to economic security and social stability. The coefficient of inequality between people, calculated as the arithmetic mean of three indicators (income, education and longevity), is lower in Russia than the average in all countries with a very high human development index (HDI). According to the aggregate indicator of inequality, Russia falls into the top 20% of countries (35th out of 176 countries for which coefficients were calculated in 2018). During the assessment of Russia's situation on the main components of human development, the authors have revealed that Russia stood out for the low life expectancy (108th place in the world). In many countries, even with an average level of human development, this indicator is higher. In terms of the production of gross national income per capita, the gap between Russia and the leaders of the HDI rating is 2.7 times. In recent years, the country's socio-economic development has been characterized not only by low growth rates of macroeconomic indicators, but also by deterioration in the social well-being and quality of life. Therefore, it is necessary to take into account the full range of conditions and factors affecting the development of human potential, and hence the implementation of priority national projects in Russia.

Using the case of the Voronezh and Kursk oblasts, ***E.A. Kogai*** (Doctor of Sciences (Philosophy), Professor, Kursk State University) has revealed a range of problems, related to the implementation of priority national projects of the Russian Federation for the period through to 2024. The author has presented the perception of the changes being implemented by the regions' residents. Based on the analysis of focus group materials, the report proves that financial problems and institutional obstacles create significant difficulties for the implementation of national projects in the Voronezh Oblast: decisions are often made by those who are not interested in the results of their activities. Accordingly, there is a need to form a new architecture and new executive authorities. In the Kursk Oblast, respondents note the importance of solving socio-economic problems, increasing wages, developing small businesses, and improving the quality of medical services. During the speech,

E.A. Kogai concludes that in the designated regions, the national projects of the Russian Federation are adequately reflected in new regional strategies (for the period through to 2030 or 2035), are filled with specific content and adopted taking into account social wishes and moods.

In the report "Managing trends in the human capital development in the municipal districts of Russia's region", ***N.M. Lavrenyuk-Isaeva*** (Candidate of Sciences (Sociology), Associate Professor, Bashkir State University) has named several reasons for the difficulties of the human capital development in the municipal districts of the country's region. The imbalance in the development of human resources in the municipalities of the Republic of Bashkortostan according to the adapted methodology of the UNDP HDI amounted to more than 0.122 p. As a result of a series of foresight sessions attended by 195 local experts, data are obtained that allows forming a common vision of trends, and determining an agreed "vision of the future" with a differentiated horizon for the short, medium and long term.

E.B. Plotnikova (Candidate of Sciences (History), Associate Professor, Perm State National Research University) and ***Y.S. Markova*** (Candidate of Sciences (Sociology), Associate Professor, Perm State National Research University) have considered the role of socio-cultural projects of industrial enterprises in the formation of the social identity of the population of municipalities. The authors have conducted a study in four municipalities of Perm Krai using the case study method. Using the example of the project activity of Lukoil-Perm LLC, the researchers show that grant projects of residents of territories on various topics have the main goal – the formation of various types of self-consciousness of the population in the conditions of social changes, associated with the projects' implementation. Socio-cultural projects influence the formation and development of the territorial identity (local, regional, national), as well as subcultural identity within local communities. Cultural projects are aimed at the cultural and subcultural identity of the individual, projects aimed at preserving the historical memory, and solve the problems of national identity. During the analysis, the authors conclude that the socio-cultural projects of industrial enterprises not only stimulate local patriotism, but also form identification with the inhabitants of the region and the country, and also contribute to preventing the risks of forming residents' negative identity.

The study by ***E.A. Nastina*** (HSE Master) and ***A.M. Alamakaeva*** (Candidate of Sciences (Sociology), Associate Professor, HSE) is devoted to various ratings that can be used to assess and compare development rate of civil society in Russia's entities. The ratings and classifications, identified on the basis of the scientific literature review, are grouped by subject of research as follows: 1) civic attitudes and practices; 2) intersectoral social partnership; 3) factors in the development of civil society and charity; 4) political activity. The use of correlation analysis allows demonstrating that even methods similar in content and set of indicators give significantly different results. The main reasons for the differences are both the features of conceptualization and operationalization of civil society, as well as the methods of clustering or calculating ratings. The authors note the need to create a more coordinated approach to measuring the development of civil society in order to further implement a correct analysis of the factors contributing to its activation or stagnation in Russia's regions.

In the report "Economic inequality in the Russian macroregion (the case of the Central Chernozem Region)", ***Yu.M. Pasovets*** (Candidate of Sciences (Sociology), Associate Professor, Kursk State University) has revealed the specifics of the socio-economic stratification profile of the macroregional community that has developed to date and dynamics of population's monetary

incomes that has influenced its formation, observed in recent years. Based on the analysis of the population survey results, conducted in 2020 in the Voronezh, Kursk and Lipetsk oblasts (N = 1200 people), based on the standard program and methodology "Socio-cultural portrait of Russia's region", the author reveals that in the subjective dimension of socio-economic inequality in the macroregion, the middle and lower strata are the most widespread, the scale of subjectively perceived poverty is several times greater than its statistical indicators. At the same time, the socio-stratification identification is characterized by a numerical predominance of those who consider themselves to be middle strata, which can be interpreted as a kind of subjective compensation for low economic situation.

M.A. Gruzdeva (Candidate of Sciences (Economics), Senior Researcher, VolRC RAS) has devoted the report to the analysis of digital gaps in the countries of the world and Russian territories. The author draws conclusions about the presence of digital inequality of the first level in the world, despite a significant decrease in the countries' differentiation by Internet penetration. The report reveals that Russia, against the background of other countries, demonstrates a significant increase in the share of Internet users, within the Russian regions, despite the decrease in the coefficients of variation, there are elements of the digital divide.

G.F. Romashkina (Doctor of Sciences (Sociology), Professor, Tyumen State University) has presented the results of studying the interactions of social and human capital in the case of the Tyumen Oblast. Human and social capital as multidimensional constructions demonstrating personal success in work, his involvement in social communication, willingness to attract his social capital to solve specific work tasks, increase his competitiveness in the labor market, are tested on the basis of special socio-economic and psychological-economic methods[2]. An important problem is the signs of success in the implementation and management of human capital. For example, in the Tyumen Oblast, the managers and owners of the materials of in-depth interviews of businesses declare, but in reality do not show activity in the human capital development, do not consider this task important. The management of human capital and the inclusion of their employees in the consideration of the social capital remain beyond the possibilities, according to almost all surveyed entrepreneurs.

E.V. Andrianova (Candidate of Sciences (Sociology), Senior Researcher, Tyumen State University, West Siberian Branch of FCTAS RAS) has revealed the socio-cultural aspects of rural development, as well as its possibilities and limitations. The empirical base of the work is based on a series of studies, conducted in 2020–2021: expert and in-depth interviews (91 interviews, 2020, three categories of experts: business, government, public organizations, coverage: 12 municipal districts of the region), 9 focus groups (2021, with a visit to the Tyumen Oblast districts), residents' mass survey of the south of the Tyumen Oblast (a total of 1,723 people over 18 years old)[3].

D.I. Shashkin (Laboratory Researcher, Tyumen State University) has highlighted the problems of rural areas affecting personnel issues and youth's outflow. Institutional changes after economic reforms did not sufficiently contribute to the development of entrepreneurial structures in rural areas. The agricultural directions show growth against the background of youth's outflow, rural degradation and shortage of highly qualified personnel due to entrepreneurship. Understanding the image of a modern rural entrepreneur provides

[2] The reported study was funded by the RFBR, project no. 19-29-07131.

[3] The reported study was carried out as part of the implementation of the RFBR grant no. 20-011-00087.

an opportunity to determine the conditions and problems of developing rural entrepreneurship and its living environment. Resourceful entrepreneurs are implementing concrete measures to retain young people in rural areas and attract them to agriculture: cooperation with educational institutions, organization of production practices and excursions, graduates' employment, provision of decent wages, housing and working conditions.

In the report, ***A.N. Tarasova*** (Candidate of Sciences (Sociology), Associate Professor, Ural Federal University) analyzes new practices of working with young people in the city administration system. The author notes that social participation level of the Sverdlovsk Oblast students in city life has changed due to the pandemic. The share of active participants increased from 25 to 36%. The researcher makes conclusion about the instability of social participation. Despite the situational involvement in certain practices of social participation, as before, almost half of the young people surveyed have noted their unwillingness to continue it. In the course of the study, four groups of factors have been identified that determine the activity of youth inclusion in the socio-cultural development of their hometowns. Based on the analysis of cases of social urban projects implemented with the youth's participation, the practices of involving students in the socio-cultural development of the Sverdlovsk Oblast cities have been identified. The report also notes the problem of territorial inequality, which limits the potential of social participation of young people, especially in small towns and urban-type settlements.

M.M. Yusupov (Candidate of Sciences (Sociology), Associate Professor, Chechen State University) has considered the features of innovative development of a post-conflict region in the conditions of restoration of industrial, economic and socio-cultural infrastructure. The author points out that federal targeted programs have contributed to the reintegration of Chechnya life spheres into the all-Russian space, the economy's reconstruction, but the republic is at a low level of primary modernization, the preliminary stage of secondary modernization, the indices of economic conditions of innovation, scientific and technical developments are low. At the same time, the social informatization indicator is high, traditional values prevail in the regional community, orientation to the values of conservation and collectivism.

In the report "Institutional forms of rural development" ***V.A. Davydenko*** (Doctor of Sciences (Sociology), Professor, Tyumen State University) has justified the relevance of the topic by the cardinal institutional changes in Russian agriculture that occurred in 2001–2021. He emphasizes that in the context of real practices of rural development, the phenomenon of justice remains debatable. Currently, there is no clear scientific understanding of the role and in which industries agricultural holdings play, how effective they are and whether the state's bet on their support is justified giving access to large resources through development institutions. Agro-industrial companies are growing rapidly, almost regardless of market conditions, variable yields factors, saturation of domestic demand and competition level. There are quite a lot of complete agricultural holdings in Russia, almost the entire state policy of supporting agricultural producers is aimed at strengthening them; the owners of full agricultural holdings in most cases are "new operators" who were not previously associated with agriculture, brought capital from other industries, have close commercial ties with the authorities.

According to ***E.V. Kargapolova*** (Doctor of Sciences (Sociology), Associate Professor, Professor, Plekhanov Russian University of Economics) and ***Yu.A. Davydova*** (Candidate of Sciences (History), Associate Professor, Plekhanov Russian University of Economics), the most important components of the social well-being of the regional community are indicators of territorial

and settlement identity. The research group of the Department of Political Science and Sociology carried out a specific sociological study among residents of the Moscow agglomeration using an online questionnaire. Respondents were asked the question "To what extent do you feel your closeness or remoteness ("your" – "someone else's") with such people?" The results of the responses show the predominance of local settlement identity in the Moscow agglomeration, as well as in other regions of Russia. However, in the Moscow agglomeration, local-territorial identity is lower than in other entities. Perhaps this is due to significant interregional migration flows to Moscow and the Moscow Oblast. There is a large proportion of the population that has already managed to "break away" from the familiar environment of its region, but does not yet identify itself with the inhabitants of the agglomeration.

At the end of the conference, the participants discussed the research prospects under the program "Problems of socio-cultural evolution of Russia and its regions" including the possibility of initiating a grant study.

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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 (February 2022) and for the period from April 2021 to February 2022 (the last six surveys, 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 Dmitry Medvedev's presidency), and 2012 (the first year of Vladimir Putin's third presidential term).

We also provide yearly dynamics of the data for 2018–2021[2].

During the period from December 2021 to February 2022, there was a decline in the share of positive judgments about the work of the RF President (by 3 p.p., from 51 to 48%).

Over the last 6 surveys (from April 2021 to February 2022), the share of positive assessments regarding the work of the head of state decreased by 4 p.p. (from 52 to 48%)[3].

The level of approval of the work of the Chairman of the RF Government and the Governor of the Vologda Oblast remains generally stable (35–38%).

[1] The surveys 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 surveys 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.

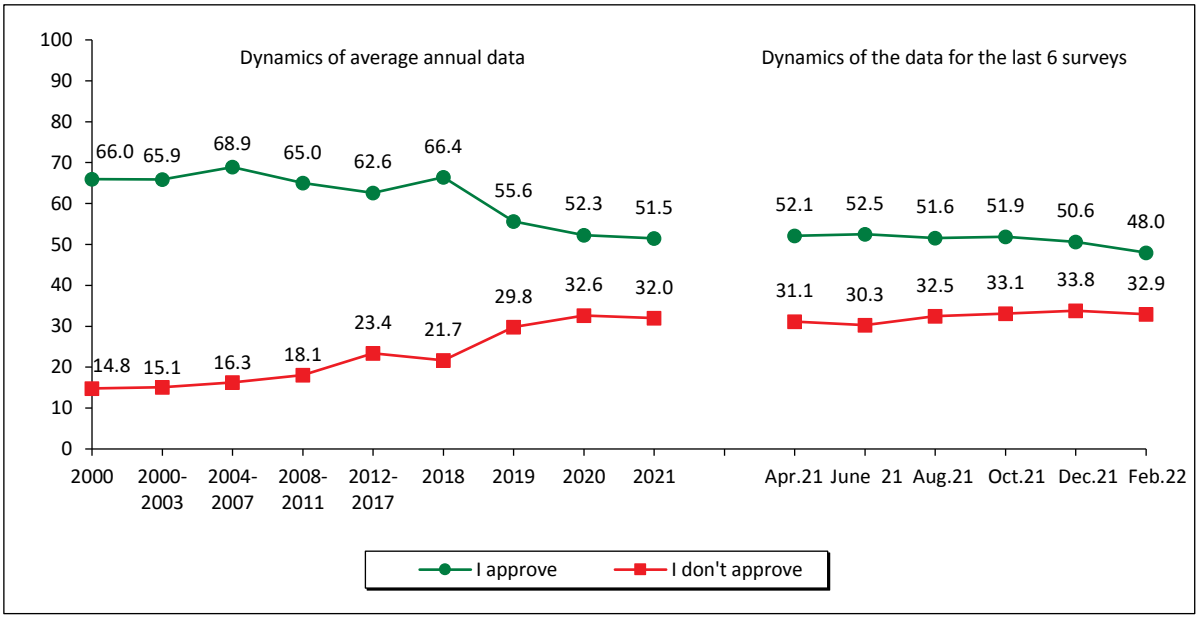
[3] Hereinafter, the results of a comparative analysis of the data from the survey conducted in February 2022, and the results of a last-year monitoring "wave", conducted in April 2021, are given in the frame.

How do you assess the current performance of..? (% of respondents)

Answer option	Dynamics of average annual data								Dynamics of the data for the last 6 surveys						Dynamics (+/-), Feb. 2022 to Apr. 2021
	2000	2007	2011	2012	2018	2019	2020	2021	Apr. 2021	June 2021	Aug. 2021	Oct. 2021	Dec. 2021	Feb. 2022	
RF President															
I approve	66.0	75.3	58.7	51.7	66.4	55.6	52.3	51.5	52.1	52.5	51.6	51.9	50.6	48.0	-4
I don't approve	14.8	11.5	25.5	32.6	21.7	29.8	32.6	32.0	31.1	30.3	32.5	33.1	33.8	32.9	+2
Chairman of the RF Government*															
I approve	-*	-*	59.3	49.6	48.0	41.1	38.7	39.9	38.8	42.2	42.7	39.7	38.3	37.6	-1
I don't approve	-	-	24.7	33.3	31.6	38.4	40.4	37.6	38.3	35.1	36.0	38.3	38.9	37.7	-1
Governor															
I approve	56.1	55.8	45.7	41.9	38.4	35.7	35.0	36.7	36.3	37.8	38.6	37.5	35.9	33.9	-2
I don't approve	19.3	22.2	30.5	33.3	37.6	40.2	42.5	40.5	41.3	38.4	38.5	40.7	41.9	41.6	0

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)

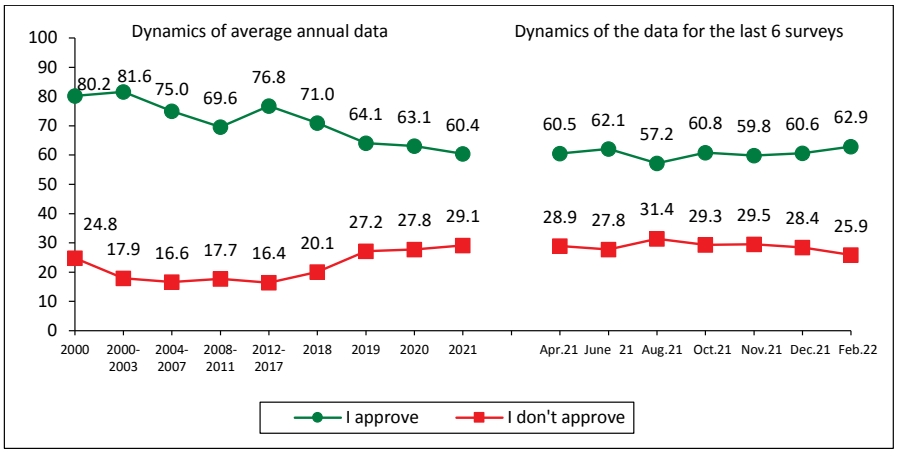


Hereinafter, all graphs show the average annual data for 2000, 2018, 2019, 2020, 2021, as well as the average annual data for the periods 2000–2003, 2004–2007, 2008–2011, 2012–2017, corresponding to the presidential terms.

For reference:

According to VCIOM, the level of approval of the RF President's work for the period from December 2021 to the beginning of February 2022 and in comparison with April 2021 did not change significantly (61–63%). The proportion of negative assessments over the last two months is 26–28%.

In general, do you approve or disapprove of the work of the RF President? (% of respondents; VCIOM data)



Dynamics for the last 6 surveys (February 2022 to April 2021)	
Answer option	Dynamics (+ /-)
I approve	+2
I don't approve	-3

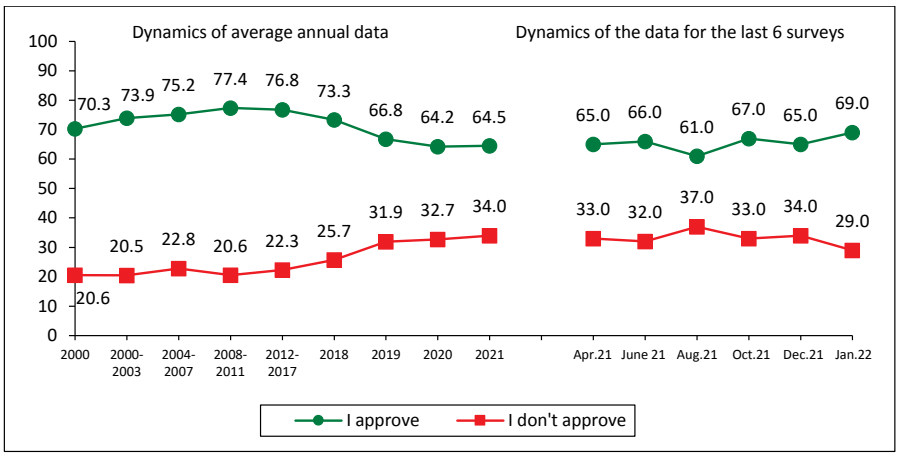
Question: "In general, do you approve or disapprove of the work of the President of the Russian Federation?"

Data for February are given as of February 6, 2022.

Source: VCIOM. Available at: https://wciom.ru/

According to the latest data by Levada-Center[4], the share of positive assessments of the RF President's activities from December 2021 to January 2022 increased by 4 p.p. (from 65 to 69%); the share of negative assessments decreased by 5 p.p. (from 34 to 29%). Population estimates are slightly better than in April 2021.*

In general, do you approve or disapprove of the work of Vladimir Putin as President of Russia? (% of respondents; Levada-Center data)*



Dynamics for the last 6 surveys (February 2022 to April 2021)	
Answer option	Dynamics (+ /-)
I approve	+4
I don't approve	-4

Question: "In general, do you approve or disapprove of the work of Vladimir Putin as President of Russia?"

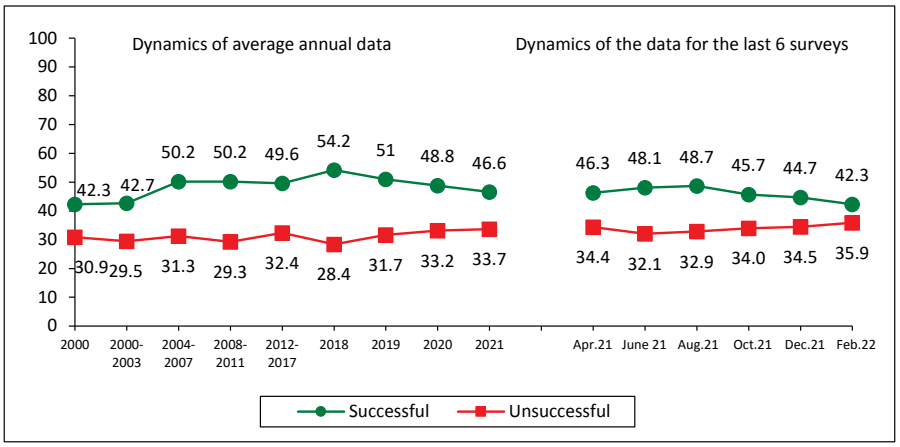
Source: Levada-Center*. Indicators. Available at: https://www.levada.ru/indikatory/

Over the past 6 months (since August 2021), the share of people who consider the actions of the head of state aimed at strengthening Russia's international positions to be successful continues to decline gradually. During this period, the share of positive assessments decreased by 7 p.p. (from 49 to 42%); over the past 2 months – by 3 p.p. (from 45 to 42%).

Over the past 6 surveys (since April 2021), the share of people who consider the actions of the head of state aimed to strengthen Russia's international standing to be successful decreased by 4 p.p. (from 46 to 42%).

In your opinion, how successful is the RF President in coping with challenging issues?
(% of respondents; VolRC RAS data)

Strengthening Russia's international position

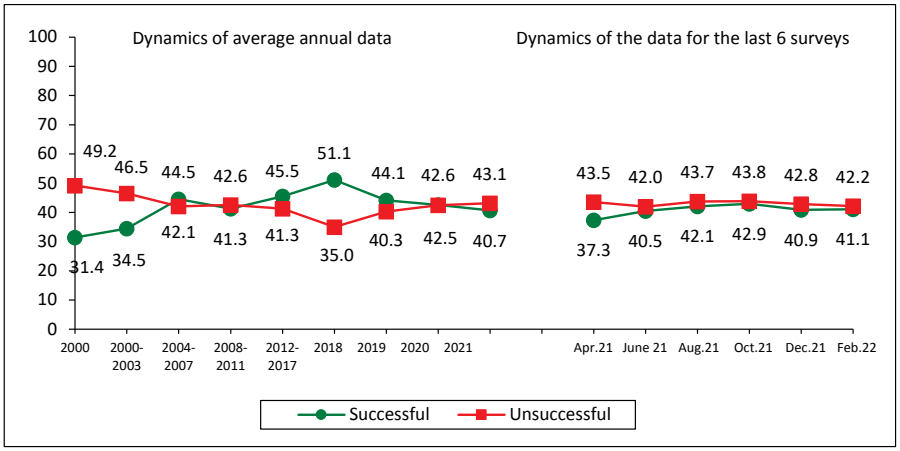


Dynamics for the last 6 surveys (February 2022 to April 2021)	
Answer option	Dynamics (+ /-)
Successful	-4
Unsuccessful	+2

There have been no significant changes in the assessments of the success of the Russian President in dealing with the issue of imposing order in the country over the past two months: the share of positive judgments is 42%, negative – 41%.

Over the past 6 surveys, the share of positive assessments of the head of state's work to impose order in the country has increased by 4 p.p. (from 37 to 41%).

Imposing order in the country

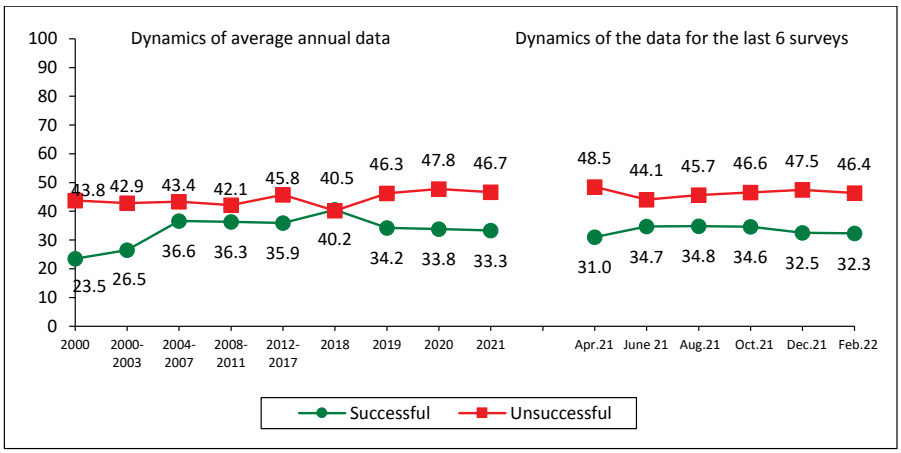


Dynamics for the last 6 surveys (February 2022 to April 2021)	
Answer option	Dynamics (+ /-)
Successful	+4
Unsuccessful	-1

The share of Vologda Oblast inhabitants who think that the RF President successfully fulfills the task to protect democracy and strengthen the freedoms of citizens in December 2021 – February 2022 was 32% (the proportion of negative judgements was 46–47%).

Compared to April 2021, there are no significant changes in the assessments of public opinion on this issue.

Protecting democracy and strengthening citizens' freedoms

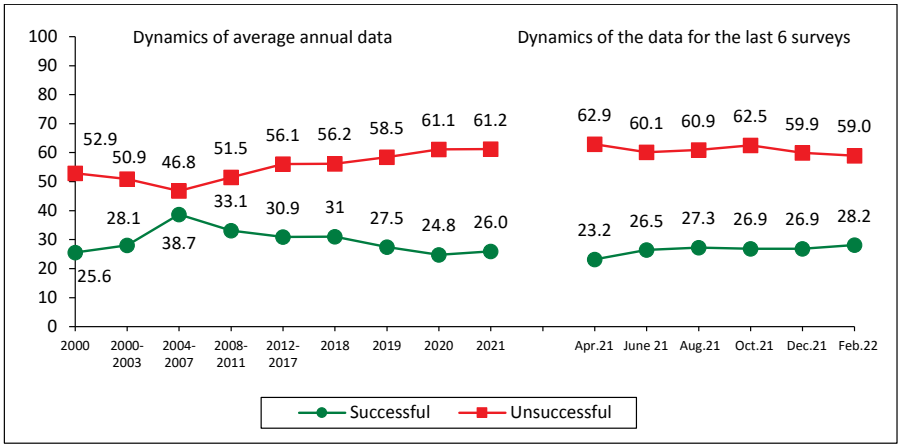


Dynamics for the last 6 surveys (February 2022 to April 2021)	
Answer option	Dynamics (+ /-)
Successful	+1
Unsuccessful	-2

As in December 2021, 27–28% of Vologda Oblast residents positively assess the President's work to boost the economy and increase the welfare of citizens.

At the same time, from April 2021 to February 2022, the proportion of those who share this opinion increased by 5 p.p. (from 23 to 28%).

Economic recovery and increase in citizens' welfare



Dynamics for the last 6 surveys (February 2022 to April 2021)	
Answer option	Dynamics (+ /-)
Successful	+5
Unsuccessful	-4

The structure of political preferences of Vologda Oblast residents remains stable: the share of people whose interests are expressed by the United Russia party is 31–32%, the Communist Party and the Liberal Democratic Party – 9–10% each, the Just Russia party – 6%.

Compared to April 2021, there were no significant changes in the structure of political preferences in February 2022.

From December 2021 to February 2022, the share of Vologda Oblast residents who believe that none of the political parties represented in parliament expresses their interests or who found it difficult to choose their political preferences increased slightly (by 3 p.p., from 39 to 42%).

Which party expresses your interests? (% of respondents; VoIRC RAS data)

Party	Dynamics of average annual data												Dynamics of the data for the last 6 surveys						Dynamics (+/-), Feb. 2022 to Apr. 2021
	2000	2007	2011	Election to the RF State Duma 2011, fact	2012	2016	Election to the RF State Duma 2016, fact	2018	2019	2020	Election to the RF State Duma 2020, fact	2021	Apr. 2021	June 2021	Aug. 2021	Oct. 2021	Dec. 2021	Feb. 2022	
United Russia	18.5	30.2	31.1	33.4	29.1	35.4	38.0	37.9	33.8	31.5	49.8	31.7	31.5	32.1	31.7	32.7	31.9	31.1	0
KPRF	11.5	7.0	10.3	16.8	10.6	8.3	14.2	9.2	8.8	8.4	18.9	9.3	8.7	8.1	9.3	11.1	10.5	9.5	+1
LDPR	4.8	7.5	7.8	15.4	7.8	10.4	21.9	9.6	9.1	9.5	7.6	9.9	9.9	8.5	9.9	11.2	9.9	9.4	-1
Just Russia – Patriots for the Truth	-	7.8	5.6	27.2	6.6	4.2	10.8	2.9	3.4	4.7	7.5	4.7	2.6	4.1	5.3	6.3	6.0	5.7	+3
New People*	–	–	–	–	–	–	–	–	–	–	5.3	2.3	–	–	–	–	2.3	1.6	–
Other	0.9	1.8	1.9	–	2.1	0.3	–	0.7	0.3	0.5	–	0.2	0.1	0.1	0.2	0.5	0.2	0.7	+1
None	29.6	17.8	29.4	–	31.3	29.4	–	28.5	33.7	34.2	–	33.9	36.4	35.4	34.1	31.7	29.6	32.4	-4
I find it difficult to answer	20.3	21.2	13.2	–	11.7	12.0	–	11.2	11.0	11.1	–	10.0	10.9	11.8	9.6	6.6	9.7	9.6	-1

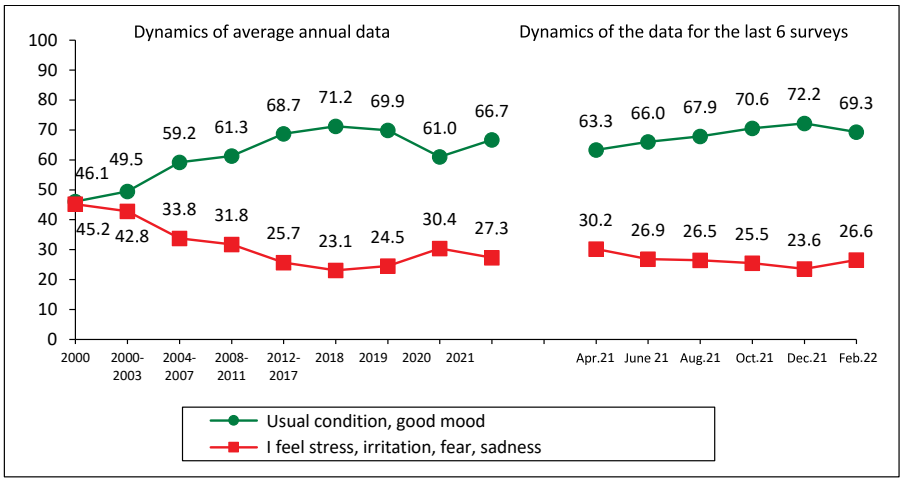
* The New People party was elected to the State Duma of the Russian Federation for the first time following the results of the election held on September 17–19, 2021.

In December 2021 – February 2022, the assessments of social well-being became worse. The proportion of those who positively characterize their daily emotional state decreased by 3 p.p. (from 72 to 69%).

Nevertheless, at the beginning of 2022, social mood assessments are better than in April 2021 (over the past 6 surveys, the share of positive judgments increased by 6 p.p., from 63 to 69%).

Estimation of social condition (% of respondents; VolRC RAS data)

Social mood

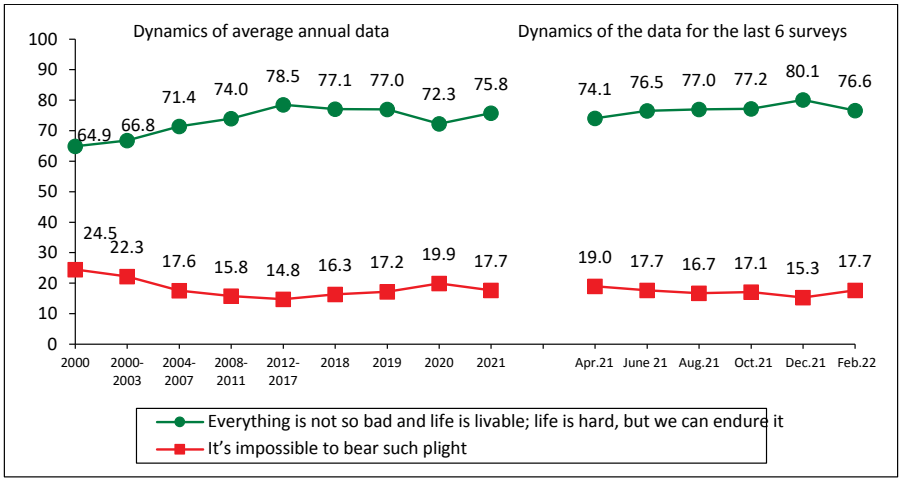


Dynamics for the last 6 surveys (February 2022 to April 2021)	
Answer option	Dynamics (+ /-)
Usual condition, good mood	+6
I feel stress, irritation, fear, sadness	-4

During the period from December 2021 to February 2022, no positive changes in social mood assessments were observed in any of the main socio-demographic groups.

At the same time, in 7 out of 14 groups, the proportion of people describing their mood as "good, normal" has decreased over the past 2 months, especially among men (by 6 p.p., from 72 to 66%); persons under the age of 30 (by 7 p.p., from 82 to 75%), and people with higher and incomplete higher education (by 6 p.p., from 78 to 72%).

Stock of patience

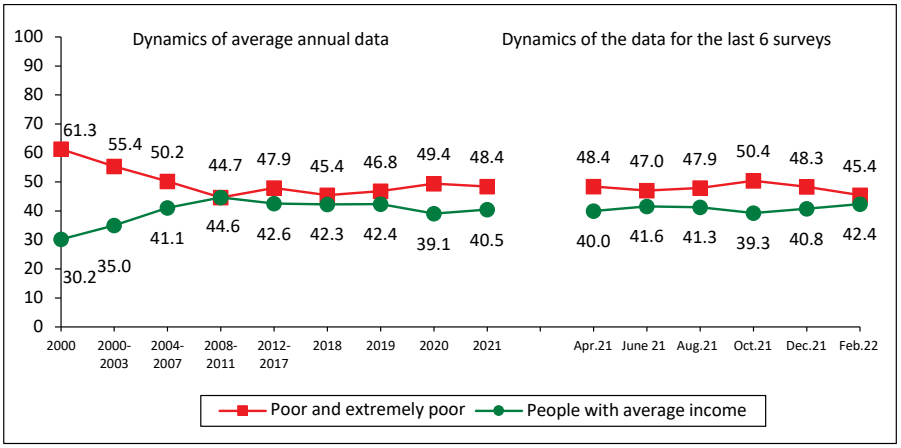


Dynamics for the last 6 surveys (February 2022 to April 2021)	
Answer option	Dynamics (+ /-)
Everything is not so bad and life is livable; life is hard, but we can endure it	+3
It's impossible to bear such plight	-1

Since October 2021, the proportion of Vologda Oblast residents identifying themselves as "poor and extremely poor" has been gradually decreasing. From April 2021 to February 2022, as well as over the past two months, their share decreased by 3 p.p. (from 48 to 45%).

The proportion of the "poor and extremely poor" at the beginning of 2022 is slightly less than in April 2021 (by 3 p.p.), although their share still exceeds the proportion of those who subjectively consider themselves to have average income (42%).

Social self-identification



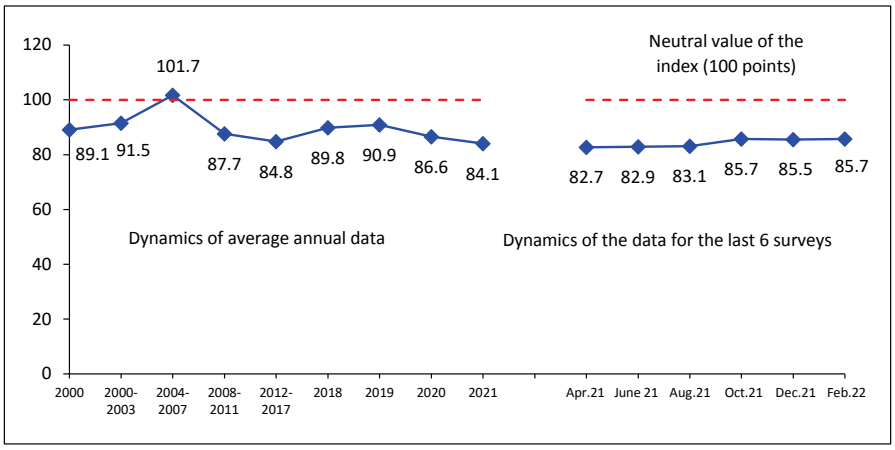
Dynamics for the last 6 surveys (February 2022 to April 2021)	
Answer option	Dynamics (+ /-)
People with average income	+2
Poor and extremely poor	-3

Question: "Which category do you belong to, in your opinion?"

The consumer sentiment index has remained stable (86 p.) since October 2021.

This is slightly higher than in April 2021 (83%), but it is still significantly below the neutral level (100 p.), which indicates the predominance of pessimistic expectations about the future of the Russian economy and one's own financial situation in people's estimates.

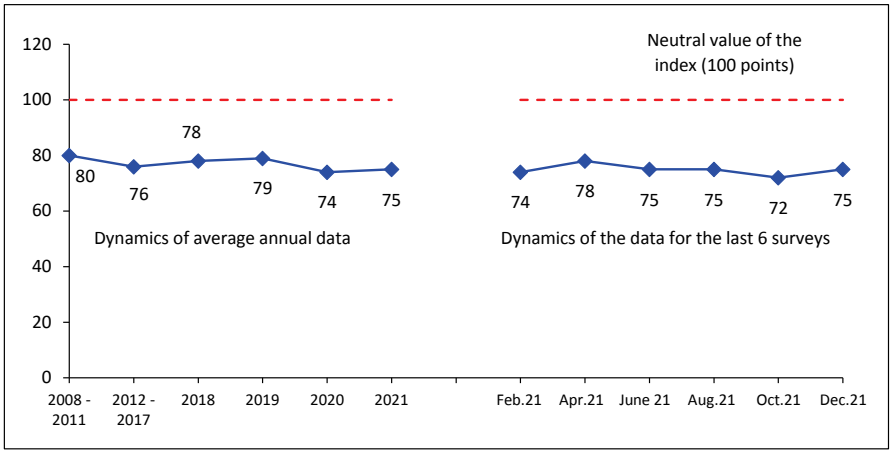
Consumer sentiment index (CSI, points; data of VolRC RAS for the Vologda Oblast)



Dynamics for the last 6 surveys (February 2022 to April 2021)	
CSI	Dynamics (+ /-)
Index value, points	+3

For reference: according to the latest data by Levada-Center, the nationwide consumer sentiment index from October to December 2021 increased by 3 points (from 72 to 75 p.); compared to April 2021, it decreased by 3 p. (from 78 to 75 p.).*

Consumer sentiment index (CSI; Levada-Center data* for Russia)



Dynamics for the last 6 surveys (February 2022 to April 2021)	
CSI	Dynamics (+ /-)
Index value, points	-3

The index is calculated since 2008.

Latest data are as of December 2021. There are no data for the period from April to August 2020.

Source: Levada-Center*. Available at: https://www.levada.ru/indikatory/sotsialno-ekonomicheskie-indikatory/

* Listed on the register of foreign agents.

During the period from December 2021 to February 2022, no positive changes in social mood assessments were observed in any of the main socio-demographic groups.

At the same time, in 7 out of 14 groups, the proportion of people describing their mood as "good, normal" has decreased over the past 2 months, especially among men (by 6 p.p., from 72 to 66%); persons under the age of 30 (by 7 p.p., from 82 to 75%), and people with higher and incomplete higher education (by 6 p.p., from 78 to 72%).

Over the past 6 surveys (from April 2021 to February 2022), social mood assessments have improved by 5–10 p.p. in all socio-demographic groups.

Social mood in different social groups (answer 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 surveys						Dynamics (+/-), Feb. 2022 to Apr. 2021
	2000	2007	2011	2012	2018	2019	2020	2021	Apr. 2021	June 2021	Aug. 2021	Oct. 2021	Dec. 2021	Feb. 2022	
Sex															
Men	50.1	65.9	64.5	69.1	72.8	70.1	60.8	65.7	61.3	65.1	65.6	70.0	71.5	65.5	+4
Women	43.3	61.7	62.0	65.8	69.8	69.6	61.2	67.4	64.9	66.7	69.8	70.9	72.8	72.3	+7
Age															
Under 30	59.1	71.3	70.0	72.3	80.0	81.1	67.6	73.5	67.4	73.0	82.3	75.3	81.9	75.3	+8
30–55	44.2	64.8	62.5	67.9	72.6	71.2	61.8	69.5	65.5	70.0	71.4	70.8	75.1	70.7	+5
Over 55	37.4	54.8	58.3	62.1	65.2	63.3	57.4	60.5	59.1	58.3	58.1	68.3	65.2	65.3	+6
Education															
Secondary and incomplete secondary	41.7	58.4	57.4	57.2	64.8	63.2	56.1	62.1	56.9	62.5	63.2	64.1	69.7	68.7	+12
Secondary vocational	46.4	64.6	63.6	66.7	72.2	72.7	63.5	66.7	64.3	66.1	68.5	70.4	70.1	68.3	+4
Higher and incomplete higher	53.3	68.6	68.3	77.0	76.8	73.4	63.3	71.5	68.7	69.7	73.0	77.1	77.6	71.5	+3
Income groups															
Bottom 20%	28.4	51.6	45.3	51.5	57.3	53.2	43.4	54.6	49.8	54.2	55.0	60.4	64.0	60.5	+11
Middle 60%	45.5	62.9	65.3	68.7	71.9	71.4	62.6	67.3	65.8	67.0	68.9	70.9	71.1	68.8	+3
Top 20%	64.6	74.9	75.3	81.1	82.9	81.8	75.6	79.9	70.8	76.5	86.7	84.2	85.3	81.5	+11
Territories															
Vologda	49.2	63.1	67.1	73.6	71.0	68.6	60.9	60.3	57.0	59.4	59.7	64.0	65.7	63.2	+6
Cherepovets	50.8	68.1	71.2	76.2	75.8	71.2	60.4	71.0	68.1	70.8	72.3	75.2	75.1	72.6	+5
Districts	42.2	61.6	57.1	59.8	68.7	69.8	61.4	67.8	64.0	67.1	70.1	71.5	74.2	70.8	+7
Oblast	46.2	63.6	63.1	67.3	71.2	69.9	61.0	66.6	63.3	66.0	67.9	70.5	72.2	69.3	+6

RESUME

The results of the regular "wave" of public opinion monitoring conducted in early 2022 indicate a slight decrease in the level of people's approval of the RF President's work (by 3 p.p., from 51 to 48%), as well as a deterioration in social well-being assessments (the proportion of people experiencing positive emotions has decreased by 3 p.p. over the past 2 months, from 72 to 69%; the proportion of those who believe that "everything is not so bad and life is livable; life is hard, but we can endure it" has also decreased by 3 p.p., from 80 to 77%).

These negative changes could be influenced by several factors: the absence of tangible positive changes in the dynamics of living standards[4], deterioration of the epidemiological situation due to the spread of the Omicron variant of coronavirus; the growing international political tension accompanied by events such as the political crisis in Kazakhstan, escalation of anti-Russian sentiment in connection with the alleged impending military invasion of Russia on the territory of Ukraine, etc.

It is possible that the widespread media coverage of the events taking place in the international political arena has contributed to the fact that over the past two months there has been a decline in positive assessments regarding the success of the Russian President's efforts aimed to strengthen Russia's international standing (by 3 p.p., from 45 to 42%); social mood deteriorated especially among men (by 6 p.p., from 72 to 66%), persons under the age of 30 (by 7 p.p., from 82 to 75%), and people with higher and incomplete higher education (by 6 p.p., from 78 to 72%).

However, we observe positive changes in the dynamics of assessing the standard of living and quality of life, which is most likely due to specific measures taken by the authorities to support the population during the pandemic.

The share of "the poor and extremely poor" from December 2021 to February 2022, as well as over the last 6 surveys (since April 2021) decreased by 3 p.p. (from 48 to 45%).

The consumer sentiment index has not changed over the past two months and amounted to 86 points, but it has increased compared to April 2021 (by 3 points, from 83 to 86 points) and the average annual data for 2021 (by 2 points, from 84 to 86 points).

The share of people who consider that the efforts undertaken by the head of state to boost the economy and increase the welfare of citizens are successful has increased slightly. In April 2021, 23% of Vologda Oblast inhabitants shared this point of view, while in February 2022 their proportion increased by 5 p.p. (from 23 to 28%). For comparison, their share was 25–26% in 2020–2021.

Thus, the results of the latest stage of the monitoring suggest that at the beginning of 2022, the deterioration of public opinion assessments on certain key indicators (attitude toward the work of the RF President, social well-being) is primarily due to the tense geopolitical situation that is directly related to the Russian Federation. There are no negative changes in the estimates of the dynamics of the standard of living and quality of life; and this, of course, is an important positive moment in the general characteristics of social attitudes that have developed at the beginning of the year.

Nevertheless, we should note that the share of people identifying themselves as "poor and extremely poor" inhabitants of the Vologda Oblast is still higher than the proportion of middle-income people (45 and 42%, respectively), and the consumer sentiment index continues to remain below 100 points, indicating

[4] In November 2021, the real wage in the Vologda Oblast amounted to 99.5% compared to October; the consumer price index was 100.6% (Source: *Socio-Economic Situation in the Vologda Oblast in 2021 (2022): Report.* Vologdastat. Vologda. P. 69.

the predominance of negative forecasts regarding the prospects for development of the economic situation in the country and one's own financial situation.

This suggests that the stability achieved in the assessments of public opinion about the dynamics of the financial situation is still insufficient; thus, it is necessary to continue implementing active measures to maintain the standard of living not only for socially vulnerable groups, but also for the wider population.

Materials were prepared by M.V. Morev, I.M. Bakhvalova

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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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