

# Carbon Polygons as a New Tool for Climate Change Management

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**Abstract.** The need to counteract climate change remains relevant in the world, and in Russia the active development of climate policy continues. Data on emissions and removals of greenhouse gases (hereinafter referred to as GHGs) are of key importance: they are the basis for climate goals and reporting of countries and companies, they are the basis for the implementation of climate projects, and carbon markets are built on them. However, the quality of data on emissions and removals at the current stage is far from perfect. According to the IEA, the uncertainty in estimating global emissions of carbon dioxide is 10%, methane - 25%, nitrous oxide - 30%, fluorine-containing gases - 20%. Considerable difficulties are also caused by the assessment of the absorption capacity of forests and other ecosystems (pastures, swamps, water bodies, etc.), which Russia focuses on in its climate policy.

## 1 Introduction

Russia's current climate goal and international commitments are formulated as follows: "by 2030, reduce GHG emissions by up to 70% compared to 1990 levels, taking into account the maximum possible absorption capacity of forests and other ecosystems, and subject to sustainable and balanced socio-economic development" [1]. The absorption already offsets almost 30% of Russia's GHG emissions. It is assessed according to the methodology of the Ministry of Natural Resources of Russia (drawn up taking into account the recommendations of the Intergovernmental Panel on Climate Change), but discussions about approaches to its assessment continue. In Russia, in February 2022, by presidential decree, the Federal Program for Environmental Development and Climate Change until 2030<sup>2</sup> was approved, which involves the development of a monitoring system for GHG flows and the carbon cycle. It can be noted that the Federal Law "On Limiting Greenhouse Gas Emissions"<sup>3</sup> adopted in 2021 introduced mandatory reporting on GHG emissions in Russia for the largest emitting companies and created opportunities for the implementation of climate projects.

In the current international practice, carbon farms are in the foreground as a promising area of activity for natural absorption and removal (sequestration) of GHGs. For example, the EU defines a carbon farm as "a green business model that encourages owners and managers to improve land management, which translates into increased carbon

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sequestration in living biomass, dead organic matter and soil by increasing carbon sequestration and/or reducing carbon emissions.” into the atmosphere, in accordance with environmental principles that support biodiversity and natural capital in general” 5 . Carbon farms are expected to contribute to the achievement of EU climate targets, supported by the Common Agricultural Policy and programs such as LIFE6 and Horizon Europe7, as well as private initiatives linked to carbon markets (climate projects) [2]. By the end of 2022, legislative proposals are expected in the EU for the certification of “carbon withdrawals”, based on reliable and transparent accounting, monitoring and verification. Another example is Australia’s Carbon Farms Roadmap8, which aims to increase state revenues and create new jobs by 2030. At the same time, there are still quite a lot of questions regarding the stability and reliability of the results obtained for carbon farms.

Carbon polygons in Russia are created on the basis of universities and scientific organizations (operators) with the participation of industrial and technological partners and receive budgetary support. Organizations-industrial partners undertake to co-finance the carbon landfill, organizations-technological partners - to organize its scientific and practical activities [3]. Determining the vector of development of the network of Russian carbon landfills, coordination and methodological support is provided by the Expert Council under the Ministry of Education and Science of the Russian Federation on scientific support for the development of carbon balance control technologies. It considers proposals for the creation of new landfills (inclusion in a pilot project requires the opinion of the Expert Council), determines performance indicators and evaluates their performance.

## 2 Research Methodology

Carbon polygons are a noticeable and promising area of Russian climate policy. They will not only contribute to the formation of a reliable national system for monitoring GHG flows in Russian ecosystems, but will also increase confidence in Russian climate projects (the reliability of the results is the most vulnerable point of foreign carbon farms) [4]. The landfills surveyed by the CSR, sharing the goals and objectives set by the Russian Ministry of Education and Science, also emphasize the practical aspects of their activities (for example, the search for optimal solutions for decarbonization). The practical vector of landfill activities is strengthened by the presence of industrial partners [5]. Despite the fact that most of the carbon landfills in Russia are in the early stages of implementation, as of September 2022, they have already managed to achieve certain results, primarily in the areas of education and research (Appendix 1). Most of the current scientific research of the surveyed polygons (and, accordingly, the main results obtained) is related to the development of scientific and methodological tools in the field of climate monitoring - for example, the creation of geographic information systems (hereinafter referred to as GIS). The key condition for the intensification of scientific research is called the timely delivery of equipment. At the same time, the equipment for Russia’s carbon ranges is predominantly foreign (the United States can be especially singled out), which, in the context of an aggravated geopolitical situation, creates risks of supply restrictions [6]. So far, according to the information of the Russian Ministry of Education and Science, deliveries continue, but with an increase in terms and an increase in cost by 20% -30%. The educational direction of carbon polygons is already developing quite successfully. For 2021–2022 at least 7 new undergraduate and graduate educational programs were created, existing programs were updated and new courses were introduced [7]. More than 15 programs and courses of additional exemplary and advanced training have been prepared. In addition, carbon landfills actively conduct educational and outreach activities.

### 3 Results and Discussions

The concept of low-carbon development is a concept based on the development and implementation of strategies and plans for socio-economic development, involving the reduction of greenhouse gas emissions and climate-resilient economic growth (low-emission development strategies - LEDS) [8].

Systemic international cooperation to prevent negative climate change and combat its consequences under the auspices of the UN began in 1992 with the UN Framework Convention on Climate Change [9]. More specific guidelines and obligations for the member countries of the convention were established in the documents adopted later as additional agreements to the UN Framework Convention at conferences regularly held by the member countries<sup>26</sup>, including [10]: - The Kyoto Protocol to the UN Framework Convention (Kyoto Protocol), adopted on December 11, 1997 and calculated for the period up to 2012; - Paris Agreement under the Framework Convention on Climate Change (Paris Agreement), adopted on December 12, 2015 and entered into force on November 4, 2016; - The Glasgow Climate Pact, signed on November 13, 2021. Russia was a party to all these agreements. In the future, Russia took a more cautious position regarding the signing of climate agreements [11]. Thus, Russia signed the Glasgow Climate Pact, but did not sign the agreements adopted at the same conference on reducing the use of coal in the energy sector, accelerating the transition to electric vehicles and reducing methane emissions into the atmosphere (by at least 30% by 2030). In Russia, the concept of low-carbon development has been implemented in a number of federal documents of various status. The goals and objectives of these documents correspond to the provisions of the UN Framework Convention and its supplementary agreements and are based on the principles of sustainable development of territories. Until recently, in fact, the only financial instrument actually used in Russia to stimulate issuers to reduce emissions of pollutants was the collection of fees from natural resource management entities for negative environmental impact (in accordance with Article 3 of the Federal Law of January 10, 2002 No. 7-FZ “On Environmental Protection”) [12]. Today, such an instrument is already perceived as ineffective. The situation with the development and implementation of new economic and financial instruments to support low-carbon development in the Russian Federation has begun to change over the past three years. In 2020–2021 VEB.RF has developed a national methodology for green finance [13]. The methodology contains a system of criteria for the compliance of projects with the status of “green projects” and “adaptation projects”, as well as requirements for the verification system for projects of sustainable (including “green”) development in the Russian Federation.

In 2002, the EU introduced energy performance certificates (energy passports) as an integral part of the Energy Performance of Buildings Directive (EPBD). The ultimate goal of building energy certification is to create a demand-driven market for energy efficiency in the building sector. The topic of energy saving is no less relevant for Russia [14]. If before 2008 there was a downward trend in the energy intensity of the country’s GDP, then after 2008 the level of energy intensity of GDP remained virtually unchanged, which indicates the absence of a sustainable trend towards technological transformation that would reduce the energy intensity of the operation of buildings, transport and production processes [15]. The Strategy for the Socio-Economic Development of the Russian Federation with Low Greenhouse Gas Emissions until 2050 assumes that the main way to reduce greenhouse gas emissions in the areas of housing and communal services and housing construction is to increase the efficiency of heat supply systems, heat and cold supply and introduce high energy efficiency standards for new buildings (classes A , A+) [16]. These measures are mainly focused on new residential construction, while for existing multi-apartment

buildings, this Strategy calls the decommissioning and replacement of worn-out, non-energy efficient housing stock a top priority.

Federal Law No. 261-FZ dated November 23, 2009 “On Energy Saving and Improving Energy Efficiency and on Amending Certain Legislative Acts of the Russian Federation” gives a significant place to improving the energy efficiency of apartment buildings, including the installation of metering devices for the consumption of communal resources. However, so far, the degree of metering in the housing sector is relatively low [17]. Thus, according to the State Information System for Housing and Communal Services (GIS HUS), as of October 2022, 55% of multi-apartment buildings were equipped with general-house electricity consumption meters, less than 40% of apartment buildings were equipped with heat energy, 80% of apartment buildings were equipped with individual electricity consumption meters. houses, thermal energy - only 5% of apartment buildings.

## 4 Conclusions

Environmental issues, including those related to the reduction of anthropogenic greenhouse gas emissions and climate conservation, occupy an important place on the agenda of most world powers, including the Russian Federation (RF), which was documented by the adoption of the Paris Agreement. The countries of the European Union (EU) have historically been the most active supporters of environmental initiatives and have long adapted various fiscal instruments (taxes and quotas) to stimulate enterprises to reduce carbon dioxide and other greenhouse gas emissions. One of the latest steps towards such a policy was the introduction of a proposal to introduce cross-border taxes on carbon dioxide in relation to a number of goods imported into the EU countries . And although this project is currently under development, and the legal and methodological details of its implementation are unknown, experts are confident that the new tax will be introduced and entail significant financial losses for the Russian Federation . Taking into account the fact that more than 40% of Russian exports go to the EU, of which more than 70% are “environmentally dirty”: oil, coal, gas and metal, due to the new tax, the Russian economy will lose from three to five billion dollars annually already. from 2022, and by 2030 these costs will amount to more than eight billion a year.

## Acknowledgments

The work was carried out within the framework of the state assignment of the Ministry of Science and Higher Education of the Russian Federation (topic No. 075-03-2021-074 / 4).

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