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Carbon Pricing as a Tool for Cross-Border Carbon Regulation and "Green" Transformation of the Global Economy

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ABSTRACT

The *relevance of the study* stems from the need to establish a mechanism for cross-border carbon regulation in the global economy. The *subject of the study* is different systems of carbon pricing in international practice in order to reduce greenhouse gas emissions. The *purpose of the work* is to analyse the current state of decarbonisation of the economy and energy transition as well as the challenges, taking into account current trends in the world economy; to identify the existing problems in the further development of transboundary carbon regulation. Using data from official Russian and foreign sources one can examine specific features and shortcomings of the major existing systems of carbon regulation in international practice, one can also analyse carbon charges in major countries and regions of the world from the perspective of sufficiency for meeting carbon neutrality targets by 2050. The study is based on a comprehensive approach to the consideration of possible options for the development of international carbon regulation and pricing. In the course of the research, the authors identify the existing problems in the decarbonisation of the world economy; study the objectives and possible consequences of the introduction of a carbon tax in the European region in 2026; and study the scenarios for the further development of the Russian economy as part of the global energy transition as set out in the Strategy for Socio-Economic Development of the Russian Federation. The main directions for the development of Russia's regional system of international carbon units trade were also outlined and the prospects for this system integration into the international emissions trading system were assessed.

Keywords: carbon regulation; energy transition; European Union; emissions trading system; green economy; carbon tax; greenhouse gases; climate change; border adjustment carbon mechanism

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INTRODUCTION

The world community is currently experiencing global shocks due to recovery from the COVID-19 pandemic, rising energy prices, inflation, economic recession, and global geopolitical instability.

Nevertheless, combating climate change remains high on the social, economic, and environmental agenda of this century and is one of the seventeen United Nations Sustainable Development Goals. To date, the Earth's average temperature has risen by 1.1 °C above pre-industrial levels, resulting in the melting of glaciers and rising sea levels, and causing a host of other environmental, social, and economic problems, such as floods and drought, forced migration, poverty, and lack of access to health care and education to meet basic human needs. All of these provoke further social inequalities and lower rates of economic development. According to some estimates, by 2030 some 700 million people in the world will be displaced by drought, while at the same time global sea levels could rise by up to 60 centimetres by 2100.[1]

Global warming is known to be caused by greenhouse gas emissions (*Fig. 1*) produced by major industries such as energy, transport, industrial production, and construction (*Fig. 2*).

In 1992, the United Nations Framework Convention on Climate Change was adopted to combat global warming and keep greenhouse gas emissions at an acceptable level, and is the main legal instrument for international co-operation in this regard.

The Kyoto Protocol, — a supplementary document to the United Nations Framework Convention on Climate Change, — was signed in 1997 and stipulated that between 2008 and 2012, total greenhouse gas emissions should be reduced by 5.2 per cent from 1990 levels.[2]

In 2015, the 21st Conference of the Parties to the UN Framework Convention on Climate Change resulted in the adoption of the Paris Climate Agreement,[3] which replaced the Kyoto Protocol. At that time, 195 countries (including Russia and the United States), which accounted for more than 94% of global greenhouse gas emissions, were in favour of joining the agreement, and it entered into force in 2020.

However, the US government then formally notified the UN of its decision to withdraw from the agreement — so it has now been ratified by 194 countries.

The Paris Agreement sets out three main long-term objectives:

1. The need to reduce greenhouse gas emissions to keep global climate warming to 2 °C this century, with efforts to keep warming to 1.5 °C if possible.

2. Regular review of country environmental targets and emission reduction commitments every five years.

3. Introduction and development of green finance.

According to the latest available data, 15 countries (including the EU) emitted more than 70 per cent of greenhouse gases globally in 2019 (*Fig. 3*).

The Paris Agreement stipulates that each participating country develops its own climate policy, makes commitments, and contributes to combating global climate change [1]. In addition to these three main goals, the agreement calls for achieving carbon neutrality (where the amount of greenhouse gases emitted equals their uptake) by 2050, and many countries have already made this commitment.

[1] Goal 13: Take urgent action plan to combat climate change and its impacts. 2017. URL: https://www.un.org/sustainabledevelopment/climate-change/ (accessed on 01.03.2023).

[2] Kyoto Protocol to the United National Framework Convention on Climate Change 11.12.1997. URL: https://unfccc.int/sites/default/files/resource/docs/cop3/l07a01.pdf (accessed on 01.03.2023).

[3] The Paris Agreement on climate change. 2015. URL: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf (accessed on 01.03.2023).

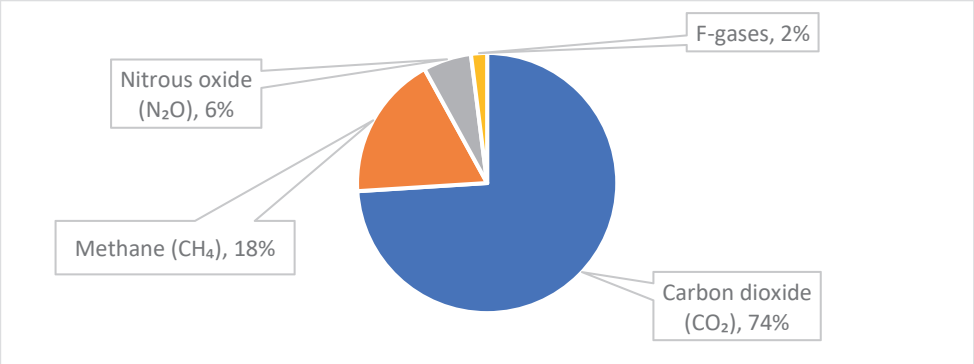

Fig. 1. **The composition of greenhouse gases and emissions, 2022**

Source: The Climate Action Monitor 2022. URL: https://www.oecd-ilibrary.org/docserver/43730392-en.pdf?expires=1675960254&id=id&accname=guest&checksum=D2A24AED6B67BD26A26EE0587EB634E0

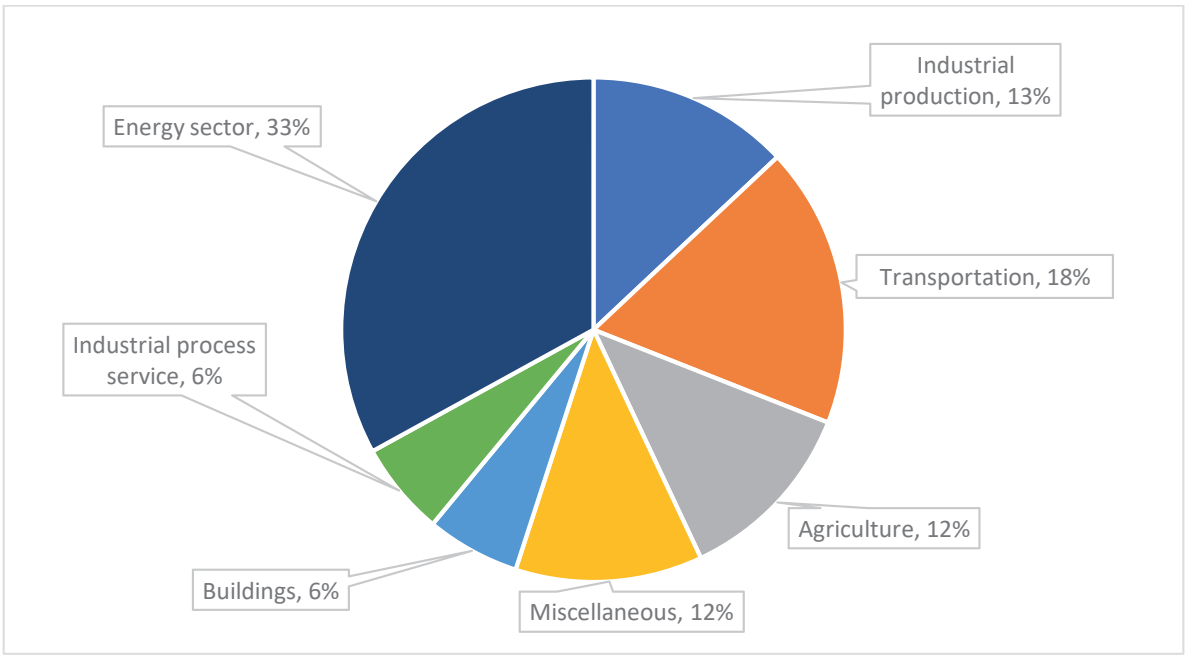

Fig. 2. **Shares of global greenhouse gas emissions by sector, 2022**

Source: The Climate Action Monitor 2022. URL: https://www.oecd-ilibrary.org/docserver/43730392-en.pdf?expires=1675960254&id=id&accname=guest&checksum=D2A24AED6B67BD26A26EE0587EB634E0

For example, in September 2022, 136 countries, which account for 80 per cent of all greenhouse gas emissions, signed up to a commitment to carbon neutrality by 2050. However, for now, current estimates suggest that greenhouse gas emissions will increase by 10.6% by 2030 compared to the 2010 figure, with an international target to reduce emissions by 43% by 2019.[4]

GREENHOUSE GAS EMISSIONS TRADING AND CARBON TAX

So how to reduce greenhouse gas emissions and achieve carbon neutrality? There is an idea to use such a market instrument as emission trading [2] for pollution and emissions of greenhouse gases into the atmosphere, including at the international

[4] The Climate Action Monitor. 2022. URL: https://www.oecd-ilibrary.org/docserver/43730392-en.pdf?expires=1675960254&id=id&accname=guest&checksum=D 2A24AED 6B 67BD 26A26EE 0587EB 634E 0 (accessed on 01.03.2023).

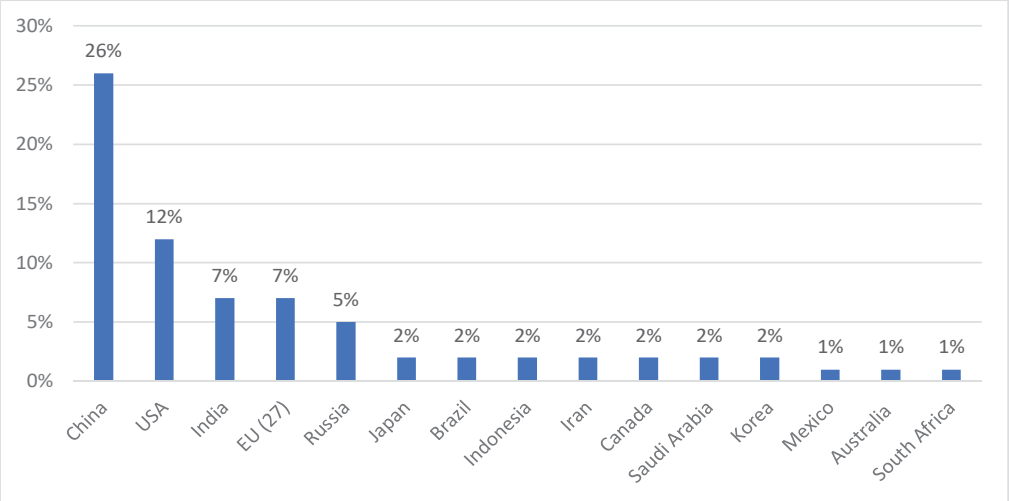

Fig. 3. **Global greenhouse gas emissions by country, 2019**

Source: The Climate Action Monitor 2022. URL: https://www.oecd-ilibrary.org/docserver/43730392-en.pdf?expires=1675960254&id=id&accname=guest&checksum=D2A24AED6B67BD26A26EE0587EB634E0

level. In essence, this represents a "price on carbon", which is further included in the costs of production and determines the fee that must be incurred to compensate for the consequences of environmental pollution by greenhouse gases.

As of the end of 2020, the World Bank counted 64 carbon pricing initiatives, including carbon taxes and Emissions Trading Systems (ETS), in operation or with a start date. At the same time, the actual carbon price remains very low, for more than half of all emissions it does not exceed USD 10 per tonne of CO-equivalent. For more than half of all emissions it does not exceed USD 10 per tonne of CO-equivalent (*Fig. 4*). In addition, carbon pricing now covers only 50% of greenhouse gas emissions among the member countries of the Organisation for Economic Co-operation and Development (OECD) and the G20, and the effective value of carbon "payment" is in the range of 20 euros per tonne of CO, which is much less than the amount of 50–160 euros per tonne required to meet the commitments of the Paris Agreement.[5]

Fig. 4 shows that the highest price for the disposal of 1 tonne of greenhouse gases is in North America; in the EU it is about 52 euros, while the International Energy Agency estimates that the price should be in the region of 75–100 USD per tonne of greenhouse gas emissions to meet the goals of the Paris Agreement.[6]

In the theory of carbon pricing, there are several ways to set a payment for greenhouse gas emissions:

1. The cap-and-trade system (from the English — cap-and-trade). The most famous one was developed and operates in the European Union.

The idea behind the use of emission quotas is that the state determines the limit of pollutant emissions on its territory for a certain period of time and distributes (sells) these quotas among industries. Over time, the amount of allowances (i.e., allowable pollution) decreases, contributing to the realisation of environmental goals. Greenhouse gas emissions without first

[5] Ibidem.

[6] International approaches to carbon pricing. URL: https://www.economy.gov.ru/material/file/c13068c695b51eb60ba8cb2006dd81c1/13777562.pdf?ysclid=le30toz4me704691704 (accessed on 01.03.2023).

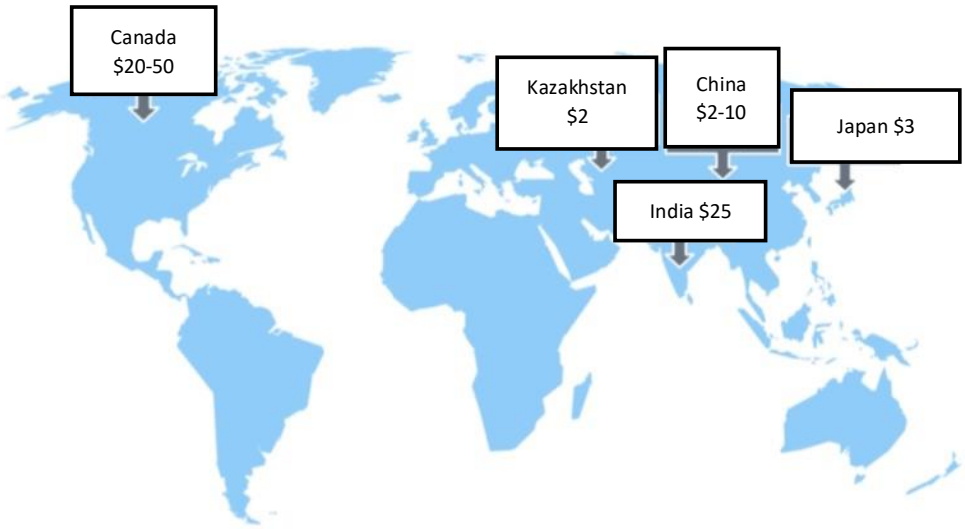

Fig. 4. **Price per tonne of CO_2 emissions in selected countries, 2021**

Source. International approaches to carbon pricing. URL: https://www.economy.gov.ru/material/file/c13068c695b51eb60ba8cb2006dd81c1/13777562.pdf?ysclid=le30toz4me704691704

purchasing a quota are subject to a penalty. If a company emits less than the allowances it has purchased, it accumulates carbon units. They are accounted for in a special registry of carbon units and can later be sold to states that need additional emission allowances [3].

Some of these quotas may be distributed free of charge by governments to greenhouse gas emitting companies or sold at special auctions. International trade of emission quotas between states is possible, which is stipulated by the UN Framework Convention on Climate Change, and is also verified within the European Union in the case of trading of EU emission quotas. Thus, states that consume large amounts of non-renewable energy can buy allowances from states with lower hydrocarbon energy consumption, which are traded, for example, on the London Stock Exchange and the European Climate Exchange.

The quota trading system is designed to incentivise companies to switch to renewable energy sources and to use and develop "green" technologies.

2. *The baseline-and-credit approach* (from the English — baseline-and-credit) to charging for hydrocarbon emissions also incentivises pollution reduction. It consists of providing "credits" to companies that reduce greenhouse gas emissions below a baseline level, which is usually defined as the maximum emission limit at some point in the past. The company can then use the earned "credits" to cover its emissions or sell them to other companies that exceed the baseline level of emissions.

3. *Carbon taxes,* which may include excise taxes on petroleum products; taxes on greenhouse gas emissions into the environment, on mining, on consumption of energy products (expressed in a fixed fee per 1 tonne of CO_2 emissions and applied to major carbon-intensive industries) [4].

Fig. 5 shows the coverage of pollutant gas emissions by existing carbon pricing systems in major countries.

Thus, carbon pricing is designed to oblige emitters of greenhouse gases to pay for emissions either in the form of pre-purchase of emission allowances or through a carbon tax. In both cases, the emitted carbon will have to be paid for, but the former incentivises the reduction of greenhouse gas emissions as well as the development of "green" technologies.

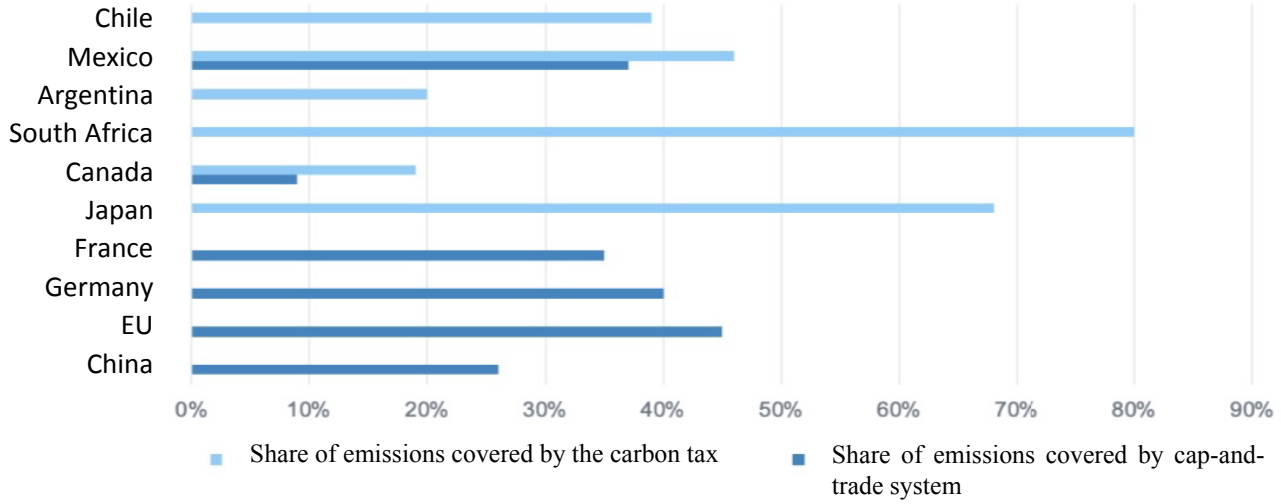

Fig. 5. **Coverage of emissions from existing carbon pricing systems in major countries, 2021**

Source: International approaches to carbon pricing. URL: https://www.economy.gov.ru/material/file/c13068c695b51eb60ba8cb2006dd81c1/13777562.pdf?ysclid=le30toz4me704691704

INTERNATIONAL CO-OPERATION IN THE FIELD OF CARBON REGULATION

The Organisation for Economic Co-operation and Development has set its agenda for combating climate change and greenhouse gas emissions by adopting an "International Programme for Action on Climate" (IPAC)[7] in 2021 to transition to a carbon-neutral and more sustainable economy by mid-21st century. This programme brings together all OECD countries, as well as six candidate countries (Argentina, Brazil, Bulgaria, Croatia, Peru, and Romania), partner countries (China, India, Indonesia, and South Africa), the G20 countries and Malta.

The European Union has had the world's first international quota trading system (EU ETS) in place since 2005.[8] Until 2008, 95% of EU emission quotas were distributed free of charge to greenhouse gas emitters, then 90% for the next three-year period, with a fine of € 100 per tonne to be paid if the limit was exceeded. Agreements were concluded between the EU and countries that ratified the Kyoto Protocol on the mutual recognition of quotas issued by an individual country under the quota trading system.

As noted above, about 40 per cent of greenhouse gas emissions come from the most carbon-intensive industries: electricity, industrial production, and agriculture. At present, the EU emissions trading system covers the following types of greenhouse gases (which can be relatively accurately measured and verified)):

- Carbon dioxide (CO_2) gas emitted by:

– the electric power industry;

– energy-intensive industry, including petroleum refineries, steel, cement and glass production, pulp and paper mills, and chemical industries;

– commercial air transport;

- Nitrous oxide (N_2O), emitted by nitrogen compounds, glyoxylic acids, and fat mills;

[7] The Climate Action Monitor. URL: https://www.oecd-ilibrary.org/docserver/43730392-en.pdf?expires=1675960254&id=id&accname=guest&checksum=D 2A24AED 6B 67BD 26A26EE 0587EB 634E 0 (accessed on 01.03.2023).

[8] Directive 2003/87/EC of the European Parliament and the Council establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. 13 October 2003. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003L0087&qid=1676107226821&from=EN (accessed on 01.03.2023).

• Perfluorocarbons (PFCs) from aluminium production.

The above-mentioned companies are legally obliged to purchase greenhouse gas emission quotas. Although the EU accounts for only 8 per cent of global greenhouse gas emissions,[9] it is the most active in setting and implementing climate change targets. In the future, the EU plans to expand and implement the use of emission allowances in sectors such as aviation, maritime transport, and real estate,[10] and to reduce the allowable emission limit by 2.2% annually from 2021 onwards.

In addition, due to the fact that the EU has an active policy of carbon neutrality by the middle of this century, but not all countries have made similar commitments to decarbonisation, the EU government has decided to introduce — Carbon Border Adjustment Mechanism — (CBAM) [5]. This mechanism is essentially a cross-border carbon regulation that equalises the pricing of the international movement of products containing hydrocarbons in terms of limiting greenhouse gas emissions and charges a carbon "fee" depending on the carbon intensity of raw materials and products imported into EU countries [6]. It is assumed that the price of imported products with a high carbon footprint will be correlated with EU domestic prices for similar hydrocarbons, which implies fair competition between countries — importers of carbon products, in accordance with the rules of the World Trade Organisation and the EU's environmental commitments to the global community. Such cross-border carbon regulation implies an additional carbon tax on imports of carbon-containing products, the production of which involves a large amount of greenhouse gas emissions into the atmosphere (e.g., aluminium, fertilisers, cement, electricity). This could also help prevent the relocation of production from the EU to other regions with lower environmental requirements. Presumably, the carbon tax under a border adjustment carbon mechanism would be commensurate with the value of emission allowances under the EU Emissions Trading System (EU ETS). It is still planned to introduce such a carbon tax by 2026. Undoubtedly, these measures will lead to an increase in the costs of European producers and reduce the competitiveness of individual producers [7].

CARBON REGULATION IN RUSSIA

Pursuant to the Decree of the President of the Russian Federation No. 666 dated 04.11.2020 "On Reducing Greenhouse Gas Emissions", the Strategy for the Socio-Economic Development of the Russian Federation[11] (hereinafter — the Strategy) with Low Greenhouse Gas Emissions until 2050 was approved and the national contribution to the implementation of the Paris Agreement was determined.

As stated in the Strategy, "to implement international climate agreements, various policy measures are used at supranational, national and subnational levels to stimulate, among other things, the technological transition of the global energy sector from hydrocarbon-based generation and other fuels to carbon-free energy resources and energy resources with low greenhouse gas emissions".

[9] "Fit for 55": delivering the EU's 2030 Climate Target on the way to climate neutrality. 2021. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC 0550 (accessed on 01.03.2023).

[10] The European Green Deal. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the regions. URL: https://eur-lex.europa.eu/resource.html?uri=cellar: b828d165–1c22–11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF (accessed on 01.03.2023).

[11] Strategy of socio-economic development of the Russian Federation with low greenhouse gas emissions until 2050. 2021. URL: http://static.government.ru/media/files/ADKkCzp3fWO32e2yA0BhtIpyzWfHaiUa.pdf (accessed on 01.03.2023).

In order to ensure competitiveness, sustainable economic growth and preparation for such a global energy transition, the Strategy considers two scenarios for further development of the Russian economy: inertial and targeted.

The first one assumes following the existing economic model and planned replacement and modernisation of the equipment in use, but this scenario will not be able to meet the Russian Federation's commitments to achieve carbon neutrality by 2060.

Accordingly, the second, target (intensive) scenario was adopted as a basis, which envisages faster growth rates of non-energy exports in the short term, introduction and replication of low- and no-carbon technologies, stimulation of the use of secondary energy resources, appropriate changes in tax policy, development of "green" financing, implementation of measures to preserve and increase the absorption capacity of forests and other ecosystems, introduction of technologies for the capture, use and utilisation of greenhouse gas emissions.[12] In this scenario, energy transition is considered as one of the factors for ensuring the competitiveness of the Russian economy on a global scale [8, 9].

Measures are envisaged to reduce greenhouse gas emissions to 70 per cent of 1990 levels by 2030 and, moreover, an ambitious target has been set to reduce accumulated net greenhouse gas emissions in the Russian Federation to lower values than those of the European Union between 2021 and 2050. This should be facilitated by the development of "green" technologies, such as, for example, the development and implementation of technologies for the capture, processing, utilisation and/or disposal of carbon dioxide from industrial and energy production.

It is interesting to note that the Strategy implies the introduction of a system of voluntary climate projects (which will make the circulation of carbon units possible). The first such pilot project has been launched in the Sakhalin Oblast and will operate until 2028[13] As a result of the experiment, Sakhalin will have Russia's first regional system of international trade in carbon units, and the region could achieve carbon neutrality by as early as 2025.[14]

Russia is developing its own market for carbon units, which should be recognised on the international market. According to Russian economists,[15] in order to trade in carbon units, it is necessary to create a developed system of monitoring and identification of all processes related to greenhouse gas emissions. This makes Russia reliable in international negotiations for the implementation of global climate agreements. It should be noted that Russia is in favour of voluntary action by participants in trading in carbon units, unlike the EU, where a mandatory cross-border carbon tax is expected to be introduced. Our country has taken a course

[12] The Government approved the Strategy for the Socio-Economic Development of Russia with Low Greenhouse Gas Emissions until 2050. URL: http://government.ru/docs/43708/ (accessed on 01.03.2023).

[13] Federal Law No. 34-FL dated 06.03.2022 "On Conducting an Experiment to Limit Greenhouse Gas Emissions in Certain Constituent Entities of the Russian Federation". URL: https://base.garant.ru/403615518/#:~: text=%D0%A4%D0%B5%D0%B4%D0%B5%D1%80%D0%B0%D0%BB%D1%8C%D0%BD%D1%8B%D0%B9%20%D0%B7%D0%B0%D0%BA%D0%BE%D0%BD%20%D0%BE%D1%82%206%20%D0%BC%D0%B0%D1%80%-D1%82%D0%B0,%D0%B3.%20N%2010%20%D1%81%D1%82.%201391 (accessed on 01.03.2023).

[14] International approaches to carbon pricing. URL: https://www.economy.gov.ru/material/file/c13068c695b51eb60ba8cb2006dd81c1/13777562.pdf?ysclid=le30toz4me704691704 (accessed on 01.03.2023).

[15] ESG reset: do environmental, social and governance factors affect the economy?. URL: https://www.vedomosti.ru/esg/green_finance/articles/2022/12/22/956555-esg-perezagruzka-vliyayut-ekologicheskii-sotsialnii-upravlencheskii-faktori-ekonomiku (accessed on 01.03.2023).

to build a national system with recognition of Russian carbon units in the global market afterwards [10].

Although the current geopolitical situation and sanctions policies are forcing EU countries to adjust their decarbonisation plans, the European government is not linking a temporary return to coal as a fuel to EU climate goals and continues to pursue industrial decarbonisation activities,[16] albeit with less enthusiasm.

"The closure of the European market from Russia does not mean that the Russian economy will stop moving towards decarbonisation. On the contrary, it is now crucial to expand the directions of this movement and intensify cooperation with Eastern partners, who are full-fledged participants in the international climate dialogue".[17] Moreover, Asian countries such as India and China are among the largest consumers of hydrocarbon fuels and have also committed themselves to decarbonisation by 2060.

CONCLUSIONS

Combating climate change is one of the most important goals of sustainable development of the world economy for the coming decades. However, due to the current geopolitical situation, changes in the logistics of energy supplies to the European region, and a partial return to the use of coal as a fuel, the issue of decarbonisation is undergoing certain transformations. The near future will show what they will be. Nevertheless, the countries do not intend to abandon the goal of carbon neutrality by the middle of the 21st century and continue to actively use various mechanisms and instruments of carbon pricing.

Russia is also keeping up with the global agenda in the fight against climate change and is developing its national climate projects aimed at testing a regional system of international trade in carbon units with the possibility of subsequent integration into the global system of emission trading under the Paris Agreement.

[16] "Economy Ministry urged not to consider Asia a safe haven from EU carbon tax". 14.12.22. URL: https://www.economy.gov.ru/material/news/v_minekonomrazvitiya_prizvali_ne_schitat_aziyu_tihoy_gavanyu_ot_uglerodnogo_naloga_es.html (accessed on 01.03.2023).

[17] Ibidem.

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