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Assessing the Scale and Prospects of the Impact of Climate-Related Risks on Russia's Socio-Economic Development*

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Abstract. Global climate change is one of the most critical issues of our time. It is of vital importance to Russia, since the functioning of the country's economy to a great extant depends on natural resources, and one of the most dangerous consequences of climate change is the depletion of natural capital. In this regard, one should take an assessment of climate-related risks. The purpose of the work is a comprehensive assessment of the impact of climate-related risks on the socio-economic development of Russia. The article determines external climate-related risks expressed in the external pressure of international treaties and trade policy, pursued by foreign countries, particularly Europe, and internal risks realized through ecosystem disbalance and biodiversity loss, epidemic outbreaks and complication of their course, deterioration of infrastructure and other fundamental structures in a large part of the country. It has been established that Russia has just begun the transition to a low-carbon development, and the feature

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of this process compared to other countries is a comprehensive approach that involves both greenhouse gas reduction and its absorption directly from the atmospheric air. Hydrogen economy plays a key-role in emission reduction; in order to absorb greenhouse gases from the atmosphere, it is planned to form industry for their utilization through building carbon polygons and farms. We have found that measures to reduce the country's carbon footprint are now consistent and do not interfere with the interests of either business or government. However, the main issue, in our opinion, is the low rate of implementation of the measures taken relative to similar efforts of foreign countries, which to some extent gives foreign countries the opportunity, under the pretext of environmental policy, to influence the Russian economy and further hinder the Russian Federation in standing its ground in the international arena.

Key words: climate-related risks, socio-economic development, Russia, low-carbon development, decarbonization.

Introduction

In recent years, the planning of economic development at the global and national levels has been increasingly focused on environmental aspects [1–4]. In particular, this is caused by the increasing frequency of natural emergencies, which affect both the environment and the socio-economic system of individual countries.

According to the American scientist T. Farmer, it is the process of environmental degradation, noticeably increased in recent decades, that becomes the main factor in the emergence of many natural phenomena that produce a devastating effect on the economy [1]. The main danger of natural risks lies in the fact that many of them are realized very slowly and accumulate many phenomena (geological, geophysical, hydrological and meteorological) [2].

In the last decade, special attention has been paid to climate-related risks, which are often the cause of various natural disasters and, as a consequence, significant material damage [4–8].

According to The Global Climate Risk Index 2020, which shows to what extent countries and regions have suffered from the consequences associated with natural risks (storms, floods, heat waves, etc.), Russia in 2018 ranked 79th out of 137. Moreover, in terms of natural disasters per 100,000 people, it fell to 103rd out of 115 possible ranks [3].

The unpredictable and uncontrollable force of nature poses a significant danger to the socio-economic development of Russia. According to RAS academician B.N. Porfir'ev, the main problem of coming natural risks is the complexity of their prediction and assessment, which makes it very difficult to carry out preventive and adaptation measures [4]. This necessitates a comprehensive approach to solving the problem of climate-related risks reduction, implemented through consideration of environmental, social and economic aspects, their reflection in domestic and foreign policy of the country.

The purpose of this work is to conduct a comprehensive assessment of the impact of climate-related risks on the socio-economic development of the Russian Federation.

The novelty of the study consists in a comprehensive assessment of the current state and prospects for the realization of climate-related risks for the socio-economic development of Russia.

Theoretical aspects of the research

With the increasing influence of the concepts of sustainable development and green economy in the world, there is a growing awareness of the need to consider the environmental aspects of socio-economic development. One possible reason for this is the increasing frequency of natural disasters

and emergencies which damage almost all spheres of economic life.

According to the World Meteorological Organization, the number of natural disasters in the period 2010–2019 increased 4.5-fold compared to 1970–1979, and economic losses from them increased almost 8-fold *(Tab. 1)*.

If we consider natural emergencies in Russia, we can see that the situation has changed. For example, in the regions of the Northwestern Federal District, cases of special fire risk have become more frequent since 1998, and since 2001 entire range of adverse phenomena has been observed. In the constituent entities of the North Caucasian Federal District, as well as in the Northwestern Federal District, cases of special fire risk have become more frequent since 1998, cases of avalanches have become quite regular since 1999, and hail has become more frequent in Stavropol Krai since 2016. In the Far Eastern Federal District, the problem of floods has become more acute since 2013[1].

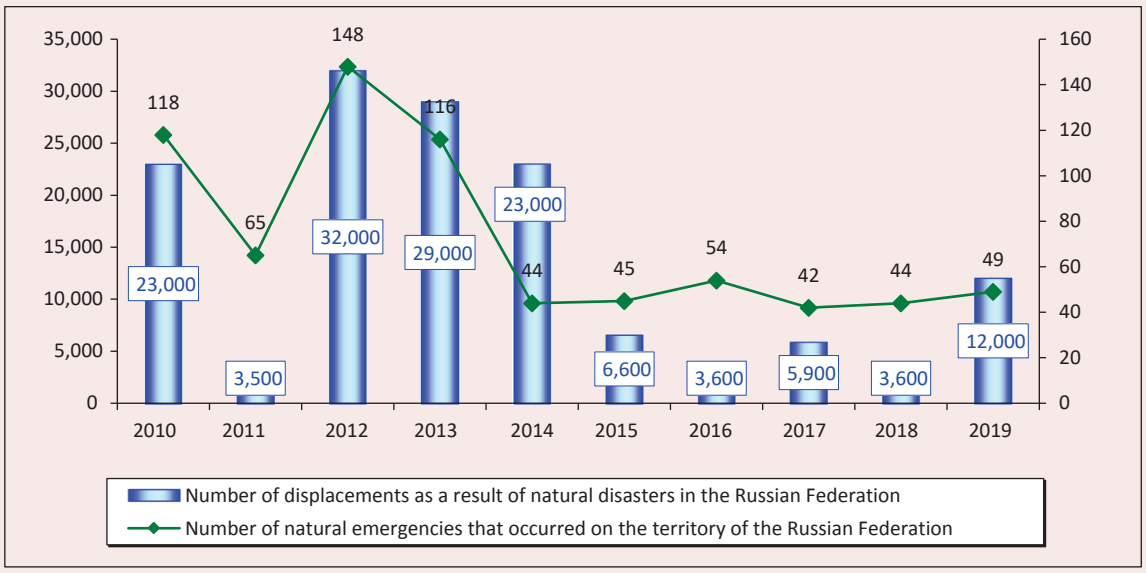
Some of these emergencies have caused more than 140,000 population displacements and forced migrations *(Fig. 1)*, even though the number of emergencies decreased between 2010 and 2019.

Table 1. The number of natural disasters in the world and the associated economic losses

Indicator	1970–1979	1980–1989	1990–1999	2000–2009	2010–2019
Natural disasters, cases	711	1,410	2,250	3,536	3,165
Economic losses, billion dollars	175.4	289.3	852.3	942.0	1,381.0

Source: The atlas of mortality and economic losses from weather, climate and water extremes (1970–2019). *WMO*. 2021. 19 p.

Figure 1. Number of displacements as a result of natural disasters in the Russian Federation, cases



Compiled according to: Internal Displacement Monitoring Centre (IDMC). Russia. 2020. Available at: https://www.internal-displacement.org/countries/russia; Environment. *Rosstat*. Available at: https://rosstat.gov.ru/folder/11194

[1] Information about dangerous and adverse hydrometeorological phenomena that caused material and social damage on the territory of Russia. Available at: http://meteo.ru/component/docman/doc_download/738-massiv-dannykh-ojdamage-rus?Itemid=

Table 2. Classification of natural risks by genesis, scale and nature of impact

Indicator	Type of risks
Genesis	Cosmogenic
	Atmospheric
	Hydrologic
	Climate
	Geologic
	Biogenic
Scale	Worldwide
	Continental
	National
	Regional
	District and local
Nature of impact	Destructive
	Paralyzing
	Depleting
	Causing technological emergencies

Source: Bedilo M.V. et. al. *Opasnye prirodnye protsessy: ucheb* [Hazardous Natural Processes: Textbook]. 2nd edition revised and supplemented. Moscow: Akademiya GPS MChS Rossii, 2020. 9 p.

Natural risks are very diverse both in their origin and in the scale and nature of their impact *(Tab. 2)*. However, in recent years, special attention has been paid to climate-related risks which, by definition, will be long-term, and the scale of their consequences may affect all levels of management.

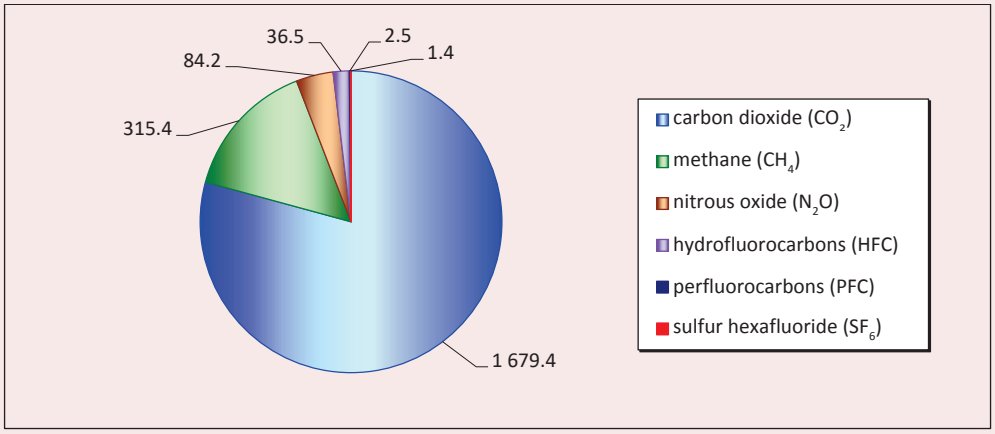
In our study, climate-related risk will be understood as "the time-limited probability of adverse socio-economic, socio-demographic and natural conditions caused by climatic reasons" [2].

The priority of climate-related risks is also due to the fact that they can act as a kind of trigger for other types of natural risks. For example, a long-term increase in temperature can provoke a forest fire, followed by depletion of natural capital and loss of biodiversity, increased morbidity (due to air pollution and smoke poisoning) and nearby population mortality. Another example of the interdependence of natural risks with climate-related ones would be the permafrost thawing, the consequence of which would be ecosystem disbalance, (which, again, leads to the depletion of natural capital and loss of biodiversity) the destruction of infrastructure, resulting in human losses.

At the present stage of development, global climate change primarily means global warming. Its generally recognized cause was an increase in the concentration of greenhouse gases (GHG) in the atmosphere, coming from both natural (e.g. due to volcanic eruptions, marsh gas emissions, etc.) and anthropogenic sources (emissions from industry, transport, landfill, etc.). While society cannot prevent natural emissions, it is possible to reduce anthropogenic emissions, and in some countries, it is claimed that they can be reduced to zero.

Among all greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrochlorofluorocarbons, hydrofluorocarbons, ozone), the proportion of carbon dioxide in the structure of emissions is the largest (79.2%, *Fig. 2*). Despite this, researchers are increasingly drawing attention to the importance of focusing on the effects of the other GHGs because of their higher risk. For example, B.N. Porfir'ev emphasizes that "the greenhouse effect of methane

Figure 2. Total greenhouse gas emissions in Russia in 2019, million tons CO2-eq.



Source: Environmental Protection. *Rosstat*. Available at: https://rosstat.gov.ru/folder/11194

and the associated risks are many times greater than those of CO2, and the environmental and economic efficiency of measures to reduce CH4 emissions is significantly higher" [9].

The negative impact of the consequences of climate change is confirmed by a number of recent studies. Thus, researchers of the Institute of Economic Forecasting of the Russian Academy of Sciences (IEF RAS) (B.N. Porfir'ev, D.O. Eliseev, D.A. Streletskii) predicted possible economic losses due to the destruction of infrastructure caused by climate change until 2050. The results obtained show that the costs of restoring and maintaining the sustainable functioning of regional road infrastructure due to the risk of permafrost thawing and degradation may vary from 14 to 28 billion rubles[2] in annual investments [10].

Another researcher from IEF RAS, Professor B.A. Revich proved the impact of climate warming on the health of the population and the need to implement adaptation measures[3]. In his work he notes that a feature of climate change in the Russian Arctic is the increased frequency of heat waves, which pose a particular danger to health. "The economic damage from temperature waves is estimated on the basis of calculations of additional mortality of the working-age population, limitations of working capacity, disability due to complications of climate-dependent diseases, such as stroke. In 2018, for example, 133.6 billion potential working hours were lost worldwide, an increase of 45 billion over the 2000 level". [11, p. 395].

Another negative manifestation of climate-related risks in the north of Russia due to thawing permafrost is the destruction of numerous burial grounds, which are major sources of dangerous infections, such as anthrax. Its outbreak in Yamal in 2016 with the hottest summer in the 150-year history of hydrometeorological observation was a confirmation [12].

In addition, it has been proven that greenhouse gas emissions may be a factor contributing to the further development of the COVID-19 pandemic because they affect respiratory health and may exacerbate the epidemiological situation [13].

[2] At 2018 prices.

[3] Drize Yu. Hot breath of the North. *Poisknews*. Available at: https://poisknews.ru/magazine/zharkoe-dyhanie-severa

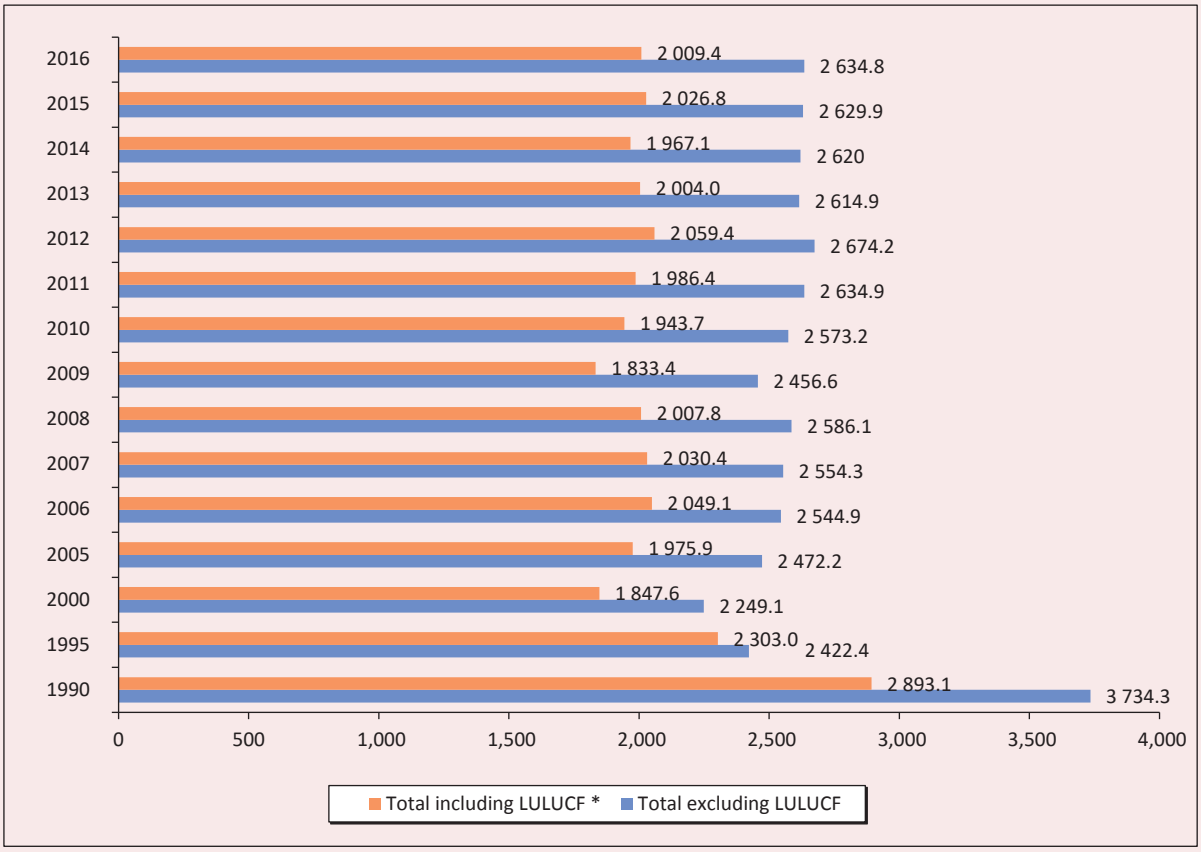
Consequently, we can conclude that the problem of climate change is an objective reality that requires a comprehensive approach to addressing it. Assessment of the level and nature of climate-related risks in the Russian Federation has practical relevance, consisting in the possibility of subsequent minimization of economic losses.

Research findings

Climate-related risks affect Russia's socio-economic development both internally through the reduction of natural capital, the deterioration of national socio-demographic and economic indicators, and externally through the pressure of other countries' policies and international agreements.

We first propose to consider the external impact. One of the most recent international climate treaties is the Paris Agreement (2015), under which Russia pledged to reduce greenhouse gas emissions to no more than 70% of 1990 levels by 2030. However, according to the national report on the greenhouse gas inventory, this goal was achieved back in 1995 (65% of the 1990 level, *Fig.* 3).

Figure 3. Dynamics of greenhouse gas emissions in Russia, million tons CO2-eq.



*LULUCF – land use, land-use change, and forestry. A feature of this part of the economy is the ability to absorb greenhouse gases.

Source: Environment. *Rosstat*. Available at: https://rosstat.gov.ru/folder/11194

The reduction of GHG emissions from 1995 to 2005 was substantiated by a reduction in industrial production. Despite the fact that Russia still formally meets the obligations under the Paris Agreement, the level of GHG emissions has been increasing since 2005, which causes a corresponding reaction of the countries that proclaimed the need for total decarbonization and carbon neutrality.

While the Paris Agreement implies voluntary participation, the actions of some of Russia's trading partner countries exert some pressure in the field of carbon regulation, and the country will not be able to avoid this influence.

For example, in 2019 the European Union adopted a strategic document "European Green Deal", which is a plan to achieve zero total greenhouse gas emissions and zero total pollution by switching from fossil to renewable energy sources and raw materials in the EU member states by 2050 [9; 14]. Carbon border tax (CBT) has become one of the tools for the implementation of this plan. In Russia, this tool is most widely discussed. In the EU, its introduction is motivated by incentives for exporters to reduce the carbon intensity of their products. In Russia, for objective reasons, it is seen as an instrument of market protectionism. In the EU is already quite developed market of trade in greenhouse emissions, and also for quite a long time the products of domestic producers are subject to carbon tax, therefore, goods imported from countries with less stringent environmental regulation will be cheaper and more competitive in the European market [15–18].

According to various sources, the size of carbon border tax is estimated from 25 to more than 50 euros per ton of CO_2-equivalent[4]. First of all, such a tax will affect products of metallurgical, chemical and mining industries[5]. According to the calculations of IEF RAS, the size of its payment from Russia will be about 936 billion rubles[6]. The estimate is preliminary, because the amount of CBT has not yet been approved and, moreover, depends heavily on the exchange rate.

As for internal climate-related risks for socio-economic development of the Russian Federation, the following should be taken into account. Due to the fact that the country has a huge territory located in several climatic zones and rich in different ecosystems, climate-related risks may manifest themselves differently depending on the geographical location of the region and the anthropogenic activities carried out in it. This is evidenced by a study conducted by the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet). According to its results, the northern territories of the country, occupying about two-thirds of its area, will be subjected to the greatest degree of negative climate change in the next hundred years. According to the forecast, under the optimistic scenario, the temperature in the North could rise by 5°C until 2099 *(Tab. 3)*.

Since most of the country belongs to the northern territories, climate-related risks are very significant for it, and if they materialize, the consequences will be large-scale. The entire northern border of Russia runs along the shelf of the Arctic Ocean, where some of the most intense climate change processes are recorded.

[4] Assessment of the economic consequences of the introduction of a carbon border tax. IEF RAS, 2021.

[5] Potaeva K., Mil'kin V. The EU has identified goods for charging a carbon border tax. *Gazeta Vedomosti*. Available at: https://www.vedomosti.ru/economics/articles/2021/07/15/878247-es-opredelil-tovari-dlya-transgranichnogo-naloga

[6] At a tax rate of 25 euros per ton of CO_2-eq. at the exchange rate of 1 euro – 78 rubles.

Table 3. Forecasted changes in temperature at the Earth's surface due to climate change, °C

Territory	Forecasted scenarios of temperature changes at the Earth's surface*								
	RCP Scenario 2.6			RCP Scenario 4.5			RCP Scenario 8.5		
	2011–2031	2041–2060	2080–2099	2011–2031	2041–2060	2080–2099	2011–2031	2041–2060	2080–2099
Far North	1.6–2.7	2.4–4.6	2.3–4.7	1.5–2.7	2.7–5.4	3.6–7.5	1.6–2.9	3.6–6.7	6.2–12.2
Central Russia	1.3–1.5	1.5–2.3	1.7–2.3	1.2–1.4	2.3–2.8	2.9–3.8	1.3–1.6	2.9–3.4	5.5–7
South Russia	1–1.5	1.5–2.4	1.5–2.2	1–1.5	1.8–2.9	2.4–3.8	1.1–1.5	2.8–3.6	4.3–6.9

* RCP scenarios (Representative Concentration Pathways) – scenarios for the evolution of anthropogenic emissions of greenhouse gases into the atmosphere in the future. The scenario index corresponds to the magnitude of the global anthropogenic radiative forcing achieved in 2100, namely 2.6; 4.5 and 8.5. The paper shows three basic scenarios: RCP 8.5, RCP 4.5, RCP 2.6.
Compiled according to: Scenario forecasts based on global models. Available at: https://cc.voeikovmgo.ru/ru/klimat/izmenenie-klimata-rossii-v-21-veke

Nevertheless, it can be noted that active steps to reduce them began to be taken after the influence on the country from the outside. Thus, the introduction of a domestic carbon tax was initially considered as a possible response to the introduction of CBT. The initiators of such regulation saw its advantages in the fact that in this way the "under-taxed" Russian export products will be compensated, but this fee will go to the Russian budget, not out of its borders. However, later researchers from IEF RAS denied the advisability of introducing an internal carbon tax: according to preliminary estimates, the additional tax burden on business will be 1,936 billion rubles, and the total effect on the economy will be negative (-28 billion rubles)[7] [15].

In order to reduce climate-related risks within the country, the following strategic objectives were set in the Address of the President of Russia to the Federal Assembly of April 24, 2021[8]:

1. Adjusting agriculture, industry, the housing and utilities sector and the entire infrastructure to climate change.

2. Creating a carbon utilization sector, bring down emissions.

3. Introducing strict control and monitoring measures.

4. Over the next 30 years, the cumulative emissions in Russia must be smaller than in the EU.

Currently, the greenhouse gas utilization industry is just beginning to take shape. Since the main focus of Russia is not on the prevention of GHG emissions, but on their absorption directly from the atmosphere, it is supposed to consider the maximum possible contribution of Russian ecosystems to the sequestration of GHGs. For this purpose, it is planned to form a network of carbon farms and polygons. In 2021 the Ministry of Science and Higher Education of the Russian Federation launched a pilot project to create carbon polygons on the territory of Russian regions to develop and test carbon control technologies. In the first year of the project, it is planned to create carbon polygons in eight regions: in the Chechen Republic, Krasnodar Krai, the Kaliningrad, Novosibirsk, Sakhalin, Sverdlovsk, Tyumen and Moscow oblasts, and in the long-term – about 50 polygons. At each of them carbon farms will be formed – special areas of ecosystems which most effectively absorb greenhouse gases[9].

[7] Assessment of the economic impact of the introduction of a carbon border tax. *IEF RA*S, 2021.

[8] Presidential Address to the Federal Assembly. Available at: http://www.kremlin.ru/events/president/transcripts/messages/65418 (accessed: June 25, 2021).

[9] Carbon polygons. *Ministry of Science and Higher Education of the Russian Federation*. Available at: https://minobrnauki.gov.ru/action/poligony

In some regions, the creation of such farms is an individual initiative, for example, in the Vologda Oblast, the initiator was PhosAgro, which plans to deploy a test site of about 600 hectares[10].

However, another problem arises with respect to carbon farms, namely, ensuring fire protection of forest, as well as their inventory, since the regularity of its implementation is complicated by the large area of forest plantations and the lack of appropriate personnel. In 2021, Russia recorded some of the largest fires in the history of space observation, the smoke from which reached the North Pole [17]. Since forest ecosystems are the second most important carbon sink (after phytoplankton), wildfires can reverse the carbon balance. This is often used by foreign countries when Russia tries to substantiate its contribution to the global GHG sequestration.

At the same time, satellite and sampling data from 1988–2014 indicate a 39% increase in forest biomass, which corresponds to a 47% increase in carbon sequestration [18]. According to V. Guzii and V. Leibin, such an increase could compensate for the lack of carbon sequestration due to deforestation of South American forests [18].

Thus, it is clear that without an effective system of forest use, as well as a system of fire safety measures, Russia will not be able to create a carbon utilization industry and defend its status as a "carbon sink" in the international arena.

As for adapting industries to climate change, to begin with we need to assess how they deal with greenhouse gas emissions.

As shown in *Table 4*, Russia currently tries to take into account the absorptive capacity of its ecosystems, which in the majority of cases remains positive.

In general, both in the world and in Russia, the main source of GHG emissions remains the energy sector (about 80% of all GHG emissions in the country), due to the predominance of traditional generating facilities (operating on fossil fuels, mainly gas and coal). In the case of coal-fired power industry, the solution could be to improve the purification equipment capable of capturing not only particulate matter, but also greenhouse gases, including carbon dioxide.

Table 4. The level of CO2-eq. emissions by economic sector, million tons

Sector	2005	2010	2011	2013	2014	2015	2016	2017	2018	2018 to 2005, %
Energy sector	1 583.7	1 635.1	1 683.1	1 623.3	1 620	1 616.5	1 612.3	1 629.6	1 679.2	106.0
Industrial processes and the use of industrial products	207.4	196.4	199.8	220.2	220.5	218.6	218.3	232.6	243.3	117.3
Agriculture	104.9	103.5	106.2	107.7	107.5	108.6	112.5	113.1	112.8	107.5
Land use, land-use change and forestry (LULUCF)	-530.5	-713.8	-655	-614.6	-670.3	-589	-608.9	-603.3	-586.7	110.6
Waste products	69.5	78.4	81.5	86.5	89.9	92.1	94.1	96.2	98.2	141.3
Total, excluding LULUCF	1 965.4	2 013.4	2 070.5	2 037.8	2 038	2 035.9	2 037.2	2 071.5	2 133.6	108.6
Total, including LULUCF	1 434.9	1 299.7	1 415.5	1 423.2	1 367.6	1 446.9	1 428.3	1 468.2	1 546.9	107.8
Source: Data from the Federal State Statistics Service. *Environment, climate change*. 2021. Available at: https://rosstat.gov.ru/folder/11194										

[10] PhosAgro plans to launch a carbon farm in the Vologda Oblast. Available at: https://rupec.ru/news/47300/

Table 5. Dynamics of natural gas production and consumption with GHG emissions for 2010–2018

Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018
Natural gas production, billion m^3	657	673	658	675	647	638	644	695	738
Natural gas consumption, billion m^3	466	476	471	466	465	445	444	463	499
Emissions, tons of CO_2-eq. per capita	11.08	11.62	11.64	11.32	11.20	10.81	10.61	10.80	11.13
Compiled according to: Enerdata. Global energy trends. 2021; Carbon Dioxide Information Analysis Center, Environmental Sciences Division Dataset, Oak Ridge National Laboratory, Tennessee, United States.									

Rejection of coal is fraught for Russia not only with economic losses, but also with the loss of relations with some countries that import coal for domestic generation. For example, the UK, which declares its desire to decarbonize its economy, purchases Russian coal for power supply in winter[11].

The value of GHG emissions from the gas production sector remains relatively constant *(Tab. 5)*.

Nevertheless, one should note that specific GHG emissions from natural gas production remain quite large. This is due to the nature of its consumption (combustion) and certain losses during extraction and distribution.

Since the gas production industry for Russia remains one of the strategically important, the refusal to use gas is guaranteed to have a negative impact on the socio-economic development of the country.

Given the global low-carbon development trend, as well as the need to maintain the volume of natural gas production and exports, as oil and gas revenues account for about 30–40% of the federal budget, in 2020 the Russian government approved the action plan "Development of hydrogen energy in the Russian Federation through to 2024"[12]. This document provides for the development of hydrogen energy on the basis of the existing capacities of nuclear power plants, the development of technologies for the production of hydrogen from gas, and the launch of rail transport using hydrogen. It is also planned to develop international relations with producers and consumers of hydrogen fuel (Germany, Austria, the Netherlands – the main importers of Russian natural gas). Consequently, in our opinion, the main emphasis in reducing GHG emissions by the gas industry should be placed on the prevention of gas leaks, the greenhouse effect of which is many times greater than that of carbon dioxide.

As for strict carbon regulation in Russia, both the scientific community and the authorities are currently unanimous in this case. As stated earlier, the internal carbon tax is fraught not only with a large tax burden on business, but also with a negative economic effect, so we are currently only talking about carbon reporting for organizations – GHG emitters. For large enterprises such reporting will be mandatory, for small – voluntary. The Ministry of Economic Development of the Russian Federation called this measure the first stage of the formation of carbon regulation without taxes and mandatory payments[13].

[11] Martsikevich B. Reliable "black diamonds". What is going on in the Russian coal industry. *Zavtra*, 2021, no. 31 (1441). Available at: https://zavtra.ru/blogs/ugol_i_d

[12] Action Plan "Development of hydrogen energy in the Russian Federation through to 2024": Approved by Governmental Decree no. 2634, dated October 12, 2020.

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In our opinion, it is also more appropriate to develop a database on GHG emissions broken down by region, using the system of carbon polygons and farms to assess the contribution of forest ecosystems in the sequestration of carbon. This is exactly what allows creating a system for monitoring GHG emissions and carbon balance of territories of Russia. Since the business takes the initiative and supports projects to create such carbon sequestration industry facilities (including financially), it will be unfair to impose additional tax on them.

Thus, we can make the conclusion that Russia has begun the transition to low-carbon development. Nevertheless, despite all the measures taken, there is a fairly high probability of lagging behind the global rate of decarbonization.

As experience shows, the transition of other countries to a green economy is very rapid. For example, in the USA, a state that withdrew from the Paris Agreement in 2017, climate change was already declared the center of foreign, domestic policy and national security in 2021. With the inauguration of President Biden, the country returned to the Paris Agreement. Moreover, the new president has carried out administrative reform and has established anew the entire conceptual, institutional and legal, organizational and structural framework of the country's climate policy. S.A. Roginko, member of the Workshop on Climate Change at the Presidium of RAS, notes that the pace of changes in the United States, as defined by the climate agenda, is very noticeable and one gets the impression that Washington intends "not just to work, but to fight". To fight against the major opponents – China and Russia, whose economy is based on the use of fossil fuels [20]. Therefore, such changes, both in the U.S. and Europe, necessitate more extensive and rapid action from Russia, which can be implemented only through the cooperation of government, business, science and society as a whole.

Conclusion

Thus, we can make the conclusion that climate-related risks are quite reasonable for Russia's socio-economic development. They are expressed in the depletion of natural capital, the use of which is the basis of the Russian economy, and, most importantly, in increasing the vulnerability of Russia's position in the world and limiting its ability to defend its national interests. Taking into account global trends of low-carbon development, the goal to be ahead of the EU in reducing net GHG emissions by 2050 becomes clear.

In order to reduce internal climate-related risks, it is necessary to improve the environmental management system, in particular forest use. It is necessary to ensure the complete forest reproduction of felled and dead forest planting, to monitor them, and to carry out fire-fighting measures. In addition, it is advisable, in our opinion, to toughen responsibility in the sphere of forest use regarding unlicensed logging. At present, only this will contribute to the preservation of forest ecosystems and, consequently, to the creation of a carbon sequestration industry.

Regarding external climate-related risks, it is important to ensure cooperation between government, business, science and society as a whole. This is due to the need to implement the planned activities in a short time, and in this regard, it is necessary to support the low-carbon initiative of business. In our opinion, this will not only help to reduce climate-related risks within the country, but also to defend its national interests in the international arena.

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