Forecast of Long-Term Interaction of Socio-Economic, Natural and Climatic Systems

A. Dokhtukaeva[1,*], and *A. M.* Plieva[2]

[1]Kadyrov Chechen State University, Sheripova Street, 32, 364024, Grozny, Russia
[2]Ingush State University, I. Zyazikova Ave., 7, 386001, Magas, Russia

Abstract. Global climate change is perceived at the local level mainly through individual shocks. The risks associated with global climate change and global climate policy bring the issue of territorial resilience into focus. It includes not only the ability of territories to recover from shocks of various genesis, but also to adapt to stresses, renew and transform. The problems of managing territorial resilience in the context of global changes are considered in the second section on the example of the implementation of forest climate projects and the problems of sustainable forest management. In the context of the development of the global climate agenda and the gradual formation of mechanisms for paying for greenhouse gas emissions, Russia's natural advantage is the great potential for CO2 absorption by natural systems on its vast territory, including both forests and abandoned agricultural lands, including those overgrown with forests.

1 Introduction

In recent years, the influence of environmental and natural factors on socio-economic development has increased many times over. Climate change and the growth of anthropogenic pressure on the environment entail a reduction in biodiversity and degradation of ecosystems, an increase in the likelihood of hazardous natural phenomena and environmental disasters that have a significant impact on individual countries, regions and the world as a whole. The process of depletion of natural mineral raw materials, water, land, forest and other resources is accelerating. Extreme natural events are spreading to territories where they were not previously observed, which leads to a significant increase in the flow of climate migrants [1]. It is expected that the change in climatic conditions with the accelerated growth of the world's population will lead to a decrease in the agro-climatic potential of the planet, problems in the development of agriculture and food supply. The complex and unpredictable nature of climate change requires a transition to sustainable development and a low-carbon economy, which will require new technological solutions and the implementation of significant changes in the structure of the economy.

Russia joined the UN Paris Climate Agreement in 2019 and committed itself to preventing a rise in global temperature by 1.5–2°C, as well as a significant reduction in greenhouse gas (GHG) emissions by the middle of the 21st century. A national target has been set for 2030 to reduce GHG emissions by up to 70% compared to 1990 levels [23-].

*Corresponding author: kurumova71@mail.ru

The Strategy for Social and Economic Development with Low GHG Emissions until 2050, being developed by the Ministry of Economic Development of the Russian Federation, provides for a number of scenarios related to the implementation of climate policy measures, including low-carbon development energy, industry, transport and other industries. In the context of the development of the global climate agenda and the gradual formation of mechanisms for paying for greenhouse gas emissions, Russia's natural advantage is the great potential for CO2 absorption by natural systems on its vast territory, including both forests and abandoned agricultural lands, including those overgrown with forests. One of the most urgent tasks for setting goals for reducing emissions and increasing GHG absorption in Russia is to conduct economic and mathematical modeling and a comprehensive assessment of the impact of various low-carbon development scenarios on financial, economic, social, technological and environmental indicators for the period up to 2050 and beyond. Another important task is to predict the net absorption of CO2 by forest ecosystems that compensate for more than 25% of anthropogenic GHG emissions in the country. Recently, interest in the ecosystem function of forests for carbon sequestration has increased both at the state and corporate levels [4]. The interest of companies is associated primarily with the expected introduction by the European Union of a cross-border carbon tax from 2023, which will lead to large financial losses for Russian exporters (3-5 billion dollars a year), as well as with the development of the market for "green" metals, cement and other mass products requiring evidence of a low carbon footprint in their production. Many companies in the oil and gas sector, metallurgy, chemical industry, unable to significantly reduce their carbon footprint through traditional programs to reduce greenhouse gas emissions and improve energy efficiency, are considering using one of the most low-cost ways - the purchase of emission reduction units (ERUs) accumulated in forest climate projects [5]. More than 260 forest climate projects have been implemented and certified in the world, of which only three are in Russia, despite the great natural potential. In the future, three types of projects can be implemented in Russia: within the framework of voluntary forest conservation by tenants, sustainable forest management, and programs of protective afforestation and afforestation. Some forest industry companies have already begun to introduce elements of climate-oriented forestry into forest management practices, including diversifying forest supply by increasing the share of hardwoods, developing the production of cellulose, bioenergy raw materials (pellets) from them.

2 Research Methodology

Today, scientists have come to a new understanding of the climatic and ecological role of the progressive degradation of underwater permafrost and the destabilization of hydrates - the massive emission of methane into the water column-atmosphere in the context of the impact on human development [6]. The processes of uncontrolled natural release of greenhouse gases into the atmosphere, the source of which are shelf gas hydrates and other geological reservoirs (pools) of methane, require the development of a monitoring and control system. An interdisciplinary approach is needed, including hydrophysical, biogeochemical, geophysical and geological methods accepted in world practice. An extended data bank on the state of underwater permafrost and identified areas of massive methane discharge due to destabilization of hydrates can be used to identify the mechanism for the formation of the maximum allowable volume of planetary atmospheric methane over the Arctic, which is one of the modern world challenges in the field of natural sciences.

3 Results and Discussions

For a long period preceding the achievement of the modern level of scientific and technological progress, the use of the natural environment was carried out extensively, which meant an increase in the volume and types of resources received. At the same time, there were practically no restrictions on human activity, with the exception of his own productive forces [7]. By the middle of the XX century. this approach to the environment began to reach critical values in a number of ways. While maintaining the scale and dynamics of consumption of fossil energy resources and other types of raw materials and materials in the medium term, it is possible to predict their depletion. We can say that humanity and the natural environment are a single system "society – environment", the subjects of which constantly interact with each other. In the socio-economic subsystem of this system, one can trace the influence of scientific and technological progress on economic development and the distribution of productive forces, taking into account socio-demographic, natural-resource and natural-climatic factors. The socio-economic subsystem influences the natural-resource and natural-climatic subsystems: there is an impact of productive forces on various types of natural resources and climate. The relationship between the availability of natural resources and the level of human capital can be seen through the lens of economic growth [8]. As the main factor of economic growth, the presence and high level of human capital are distinguished: investments in human capital are characterized by physical capital - diminishing returns. The presence of significant volumes of natural resources, the extraction of which is more than 10% of GDP and 40% of the country's exports, from the point of view of supporters of resource-based economic growth (Resource Based Growth), is a boon and a major development factor, provided they are used rationally. In connection with the peculiarities of pricing for natural resources, resource-oriented economies are largely dependent on the situation in world markets. However, natural resource abundance does not guarantee economic growth and can lead to long-term and over-reliance on extractive industries – the "resource curse". When compared across countries, there is a negative correlation between economic growth rates and the share of natural resources in countries' exports: a decrease in the share of resources in exports by 10 p.p. provides an increase in growth rates by 1 p.p. in year. The negative effects of the "natural resource curse" include insufficient household investment in human capital, which is primarily due to low demand for skilled labor [9].

In all scenarios considered, Russia's obligations under the Paris Agreement to reduce GHG emissions by 30% from 1990 levels by 2030 are fully met, and there are no risks of exceeding the target level [10]. With an active policy to stimulate low-carbon development, decarbonization of the economy and other measures to reduce GHG emissions, it is expected to create a significant reserve for reducing emissions in the period from 2030 to 2040. When developing Russia's position on obligations for the period after 2030, it is advisable to take into account the cumulative reduction in GHG emissions and using accumulated emission reductions for future periods. In the period from 2040 to 2050, an increase in total GHG emissions is possible due to a decrease in the absorption capacity of forests (increase in harvesting, the impact of climate change, the spread of forest fires, forest diseases, etc.) and a delay in the transition to low-carbon technologies in energy, industry, transport and housing and communal services [11]. The transition to low-carbon and carbon-free energy resources and technologies, energy efficiency, transition to production processes without greenhouse gas emissions in metallurgy, chemical, petrochemical and other industries, improvement of management systems and other measures, in combination with improved carbon accounting and forest ecosystem management will contribute to achieving Russia's leadership in fulfilling the goals of the Paris Agreement. Our country has a huge natural resource, technological, investment potential for large-scale reduction of GHG emissions and decarbonization of the economy.

4 Conclusions

In conclusion, it can be noted that the subjects of the "society-environment" system constantly interact with each other, and their interests often do not coincide or conflict. Although the trends in the development of natural-climatic systems and human potential partially intersect (in the field of sustainable development), studies of these two phenomena are focused on assessing and measuring progress in fundamentally different areas. Natural resource abundance often has negative effects on economic growth and human capital. Economists have proven a negative correlation between the rate of economic growth and the share of natural resources in the country's exports. The negative effects of the "resource curse" include insufficient incentives for investment in human capital by households due to the lack of demand for skilled labor; lack of incentives for investment in human capital by the state due to the volatility of export earnings from the sale of natural resources; high level of social stratification; the irremovability of the ruling elites; negative impact on the environment and the health of citizens. The listed negative effects refer to those countries in which political and economic institutions and social infrastructure are underdeveloped. The analysis of big data made it possible to identify the problems and trends that dominate the international and Russian agenda, taking into account their significance and dynamism. The main themes identified by the results of the analysis of Russian-language sources have something in common with those that were identified in English-language sources. The issues of environmental protection (ecology) and transition to sustainable development come to the fore. The world agenda is dominated by the growth of the world population and the growing demand for resources (especially in cities). In terms of technological trends in Russia, as well as in the world, solutions are being developed in the field of extraction of fossil energy resources. Structural changes in the fuel and energy complex are observed on the global agenda and, to a lesser extent, in Russia, research and development of clean technologies are developing. We can note the value shift of households and companies towards new, more sustainable patterns of consumption of goods and resources.

References

1. S. O. Abioye, Artificial Intelligence in the Construction Industry: A Review of Present Status, Opportunities and Future Challenges, **44** (2021).
2. G. V. Vorontsova, G. V. Chepurko, R. M. Ligidov, T. A. Nalchadzhi, I. M. Podkolzina, Problems and perspectives of development of the world financial system in the conditions of globalization, **57**, 862-870 (2019).
3. Y. E. Klishina, I. I. Glotova, O. N. Uglitskikh, E. P. Tomilina, I. M. Podkolzina, Peculiarities of the financial policy of non-profit organizations in the macroeconomic unstable environment, Espacios, **38(34)**, 34 (2017).
4. A. Lawler, End Game for Oil? OPEC Prepares for an Age of Dwindling Demand. Reuters (2021).
5. I. V. Taranova, I. M. Podkolzina, F. M. Uzdenova, O. S. Dubskaya, A. V. Temirkanova, Methodology for assessing bankruptcy risks and financial sustainability management in regional agricultural organizations, **206**, 239-245 (2021).
6. A. S. Salamova, O. Dzhioeva, Green transformation of the global economy in the context of sustainable development, 152-159 (2023).
7. A. S. Salamova, Global networked economy as a factor for sustainable development, 03053 (2020).
8. V. Sebestyén, E. Domokos, J. Abonyi, Focal Points for Sustainable Development Strategies: Text Mining-Based Comparative Analysis of Voluntary National Reviews, Journal of Environmental Management, **263** (2020).

9. S. G. Shmatko, L. V. Agarkova, T. G. Gurnovich, I. M. Podkolzina, Problems of increasing the quality of raw material for wine in the stavropol region, **7(2)**, 725-730 (2016).
10. I. M. Podkolzina, A. I. Belousov, F. M. Uzdenova, L. V. Romanko, O. A. Chernikova, Forms of financial fraud and ways to minimize risks, Modern Global Economic System: Evolutional Development vs. Revolutionary Leap, Institute of Scientific Communications Conference, 2197-2205 (2021).
11. I. M. Podkolzina, I. V. Taranova, K. T. Paytaeva, S. V. Revunov, T. F. Abrosimova, Innovative approaches in financial support for regional economic security, 549-558 (2021).