

# Assessment of Innovation Activity in the Field of Environmental Protection in Russia and the EU Countries

B. A. Demilkhanova

*Chechen State University Named After A.A. Kadyrov, Grozny, Russia*

**Keywords:** Responsible investments, sustainable assets, environmental innovations, indicator, innovation activity, assessment, correlation.

**Abstract:** The ecological component of technological innovations is the subject of the article. The purpose of the article was to assess innovation activity in the field of environmental protection in Russia and the EU countries and to establish a close correlation between indicators of innovation activity in production and implementation activities and the use of financial potential for environmental innovations and a generalizing indicator reflecting the level of activity in the implementation of environmental innovations by industrial companies. This assessment is limited by the lack of a sufficient array of comparable statistical data in the country context and in the context of industries. As a result of the conducted research, those countries that are characterized by a pronounced correlation between the considered factor indicators have been identified. The level of innovation activity in all countries is close to the average level, relative to which there is either a moderate increase or a moderate decrease in innovation activity. A more specific assessment is possible provided that there are comparable data from Russian and international statistics on the sources of financing environmental innovations in various industries, special costs associated with environmental innovations and the results of joint innovation activities in this area between countries.

## 1 INTRODUCTION

On a global scale, the developing modern industry and human life have faced the same global problems associated with the unreasonable use, exploitation and overloading of the nature around us: the growth of waste requiring disposal, emissions of harmful substances into the atmosphere, immeasurable consumption of energy and resources, and much more. Modern challenges put forward great demands for responsible business conduct (Alexandrov, 2020; ESG Investment Market in Russia, [www.rshb.ru/](http://www.rshb.ru/)). The urgent need for further development of society based on reasonable production and consumption is reflected in the global objectives for its sustainable development, which are set in strategic documents, programs, agreements at the international and national levels. The whole world recognizes and supports investment projects of states and individual corporations aimed at obtaining, first of all, social and environmental benefits, and gradually refuses to invest in productions, industries or sectors of the economy that do not comply with the norms (standards) of responsible business. With the current

conjuncture of financial markets and the active transformation of business models, the influence of ESG factors will only increase (Khutorova, 2021).

Technological progress, the spread of digital technologies, the expansion of industrial and agricultural production cannot be regarded as positive phenomena if they do not organically fit into the multidimensional space of our and future societies. Each new stage of society's progress should develop simultaneously with the development of methods, tools and ways of environmental protection for the future society, ensuring environmental safety, prevention and control of environmental pollution (Annenskaya, 2020). Inevitably, in the current century, technological innovations will take the leading positions, in which there will be an environmental component. In other words, the development of the world economy cannot be imagined without the introduction of environmental protection mechanisms into production processes, without the development and implementation (use) of environmental innovations. Economic growth should be balanced with environmental goals: innovation, environment of innovation, ecological agenda and

social progress should be closely intertwined and support each other (Kondrashov, 2020; The New Economy, www.oecd.org).

## 2 MAIN PART

The modern investment policy of both the state and large financial and non-financial organizations is characterized by a decrease in the volume of investments in unsustainable and carbon-intensive industries, in particular in the coal and oil and gas industries, and an increase in investments in projects aimed at preventing resource depletion, establishing reasonable environmental management, eliminating the toxicity of production by modifying harmful industries, and much more. (Table 1). So, in 2020, the volume of sustainable investment assets reached \$35 trillion.

The total increase in the global volume of sustainable investment assets amounted to USD 4.618 billion in 2018-2020. The structure of responsible investment has changed towards a decrease in the share of European assets from 45.9% to 34.0%, an increase in the share of the United States

from 39.1% to 48.4% and a similar increase in the share of Canada, Australia and Japan in the global volume of responsible investment assets (Fig. 1, 2). The decrease in the share of European assets by 12% is explained by the revision of the methodology for their assessment in 2020 in accordance with EU legislation (Global sustainable investment review 2020, www.gsi-alliance.org/).

Private sustainable investments reached USD 13.8 trillion in 2020 (ESG Investment Market in Russia: present and future, www.rshb.ru) and accounted for 25% of the total global volume, 75% accounted for assets owned by institutional investors (Fig. 3, 4). The growth of the share of private sustainable investments is observed on all continents: North and South America, Western Europe, East and Central Asia, Australia, Japan, etc.

Many studies by Russian and foreign authors have been devoted to the interrelationships between the factors of sustainable development and the environmental component of technological innovations. Based on their results, the interrelationships between ESG issues, environmental innovations, corporate sustainability indicators and Sustainable Development Goals (SDGs) have been established. In particular, it is

Table 1: Global trends in responsible investment

Organizations	Measures, methods, tools, directions of ESG investments
Insurance organizations, pension funds, private companies, major banks, institutional investors, international financial organizations	Investing in assets of companies with responsible business conduct; Termination of investments in non-ecological companies (coal industry, etc.); reduction of the share of assets in portfolio investments that do not meet ESG principles (reduction of the share of "brown" assets in the investment portfolio to a certain level by the set date); taking into account ESG factors when making investment decisions; ESG integration: joint participation in ensuring compliance with the business culture of companies, the introduction of technologies that comply with the principles of responsible business conduct;
The largest banks	Creation of financial products (debt instruments, stocks, derivatives, loans, etc.) Refusal to lend to projects that have a negative impact on the environment
Central banks (France, the Netherlands, etc.)	Large investments in "green" bonds, funds; Application of financial technologies for: 1) promoting sustainable development goals and stimulating the green finance market; 2) the exchange of reports on "green" loans between banks and regulators; 3) facilitating investors' access to the sustainable financing market; 4) verification of data on emission reduction, verification of greenhouse gas absorption projects, etc.; 5) ensuring disclosure of information about ESG factors in companies' financial statements;

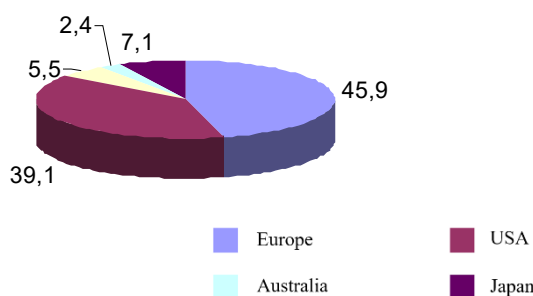


Figure 1: Structure of the global volume of sustainable investment assets in 2018.

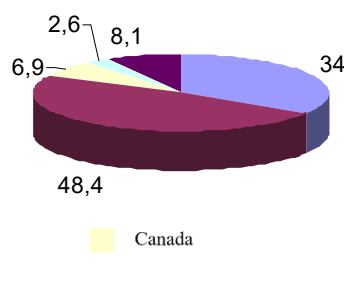


Figure 2: Structure of the global volume of sustainable investment assets in 2020.

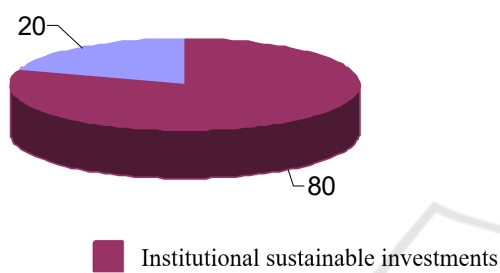


Figure 3: Structure of the global volume of sustainable investment assets in 2016 by private and institutional investors.

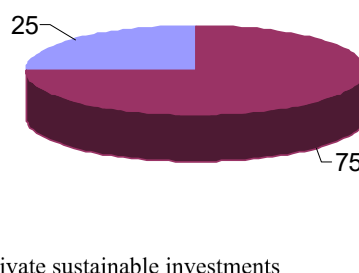


Figure 4: Structure of the global volume of sustainable investment assets in 2018 and 2020 by private and institutional investors.

concluded that an environmentally sustainable approach to economic growth and industrial development is provided by:

- innovations in "clean" innovations and their spread in industries (Cheng, 2021; Stern, 2021);
- entrepreneurship at the micro level, entrepreneurial ecosystems at the meso level and state support for entrepreneurship at the macro level (Shlichter, 2020; Andreas Kuckerz, 2020);
- implementation of "green" innovations related to a wide range of SDGs by the largest companies (Khaled, 2021; Thijssens, 2021);
- state financing of research and development in the field of environmental innovations, as well as the participation of institutional investors in financing sustainable assets through investments in stocks and bonds of companies that conduct responsible business (Polzin, 2021);
- by investing venture capital in environmentally friendly companies, considered as a "... long-term strategic tool ..." for investments in these companies (Dong, 2021).

Meanwhile, the scientific literature does not sufficiently cover the issues of factors that have a

direct, downright impact on the activity of industrial companies in the implementation of environmental innovations, which, in the framework of the article, is understood as a created new business process (new product) that significantly reduces the degree of environmental pollution (air, water and land resources, etc.).

In order to study the relationship between the indicators of innovation activity characterizing the scale of implementation of environmental innovations and the volume of their financing, a representative group of EU countries has been identified, which in recent years have a high level of environmental expenditures in GDP (from 0.7 to 1.7% of GDP) (in Russia – 0.9% in 2020). As indicators of innovation activity, the following indicators are used:

1) *indicators of production and implementation activities (PIA)* (Table 2):

1.1. the share of manufacturing companies that have achieved a reduction in environmental pollution (Manufacturing companies that have created a new business process -  $MC_{b-pr}$ );

1.2. the share of manufacturing companies that have created an innovative product that has played a significant role in improving environmental safety when used by the consumer

(Manufacturing companies that have created the product -  $MC_{pr}$ ).

2) the indicator of the use of the financial potential (FP) of innovation activity in the field of improving environmental safety is the amount of environmental protection costs.

Based on the author's methodology described in (Demilkhanova, 2013) and data from Russian and foreign statistics (Indicators of innovation activity: 2015-2020, www.hse.ru; Eurostat, ec.europa.eu), the level of innovation activity in the field of environmental protection in Russia and the EU countries is estimated (Table. 3) and the closeness of the correlation between the indicators of innovation activity in production and implementation activities ( $InA_{PIA}$ ) and the use of financial potential for environmental innovation ( $InA_{FinP}$ ) and a generalizing indicator reflecting the level of activity in the implementation of environmental innovations ( $InA_{EnI}$ ) (Table 4).

### 3 CONCLUSION

The production and implementation innovation activity of industrial companies for the implementation of environmental innovations in the studied countries in 2019-2020 is characterized by a moderate increase, with the exception of Russia, where the level of innovation activity remained at 0.479, which means a moderate decrease relative to the average level. The level of innovation activity on the use of financial potential for the implementation of environmental innovations is characterized by a moderate increase in all countries relative to the average value.

The study of the closeness of the correlation between the level of innovation activity in production and innovation activities, innovation activity in the use of the financial potential of environmental innovation and the generalizing indicator of innovation activity in the field of environmental protection shows that there is a pronounced relationship between (Table 4):

- $InA_{PIA}$  and  $InA_{EnI}$  (Russia, Malta and Czech Republic);
- $InA_{FinP}$  and  $InA_{EnI}$  (Bulgaria, Greece, Malta).

Table 2: Assessment of innovation activity in Russia and the EU countries on production and implementation activities in the field of environmental protection in 2015-2020.

	Years				
	16/15	17/16	18/17	19/18	20/19
Russia					
$MC_{b-pr}$	0.290	0.250*	0.211	0.250	0.229
$MC_{pr}$	0.250	0.250	0.195	0.250	0.250
$InA_{PIA}$	0.540	0.500*	0.406	0.500	0.479
Bulgaria					
$MC_{b-pr}$	0.192	0.250	0.294	0.250	0.250
$MC_{pr}$	0.250	0.250	0.229	0.250	0.250
$InA_{PIA}$	0.442	0.500	0.523	0.520	0.511
Greece					
$MC_{b-pr}$	0.305	0.250	0.269	0.250	0.250
$MC_{pr}$	0.268	0.250	0.233	0.250	0.250
$InA_{PIA}$	0.573	0.500	0.501	0.512	0.507
Italy					
$MC_{b-pr}$	0.280	0.250	0.309	0.250	0.250
$MC_{pr}$	0.301	0.250	0.214	0.250	0.250
$InA_{PIA}$	0.581	0.500	0.524	0.502	0.514
Malta					
$MC_{b-pr}$	0.284	0.250	0.263	0.250	0.250
$MC_{pr}$	0.291	0.250	0.129	0.250	0.250
$InA_{PIA}$	0.574	0.500	0.392	0.503	0.505
Czech Republic					
$MC_{b-pr}$	0.300	0.250	0.299	0.250	0.250
$MC_{pr}$	0.274	0.250	0.248	0.250	0.250
$InA_{PIA}$	0.573	0.500	0.546	0.514	0.509

Note: \*values of 0.250 and 0.500 mean that the level of innovation activity has not changed;  $InA$  – innovative activity.

Table 3: Assessment of innovation activity in Russia and the EU countries to improve environmental safety in 2015-2020.

	Years				
	16/15	17/16	18/17	19/18	20/19
Russia					
<i>InA<sub>PIA</sub></i>	0.540	0.500	0.406	0.500	0.479
<i>InA<sub>FinP</sub></i>	0.590	0.505	0.537	0.531	0.564
<i>InA<sub>EnI</sub></i>	0.564	0.503	0.467	0.515	0.520
Bulgaria					
<i>InA<sub>PIA</sub></i>	0.442	0.500	0.523	0.520	0.511
<i>InA<sub>FinP</sub></i>	0.570	0.461	0.358	0.549	0.478
<i>InA<sub>EnI</sub></i>	0.502	0.480	0.432	0.524	0.489
Greece					
<i>InA<sub>PIA</sub></i>	0.573	0.500	0.501	0.512	0.507
<i>InA<sub>FinP</sub></i>	0.549	0.485	0.443	0.496	0.523
<i>InA<sub>EnI</sub></i>	0.560	0.492	0.471	0.498	0.512
Italy					
<i>InA<sub>PIA</sub></i>	0.581	0.500	0.524	0.502	0.514
<i>InA<sub>FinP</sub></i>	0.489	0.517	0.537	0.507	0.508
<i>InA<sub>EnI</sub></i>	0.532	0.508	0.530	0.504	0.503
Malta					
<i>InA<sub>PIA</sub></i>	0.574	0.500	0.392	0.503	0.505
<i>InA<sub>FinP</sub></i>	0.554	0.611	0.384	0.517	0.532
<i>InA<sub>EnI</sub></i>	0.564	0.553	0.388	0.508	0.516
Czech Republic					
<i>InA<sub>PIA</sub></i>	0.573	0.500	0.546	0.500	0.500
<i>InA<sub>FinP</sub></i>	0.556	0.520	0.507	0.535	0.532
<i>InA<sub>EnI</sub></i>	0.573	0.500	0.546	0.500	0.500

Table 4: Correlation coefficients between indicators of activity in the implementation of environmental innovations in Russia and individual EU countries for 2015-2020.

	Correlation between <i>InA<sub>EnI</sub></i> and:	
	<i>InA<sub>PIA</sub></i>	<i>InA<sub>FinP</sub></i>
Russia	0.9111	0.6966
Bulgaria	-0.5314	0.9417
Greece	0.8913	0.9416
Italy	0.8392	0.0525
Malta	0.9354	0.9551
Czech Republic	0.9164	0.6867

Thus, the assessment of the innovation activity of industrial enterprises in the field of environmental protection in Russia and the EU countries shows that its level is close to the average level, relative to which there is either a moderate increase or a moderate decrease in innovation activity. The number of countries according to the degree of factor influence on the change in innovation activity was equally distributed:

- 1) Russia, Malta and the Czech Republic are characterized by a pronounced relationship between the processes of creation and use of innovative technologies and a generalizing indicator of innovation activity in the field of environmental innovation;

- 2) Bulgaria, Greece, Malta are characterized by a pronounced relationship between the volume of financing of environmental protection expenditures and the generalizing indicator of innovation activity in the field of environmental innovation.

The assessment of innovation activity in the environmental sphere is limited by a set of comparable statistical data in the country context and in the context of industries. A more specific assessment is possible provided that there are comparable data from Russian and international statistics on the sources of financing environmental innovations in various industries, special costs associated with environmental innovations, the

results of joint innovation activities in this area between countries, etc.

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