Green Economy – Startup of Environmental Saving Technologies of the Eurasian Economic Union

Oksana Gavrilova[1][a], Olga Maksimova[1][b], Lyudmila Medvedeva[1,2][c], Gennady Lukyanov[1][d] and Julia Onoprienko[1][e]

[1]*Volgograd state technical University, Volgograd, Russian Federation*

[2]*All-Russian Research Institute for Hydraulic Engineering and Land Reclamation them A.N. Kostyakov, Volgograd, Russian Federation*

smile427@mail.ru, maxsima@list.ru, milena.medvedeva2012@ya.ru, lukianov@post.volpi.ru, sttask@mail.ru

Keywords: Green economy, environmentally friendly technologies, Eurasian Economic Union, renewable energy sources, irrigation, reservoirs, green spaces

Abstract: The article presents materials that reveal the prospects for the development of a green economy in the Eurasian Economic Union (EAEU), the use of environmentally friendly and monitoring technologies in agriculture and land irrigation. Arguments have been put forward in favor of promoting the concept of a green economy and the use of technologies that reduce the effects of climate change. The use of natural and human capital, the reduction of climate and social risks, the use of renewable energy sources and the development of land irrigation to improve the efficiency of agriculture are justified. Engineering, technical and economic calculations are proposed for the placement of renewable energy sources in irrigation systems and natural reservoirs. The areas of use of the public-private partnership mechanism to stimulate organic farming and comprehensive land reclamation in arid regions of the world are shown.

1 INTRODUCTION

One of the dynamically developing economic unions is the Eurasian Economic Union (EAEU) with a population of 182.7 million people, a territory of 20.3 million km^2 (Eurasian Economic Commission, 2024). The Union includes the republics: Armenia, Belarus, Kazakhstan, Kyrgyzstan, and Russian Federation. The main factors determining the development of the EAEU include: the expansion of regional markets, a changing climate, growth in the size and well-being of the population, and the promotion of environmentally friendly technologies. The UNEP report presents the "green" economy as resource-efficient and socially inclusive, as opposed to the "brown" economy, which was driven by industrialization and the use of minerals (UNEP, 2011). The authors of the green economy concept focused on the use of natural and human capital, reducing climate and social risks, and the use of renewable energy sources (RES) (Ahman, 2017).

Some governments and civil society groups believe that the adoption of this concept is premature and that it does not affect the global social and economic foundations of humanity. Some researchers argue that "green economy" is an inappropriate term, but a scientific and philosophical error with the help of which they are trying to form a "utopian" paradigm of the world economy (Barbier, 2013, Zvarych, 2022). We believe that further exploration of the concept of a green economy and how it will be promoted economically, environmentally and socially will require some effort on the part of the UN Department of Economic and Social Affairs (UNDESA), the Global Green Growth Institute (GGGI), the Partnership for Action on Green Economy (PAGE), the Green Growth Knowledge

[a] https://orcid.org/0009-0000-6173-2609
[b] https://orcid.org/0000-0001-8147-2875
[c] https://orcid.org/0000-0002-3650-2083
[d] https://orcid.org/0000-0002-8901-8463
[e] https://orcid.org/0009-0001-6510-8691

Platform (GGKP) the Green Economy Coalition. Already today, the development of a green economy entails a transformation of relationships between states and business communities, increases added value in international sales chains, and changes the usual way of life of many peoples (Selishcheva, 2018, Dissanayake, 2021, Johnson, 2021, Liu, 2024) (Table 1).

Table 1: Argument for the transition to a green economy.

For promoting a green economy	Against the promotion of a green economy
✚ The transition to a green economy will reduce the risks of climate change, mineral depletion, and water shortages. ✚ Increasing green investments and the use of environmentally friendly technologies will stimulate the use of RES and the environment.	✚ The consequence of the growth of green investments will be an increase in production costs and a decrease in the competitiveness. ✚ It will lead to government intervention in the economy and an increase in protectionist decisions.

For EAEU countries, the transition to a green economy model is further complicated by the fact that the main contribution to their development is made by extractive and manufacturing industries, which in turn are the "pillar" of the brown economy, which the UN commissions oppose (Barbier, 2013 Bailey, 2014) . The adopted EAEU Development Strategy until 2030 lays down certain areas of the green economy model: the use of environmentally friendly and digital technologies, the expansion of organic farming, and the generation of new types of energy (EAEU, 2024). For example, EAEU countries have signed Agreements on the implementation of digital navigation seals to ensure the unhindered movement of goods, and on investing in a digital platform for accounting for greenhouse gas emissions. The main focus of the Euro-Asian Economic Commission is the optimization and harmonization of processes within the EAEU through the creation of a single integrated platform (Selishcheva, 2018, EAEU, 2024) (Table 2).

Table 2: Strategic directions for the development of the EAEU until 2030, taking into account the promotion of environmentally friendly technologies.

Introduction of innovations	Stimulating scientific and technical progress	Digitalization of management
✚ Cross - industry digital ecosystems. ✚ Green technologies in energy, transport, agriculture.	✚ Using EDB tools. ✚ Development of a circular economy. ✚ Formation of international R&D bases.	✚ Removing barriers to the movement of goods and services. ✚ Harmonization of cross-border trade. ✚ Formation of an integrated platform.

The purpose of the study was to study the development of the green economy in the Eurasian Economic Community, the promotion of environmentally friendly technologies, renewable energy sources in agriculture and land irrigation.

2 MATERIALS AND METHODS

In preparing the article, analytical and statistical materials from the EAEU on promoting a green economy, agricultural development, and land reclamation (EAEU, 2024) from Volgograd Technical University on the application of environmentally friendly technologies and renewable energy sources were used. With the help of cyber-economic and computational design modeling, solutions are proposed in the fields of land reclamation and renewable energy sources, conservation of water resources, and countering foreign economic risks. When constructing forecast values for the development of land reclamation, the relational databases of the VNIIOZ Institute for agrometeorology, ecology, water and biological resources, and investments were used. Materials characterizing the development of agriculture and the EAEU infrastructure complex are grouped in tables 3, 4 and 5 (Eurasian Economic Commission, 2024).

Table 3: Share of agriculture, forestry and fisheries in the gross value added of the EAEU economy, %.

Countries	By year		
	2015	*2020*	*2022*
Armenia	17,2	4,8	11,6
Belarus	6,3	12,7	8,6
Kazakhstan	4,7	8,1	5,6
Kyrgyzstan	14,1	5,7	12,8
Russia	3,9	4,4	4,3
Total	*4,2*	*4,8*	*4,6*

Source: EAEU bulletins.

Table 4: Agricultural production EAEU, $ million.

Countries	By year		
	2018	*2020*	*2022*
Armenia	1 928	1 774	2 489
Belarus	9 506	9 606	12 062
Kazakhstan	13 048	15 411	20 676
Kyrgyzstan	2 977	3 226	4 260

Russia	85 526	104 181	126 941
Total	112 985	137 972	166 428

Source: EAEU bulletins.

Important in EAEU policy is the conservation of water resources, including transboundary rivers that are the subject of disputes between users (Danilov-Danilyan, 2010, Garud, 2022). These are the Syrdarya, Chu, and Talas rivers, flowing through the territory of Kazakhstan and Kyrgyzstan; the rivers Ural, Ishim, Irtysh, and Tobol, belonging to Russia and Kazakhstan; and the Dnieper, Usha, Polota and Sinaya rivers, which are within the jurisdiction of Belarus and Russia (Table 5).

Table 5: State of EAEU water resources, 2019.

Name River flow	River flow km^3/year	Undergro und flow km^3/year	Specific water availability, m^3/person
Russia	4258,6	787	29944
Belarus	57,9	15,8	5800
Kazakhstan	26,06	16,4	5041
Kyrgyzstan	44,1	13,0	8480
Armenia	7,7	4,0	2945

Source: EAEU bulletins.

In the green economy, priority is given to RES, The EAEU has significant potential in the generation of solar and wind energy, the construction of hydroelectric power stations, and biogas production complexes (Ahman, 2017; Egorova, 2022). As of January 1, 2022, the total installed capacity of RES was: Armenia - 528 MW, Belarus - 495 MW, Kazakhstan - 57.1 MW, Kyrgyzstan - 57.1 MW and the Russian Federation - 3 GW. To develop the EAEU economic development model until 2030, forecasts for agricultural development for each country and balances of food supply and demand were studied. According to the forecast, the number of people employed in agriculture in the EAEU by 2030 will decrease by 21.9% compared to the reporting year 2020(Figure 1).

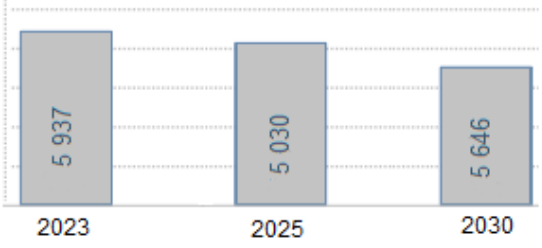


Figure 1: Forecast of the number of people employed in agriculture in the EAEU, thousand people.

Replenishment of labor resources will be ensured through technological modernization, the introduction of robotic systems, and digital technologies (Pestel, 2019, Emirov, 2019, Abualfaraa, 2020).

In the forecast period, the growth of gross agricultural production should increase by 31.3%, or $155.0 billion (Figure 2).

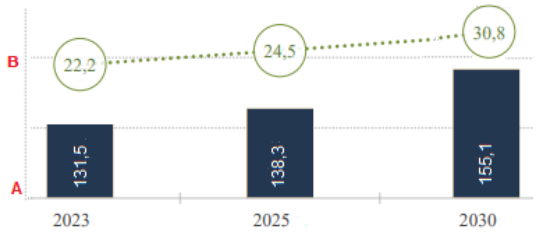


Figure 2: Forecast of agricultural production in farms of all categories (A), per person employed (B) in the EAEU, $ billion.

Mutual trade in food products and agricultural raw materials should grow by 24.2% or $12 billion (Figure 3).

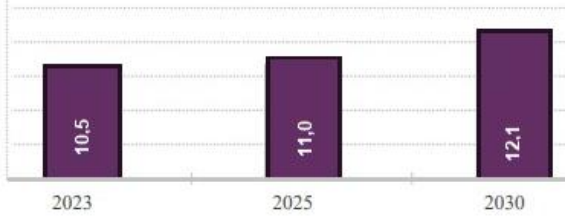


Figure 3: Forecast of EAEU mutual trade in food products and agricultural raw materials, $ billion.

By 2030, the market for EAEU goods and services will be provided in the following ratio: Belarus - 47.1%, Russia: 40.0%, Kazakhstan - 6.4%, Armenia - 4.5%, and Kyrgyzstan - 2.1% (EAEU, 2024).

3 RESEARCH RESULTS

For EAEU agriculture, the transition to environmentally friendly technologies will ensure the development of organic farming and integrated land reclamation. The area under organic farming will increase to 1.8 million ha by 2030 (EAEU, Agriculture, 2022). The development of land reclamation will be ensured, which will be a response to a changing climate (Shchedrin, 2018). The Eurasian Economic Commission, together with the Russian Association of Water Supply and Sanitation, will continue to develop an integrated digital platform that provides year-round biosphere monitoring of the state of water and biological resources in the EAEU (Danilov-Danilyan, 2010 Siebrecht, 2020) (Figure 4).

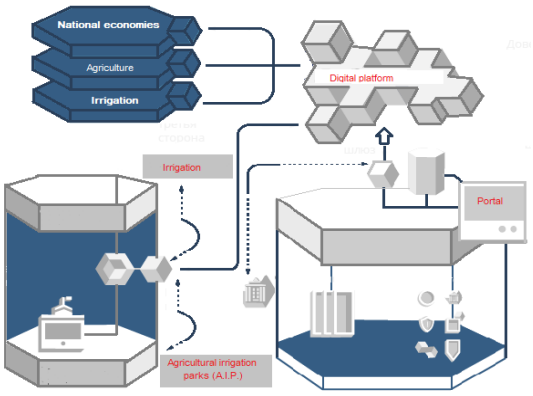


Figure 4: Block diagram of the integrated platform for agriculture and water management in the EAEU.

Irrigation lands is a very expensive resource and energy-intensive activity that ensures the supply (discharge) of water to agricultural fields and populated areas. The development of land reclamation on the green economy platform should be supported by improving the material and technical base, the use of digital virtual technologies, the construction of new generation irrigation canals, and a Public-Private partnership mechanism. Increasing the sustainability of irrigated agricultural landscapes should be ensured adaptively - landscape technologies, growth of human capital (Shchedrin, 2018, Tahat, 2020, Roiss, 2022, Liu, 2024). Table 6 presents the forecast for the increase in reclaimed land in the EAEU until 2030 (Table 6).

Table 6: Irrigated lands in EAEU countries, thousand ha.

Countries	By year		
	1991	2016	2030
Russia	11000,9	9000,1	10100,5
Belarus	3423,6	3442,5	3631,5
Kazakhstan	2000,3	1600,0	3010,0
Armenia	286,3	208,1	228,6
Kyrgyzstan	836,6	896,9	1064,0

According to calculated data, the introduction of new irrigated lands by 2030 will allow increasing the area sown with oilseeds - 14.1%, vegetables and melons - 6.6%, sugar beets - 5.0%, orchards - 4.8%. For the development of irrigated lands in arid regions, an organizational and economic structure can be used – Agricultural Irrigation Parks («A.I.P.») with a Public-Private partnership mechanism (Shchedrin, 2018, Abualfaraa, 2020, Roiss, 2022). «A.I.P.» – local agricultural clusters aimed at optimizing natural and human resources, increasing agricultural production on irrigated lands. A feature of the functioning of «A.I.P.» is the concentration of agricultural resources and the attraction of private and public investment. Management company «A.I.P.» on behalf of farmers, it designs, builds and maintains distribution, irrigation and drainage systems, develops renewable energy sources and ensures the sale of agricultural products in markets (Figure 5).

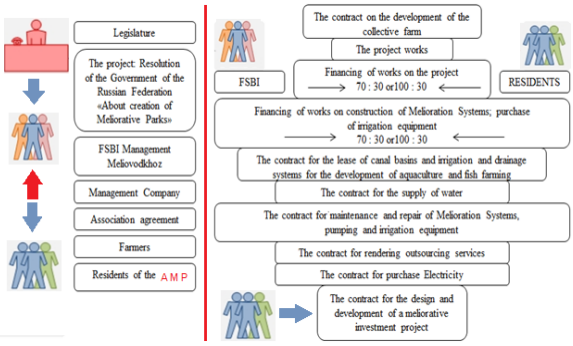
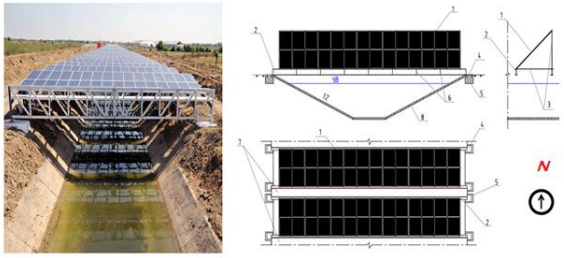


Figure 5: The algorithm for management of the «A.I.P.».

Using res in «A.I.P.» will reduce costs and increase the profitability of farms (Heshmati, 2016, Tahat, 2020, Garud, 2022, Yin, 2022,). The study developed options for using res in irrigation systems. The first option for using res on irrigation canals. The cost and efficiency of placing solar panels on the suburban irrigation system in the Krasnodar region of Russia was calculated. The total irrigation area is 23,940 hectares, the annual electricity consumption of the main pumping station is 5,754,910 kw hour, the cost of electricity for water supply is 31,313.3 thousand rubles. In year. The payback period of the project is 7 years (Belykh, 2018, Roiss, 2022). An example of placing solar panels on the main canal is shown in figure 6.

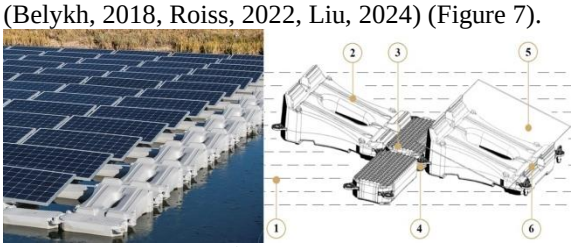


1 – solar panel (south direction, angle 45°), 2 – dvutuvr 35B1, 3 – panel mounting (Sigma profile), 4 – embedded part MI1-22, 5 – concrete foundation, 6 – transverse edge of dvutuvr, 7 – technological transition (wooden bridge), 8 – concrete facing of the canal.

Figure 6: The construction of solar panels on the main canal of suburban irrigation system.

The second option is represented by solar panels placed on the water surface of the Krasnodar

reservoir in Russia. The waters of the reservoir are used to irrigate rice fields and placing solar panels on the water surface will solve the following problems: reduce evaporation from the surface of the reservoir, obtain energy for pumping water to rice paddies (Belykh, 2018, Roiss, 2022, Liu, 2024) (Figure 7).



1 – reservoir, 2 – primary float to support the solar panel module, 3 – secondary float for maintenance and buoyancy, 4 – connection module, 5 – module platform for mounting a solar panel, 6 – mount for fixing the solar panel and the primary float.

Figure 7: Project for placing solar panels on the water surface of the Krasnodar reservoir, Russia.

4 CONCLUSIONS

The study shows that one of the dynamically developing state associations is the Eurasian Economic Union. The economic union's agenda includes the use of green technologies in economic sectors. The main factors determining the direction of the EAEU activities were the increasing turbulence of the global economy, the expansion of regional markets for goods and services, a changing climate, rising living standards, and the environment. The EAEU Strategy until 2030 presents solutions in the field of application of environmentally friendly and digital technologies in agriculture and land reclamation. Presented solutions for creating «A.I.P.» and the use of renewable energy sources at land reclamation sites are aimed at strengthening the economic potential of the EAEU and presence in global food markets. The concept of a green economy affects the global social fabric of society, which requires further study and understanding on the part of governments and the world's population.

REFERENCES

Eurasian Economic Commission [Electronic resource]. – URL: http:// eaeunion.org.

United Nations Environment Program (UNEP). [Electronic resource] – URL: http://web.unep.org/emissionsgap.

Green Economy Coalition [Электронный ресурс]. – URL: https://www.greeneconomycoalition.org.

Ahman M., Nilsson L. & Johansson B., 2017. Global climate policy and deep decarbonization of energy-intensive industries. Climp. Vol.2. pp.634-649.

Barbier E., 2013. The green economy post Rio+20. Science Institute on Climate Change and the Environment. pp. 887-898.

Zvarych R., Masna O. & Rivilis I., 2022. Methodological principles of the formation the concept of green economy. Herald of Economics. 4. 131-144.

Selishcheva T.A., 2018. Green economy as a model for sustainable development of the EAEU countries. Problems of modern economics. Vol. 3. pp. 6-12.

Agriculture of the EAEU [Electronic resource]. – URL: https://agro.eaeunion.org/Pages/default.aspx.

Agro-industrial complex, 2023. Statistics of the Eurasian Economic Union. Moscow. 137.

Dissanayake, N., Withanawasam, A., Sarjoon, A., 2021. Conceptual nexuses between sustainable development and blue-green economy: An analysis of the importance of adopting blue-green economic principles in achieving sustainable development goals. Civilization. Vol. 12. pp. 102-110.

Johnson, A. E., Smith B. L., 2021. The role of technology innovation in digital economy under thegreen economy framework. Journal of Economic and Environmental Studies. 45(2). 211-229.

Liu, Y, Yang, Y, Zhang, X., Yang, Y., 2024. The impact of technological innovation on the green digital economy and development strategies. PLoS ONE 19(4): e0301051.

Bailey, I., Caprotti, F., 2014 The green economy: functionaland Governance 23 209.20 domains and theoretical directions of enquiry Environment.

Egorova, N. E., Nekrasov, S. A., 2022. Renewable energy and small business: Synergies and sustainability strategies. Economics of Contemporary Russia. Vol. 4. pp 89-103

Pestel, N., 2019. Employment effects of green energy policies. Vol. 76. pp.1-11.

Emirov, N.D., Saltykova, A.S., 2019. Features of the implementation of the green economy concept in the EAEU countries. Current problems of international relations. pp. 407-412.

Abualfaraa, W., Salonitis, K., Al-Ashaab, A., Ala'raj, M., 2020. Lean-green manufacturing practices and their link with sustainability: A critical review. Sustainability. Vol. 12. pp. 981-1011.

Shchedrin, V., 2018. Meliorative institutional environment: The area of state interests. Espacios. Vol. 39. pp. 28 - 32.

Danilov-Danilyan, V., Khranovich, I., 2010. Water resources management. Coordination of water use strategies. M.: Scientific world. 232.

Siebrecht, N., 2020. Sustainable agriculture and its implementation gap-Overcoming obstacles to implementation. Sustainability.12. 3853.

Tahat, M. M., Alananbeh, K. A., Othman, Y. A., Leskovar, D. I., 2020. Soil health and sustainable agriculture. Sustainability. 12 (12). 4859.

Roiss O., Medvedeva L., 2022. Innovation in agriculture - An actor in the development of a green economy. AIP Conference Proceedings. 2650. 030019.

Roiss O., Medvedeva L., 2022. Rising agriculture on a convergent green economy platform. AIP Conference Proceedings. 2650. 030031.

Shchedrin V., 2017. Creation of «Reclamation agricultural Park» on the basis of resource-saving technologies, alternative energy sources, the mechanism of public-private partnership. The Novosibirsk scientific centre of RAS. Vol.2. pp.163- 165.

Belykh D., Ryzhakov A., 2018. The Use of solar energy on the land-reclamation facilities (for example, Suburban sprinklertion system of the Krasnodar territory). Ways of improving the efficiency of irrigated agriculture. Vol.2. pp. 168-181.

Garud R., Kumaraswamy A., Roberts A., Xu L. 2022. Liminal movement by digital platform-basedsharing economy ventures: The case of Uber Technologies. Strategic Management Journal. 43(3).447- 475.

Yin S., Wang Y., Xu J., 2022. Developing a conceptual partner matching framework for digital green innovation of agricultural high-end equipment manufacturing system toward agriculture 5.0: Anovel niche field model combined with fuzzy VIKOR. Frontiers in Psychology. 13. 924109.

Heshmati A., 2016. An empirical review of the implications of the green economy. Int J Green Econ. Chang technology forecast. 2016. 104:102 -21.33.