Green economy as a factor of sustainable development of the state

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Abstract: The problem of transition to a "green" economy based on sustainable technological changes is caused by global environmental pollution of the ecosystem, leading to warming and environmental change, insufficient natural resource potential to meet the vital needs of the planet's population, does not contribute to its development. The practical content is determined by the fact that theoretical and methodological provisions, conclusions and scientific and practical recommendations form the scientific basis for the development of a new holistic concept for the development of a "green economy" in Russia. Conclusions are drawn that the "green" economy can become a driver of development of the Russian Federation, therefore the prospects for creating a "green" economy become dynamic and quite achievable. **Keywords:** "green" economy, circular economy, "green" technologies, innovation, biomonitoring, sustainable development.

1 Statement of problems and analysis of recent research

The growth of the planet's population and its needs in modern conditions significantly exceed the ability to provide it with natural resources.

According to the Organization for Economic Co-operation and Development (OECD), with current production methods and consumption levels, by 2050, compared to 2000, the world's flora and fauna will be damaged from 61 to 72%, and protected natural areas will be irreversibly destroyed by 7.5 million sq km. [1].

The fourth technological revolution requires fundamental changes in the current economic system, a transition to a new business model and the implementation of the basic principles of sustainable green development.

To gradually replace the "brown" industrial economy with a new "green" one, according to experts, Russia will need more than 200 billion euros [2]. Currently, based on the results of 2022, Russia ranks 112th (out of 180 countries) in the global environmental performance index [3]. This indicator reflects the level of implementation of sustainable development in 11 categories of environmental characteristics (climate change, quality of water, land resources, air, state of environmental infrastructure, etc.).

Russian scientists made a significant contribution to theoretical research and practical aspects of the "green" economy: K.O. Petrova, I. Shi, A.S. Orozalieva, Zh. N. Omurova, [1-3]. The basic principles and goals, as well as existing trends and prospects for the

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development of this industry in Russia are analyzed by Yu. R. Achokh, I. V. Gorokhova, B. A. Akhmetova. [4,5]. However, the insufficient level of theoretical research into the environmental component of economic growth and stimulation of environmentally oriented business, the lack of a scientific and methodological base require deep scientific and theoretical developments and practical implementation to determine the relationship between environmental factors and economic development.

2 Material and research methods

To achieve the set goals, the following methods were used in the work: logical and system analysis; synthesis (for environmental analysis and innovative business activities in line with the "green" economy); groupings and typologies; modeling (to formalize the indicator of achievements in the development of a "green" economy and systematize behavioral factors when making innovative decisions); economic and statistical analysis (to analyze the behavior of innovative businesses in the green economy); principles of scientific abstraction and dialectical logic (to clarify the logic of making innovative decisions for the development of a "green" economy).

3 Research results and discussion

Russia is extremely rich in natural resources, which form the basis of the national economy, provide important raw materials for everyday life and necessary in almost all sectors of the national economy. This is an important factor in the development of the world economy. Over the past 50 years, the use of natural resource potential has increased almost 3.5 times, and since 2000, its use has accelerated by 3.2%, which has led to an excess of the physical capabilities of the Earth by almost 20% [6]. The world is changing, the planet's population is growing quantitatively, which leads to an increase in demand for limited resources, forcing the introduction of new technologies for effective and comprehensive use in order to mitigate the impact on the environment. This determines the need for a transition to a "green" economy, where Russia occupies an important place. [5]. For example, such technologies proposed by the Clean Planet team of scientists (http://cleanplanet.life/en/)

Internationally, the United Nations Environment Program (UNEP) defines a green economy as leading to improvements in human well-being and social justice, while significantly reducing environmental risks and environmental deficits [7]. It is the "green" economy that stimulates "green" growth, which, according to the OECD, consists of identifying environmentally friendly sources of growth, developing new environmentally oriented industries, creating jobs and technologies [8]. From the authors' point of view, in its simplest form, a green economy can be seen as a low-carbon, resource-efficient and socially inclusive economy.

The green economy is an alternative to the current dominant national economic model, which increases inequality, encourages waste, creates resource scarcity and poses a huge threat to the environment and human health. Her theory is based on three axioms:

- it is impossible to endlessly expand the sphere of influence in a limited space;
- it is impossible to demand satisfaction of endlessly growing needs in conditions of limited resources;
- everything on the surface of the Earth is interconnected [9].

And it is built on the following principles: well-being; justice; planetary boundaries; efficiency and sufficiency; good management [9].

"Green" (or sustainable) development of Russia should be considered as an economic necessity for its future development, as one of the possible concepts of renewal.

The "green" transition will ensure higher economic efficiency and competitiveness of Russia in world markets. The transition to a green economy will promote the adoption of environmental technologies, reduced dependence on fossil fuels and the pursuit of a zero-emission economy. Today, the degree of technological burden on the environment in Russia is 5-6 times higher than in economically developed countries of the world.

At the same time, the share of potentially environmentally hazardous industries is almost 40% of the total industrial production [10]. The share of relatively ecologically clean territories of our state was only 7% of the total area of the country, conditionally clean - about 8%. 15% of the territory of Russia is defined as slightly polluted, 30% - polluted, 40% - highly polluted [11]. However, there are reserves, because the entire agricultural sector of Russia, even in its current state, can help ensure food security and environmental sustainability. For example, the use of pesticides and fertilizers (the cause of significant environmental pressure) in Russia is well below the "ambitious" reduction targets set by the European Union in the so-called "Green Deal" adopted in 2019.

These principles, which underlie the development of a "green" economy, should become the basis of modern agrarian and economic policy in Russia. The green economy is not a one-time effort, but a broad-based policy project and a new economic tool to support the achievement of sustainable rural development, with an emphasis on reconciling economic goals with social and environmental ones. It should be based on the potential of new sustainable innovative technologies and "green" sectors, which should become the engine of a new path for the development of the agricultural sector of the economy, the necessary awareness at all levels of state architectonics institutions. However, a delay in the transition to a green economy could have negative consequences for the entire country's economy. Climate change and its damage will begin to appear in the near future, in 20-30 years.

According to some expert forecasts, Russia is entering a phase of ultra-high temperatures and weather disasters due to climate change. In addition, a significant reason for aridization in Russia is destructive human economic activity: intensive deforestation, non-compliance with crop rotation, high soil plowing, excessive use of pesticides and agrochemicals.

In world practice, the necessary conditions for the development of a "green" economy and the corresponding mechanisms for stimulating it have already been tested (Table 1). An example for Russia could be the approach of the EU countries, whose environmental sector accounts for 2.5% of GDP. 25% of all EU investments are aimed at the development of "green" technologies.

Table 1. Necessary conditions for the formation of "green" growth

Prerequisites	The necessary conditions	Tools
- planetary shortage of fresh water; - sudden climate change; - negative impact of pollution on human health; - loss of biodiversity.	- balanced structure taxes; - stimulation of research and innovation business activity of firms; - competition; - promoting trade in environmentally friendly products	- increasing the cost of environmental pollution for producers; - assessment of the value of natural capital and ecosystem services; - abolition of environmentally harmful subsidies, introduction of regulatory requirements and standards; - stimulation of "green" innovations in the organization of production; - measuring the process of economic growth of the "green" economy.

The introduction of innovative "green" technologies requires the formation of an innovation system. The transition literature recognizes that many industries, such as energy production, water supply, etc., can be conceptualized as sociotechnical and/or innovation systems [12]. These sociotechnical systems consist of networks of subjects (individuals, private firms, research institutions, government agencies, etc.), the knowledge possessed by these subjects, and associated formal and informal institutions (legal norms, codes of

conduct, etc.). This system architecture performs public functions such as energy, transport or communications, and therefore places more emphasis on usage and functionality aspects than on innovation. The formation of this system at the national level should be facilitated by the state through agricultural and economic policies, since its implementation requires a relatively long time, which can change society in several directions. For example, through legislative amendments, changes in consumer behavior, distributional effects, infrastructure development and new business models, including public enterprise partnerships.

This complex process requires the creation of an effective system. An example of this is the development of wind energy: technological development was one of the elements that influenced the emergence and growth of wind energy. Equally important was the vision and persistence of various wind energy enthusiasts, including social movements and cooperatives; the creation of new network organizations and associations along with a growing consensus of expectations regarding the further development of wind energy; the responses and strategies of powerful energy system operators to these new technologies; public debates and discussions surrounding the use of wind energy; creation and exchange of knowledge and competencies in this area; as well as the gradual creation and negotiation of new institutional conditions for wind energy, their correspondence to different types of policies and interests, as well as the creation of the entire infrastructure of test centers, wind maps and wind turbine transport and construction systems. Thus, almost a century passed from the idea and invention (1887) to active implementation (1980s). That is why it is necessary not to postpone, but to pursue an active policy to promote the development of the country's "green" economy. State policy for the transition to the development of a "green" economy should take into account the five most pressing general global challenges: combating diffuse and more global environmental risks; achieving radical, rather than merely incremental, sustainable technological change; promoting the development of green capitalism; development of appropriate incentive factors for the development of a green economy; assistance in solving the problem of its implementation.

Their analysis shows that the first two goals of modern agricultural policy in promoting the development of a green economy concern the different types of structural goals needed to achieve sustainable technological change in modern agricultural production, as well as the institutional barriers that need to be overcome in realizing these goals. The remaining questions concern the roles and responsibilities of various institutions and key participants in the transition to a green economy: private companies, government agencies and local governments. These problems must also be recognized by modern civil society.

Equally challenging is carbon capture and utilization (CCU), an area of key emerging technologies. These technologies require sufficient funding from the state, as, for example, Germany does, which not every country in the world can afford. To promote innovation, Germany supports a wide range of CCU-related research projects, from basic research to industrial demonstration plants, from catalysis and biorefinery technologies to engineering, from clean fuels to CO2-based chemicals and downstream products. CCU technologies as elements of a future "green" economy can contribute to achieving Russia's ambitious sustainable development goals for climate protection, as well as increasing the productivity of raw materials. These are expensive technologies, but unless we reduce current global greenhouse gas emissions by 7.6% annually between 2020 and 2030, we will miss the chance to keep warming below 1.5 degrees, according to a report from the United Nations Environment Program (UNEP).

Therefore, every project that is financed from the Russian budget must be verified, including through the prism of the "green" economy.

An equally important problem is the problem of cleaning areas. Currently, due to land pollution from household waste and sewage alone, almost 50 thousand hectares of arable land are withdrawn annually [13]. As of today (2020), nearly 92 percent of the world's resources,

including metals, plastics, wood, concrete, chemicals and all other materials in circulation, are used only once, in a single product, before becoming waste. These wastes represent a huge amount of resources that can be used with minimal impact on the environment. Therefore, in the agricultural sector of the national economy, one of the important ways to achieve the principles of a green economy is to stimulate the recycling and reuse of products by supporting product design that takes into account the possibility of recovery and reuse of products. Улучшение возможности вторичной переработки также может быть полезно за счет модульной конструкции продукта [14]. However, this also comes with challenges.

It is important for Russia to take advantage of the green economy development program to create a system of enterprises for the disposal and processing of this waste.

The goal of this approach is to disrupt the current dominant linear flow (open loop) of plastic in the chain, production cost from use and disposal, as it is one of the main sources of new CO2 and pollution [11]. Finally, an increased focus on circular economy solutions will mean that different sectors of the economy will need to become more interconnected in the overall economic architecture.

This interdependence really makes possible the desired increase in the efficiency of using the natural resource potential of agriculture. At the same time, this interdependence requires new forms of cooperation models between companies, including new business models in the agricultural sector of the economy. This is not a one-time act of solving a problem, since in some cases, achieving this goal requires restructuring relationships on mutually beneficial terms between business partners.

Both technological and organizational innovations are needed, as well as overcoming existing barriers to the implementation of Industry 4.0 technologies (Table 2).

Table 2 – Barriers to the development of "green" technologies in the agricultural economy of the Russian Federation

Title	Character of the manifestation
During the development of farming, there is a discrepancy in the management skills of the economic entity.	Lack of proper education among farmers results in both a lack of understanding of the impact of technological innovation and the urgency of these necessary changes. The external environment requires quick management decisions, focuses attention on dynamic investing, etc.
Insufficient understanding of promising future operational processes in a globalized world.	The difficulty of determining which Industry 4.0 technologies are only a short-term response to global changes and a temporary effect points to the emergence of an ongoing trend in today's globalized world.
Lack of a holistic vision of industry development.	The need to develop a comprehensive strategy for digitalization of the agricultural sector. Transformations in companies are implemented through functionally separate projects using different technologies. Digitalization must be systematic and in-depth.
The need to invest significant financial resources and the difficulty of assessing future economic benefits from the introduction of Industry 4.0 technologies.	Difficulties in attracting a significant amount of financial resources for the implementation of new technologies due to the lack of our own and the lack of sufficient incentive policies from the state.
Lack/inadequacy of agricultural infrastructure	Difficulties in combining new technologies with outdated farming systems. Low quality of Internet communications, absence or low quality of "technological" business transformation (automation of business processes, automation of business communications, use of unified electronic document management, equipping departments with modern IT equipment) in rural areas.
Lack/non-compliance with information security standards and norms	Due to the lack/inadequacy of information security (and other) standards, challenges arise in integrating value-added networks with global market standards.

Lack of necessary skills among industrial workers (rural degradation)	The necessary skills of workers for the effective functioning of business entities are constantly being transformed. Lack of digital skills is one of the key barriers to the adoption of Industry 4.0 technologies. In connection with digitalization, both the composition, number and role of rural workers are undergoing changes.
Resistance to change/resistance to the established culture of the company (farm)	Reluctance to change - both at the level of senior management and at the employee level due to lack of trust, fear of losing their jobs due to changes caused by the introduction of innovative technologies. Changes will also be required in the functional responsibilities of managers of business entities.

Despite the problems in the region that hinder the implementation and development of the green economy, the prerequisites for its development in Russia exist.

4 Conclusions

Thus, the "green" economy is able to clearly link the environmental, and, consequently, aspects of the national economy, acting as a key direction ensuring the "green" development of the region and the state as a whole. It is one of the main driving forces of economic growth, the key to preserving natural capital and efficient use of resources.

In its rapid progress, our country faces complex tasks in transforming the environmental consciousness of society, carrying out effective restructuring of the production sector, introducing systems of reasonable environmental management, changing legislation in the field of environmental protection, and stimulating economic development. It is important to introduce state principles of stimulating agricultural producers to switch to "green" technologies, which at the state level provide the information component of the benefits of organic products for the population.

References

1. K. O. Petrova, Social and humanitarian research **1**, 5. 45-52 (2020)
2. I. Shi, Bulletin of Science **1**, 10(67). 59-64 (2023)
3. A. S. Orozalieva, Zh. N. Omurova, Quarterly scientific and information magazine "Economic Bulletin" **3,4.** 12-18 (2022)
4. Yu. R. Achokh, Economics and management: problems, solutions **2,** 1(121). 23-29 (2022). DOI 10.36871/ek.u.p.r.2022.01.02.004.
5. I. V. Gorokhova, B. A. Akhmetova, Scientific and analytical journal "Science and practice of the Russian Economic University". G.V. Plekhanov **14**, 1(45). 52-58 (2022)
6. A. R. Nurieva, Global economy and education **1,** 1. 6-10 (2021)
7. D. Kanatbekova, G. B. Kadyrova, Bulletin of Issyk-Kul University **51**. 206-212 (2022)
8. S. M. Mambetalieva, A. D. Osmonova, Bulletin of the Kyrgyz University named after Zhusup Balasagyn **1(113).** 142-146 (2023). DOI 10.58649/1694-8033-2023-1(113)-142-146.
9. S.V. Biryukov, O.E. Ryazanova, Ethnosocium and interethnic culture **6(144).** 68-74 (2020)
10. T. E. Davydova, A. I. Popova, A. E. Raspopova // Economics **17**, 1. 49-54 (2020). DOI 10.24412/1819-6330-2020-1-49-54.

11. A. A. Burzhinsky // Economics and efficiency of production organization **33**. 3-6 (2021)
12. I.Sh. Basnukaev, M. I. Akhmatova // Financial Economics **10**. 10-13 (2023)
13. A. M. Petrov // Economic sciences **214**. 178-180 (2022). DOI 10.14451/1.214.178.
14. *State and prospects for the development of the agro-industrial complex:* collection of scientific papers of the XVI International Scientific and Practical Conference within the framework of the XXVI Agro-Industrial Forum of the South of Russia and the exhibition "Interagromash" and "Agrotechnologies", Rostov-on-Don, March 01–03, 2023 / Don State Technical University. – Rostov-on-Don: Limited Liability Company "DSTU-PRINT", 2023. – 335 p. – ISBN 978-5-6049569-8-4.