Carbon farming as a new climate change management tool in Russia

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Abstract. Carbon farming, often referred to as carbon sequestration or carbon agriculture, is gaining recognition as a powerful climate change management tool worldwide. It involves agricultural and land management practices that enhance carbon storage in soils and vegetation, ultimately reducing greenhouse gas emissions in the atmosphere. Russia, with its vast land resources and role as a major contributor to global carbon emissions, has a unique opportunity to harness the potential of carbon farming as a proactive response to climate change. The urgency of addressing climate change is undeniable, as its far-reaching consequences have become increasingly evident. Rising temperatures, extreme weather events, and disruptions in ecosystems necessitate immediate action. Carbon farming is a promising approach that not only mitigates greenhouse gas emissions but also offers several environmental, economic, and social benefits. This introduction provides an overview of the concept of carbon farming and its relevance in the context of Russia's climate and land use challenges. By exploring the principles and practices of carbon farming, we can understand its potential to transform the agricultural and land management sectors in Russia while contributing to global efforts to combat climate change. This paper aims to delve into the methods, benefits, and challenges associated with carbon farming in Russia and assess its role as a new and innovative climate change management tool.

1 Introduction

Over the past few decades, the problem of ecology has been very acute all over the world. More recently, the discussion of issues related to human technogenic activity and its impact on nature has become even more popular and widespread. In 1992, almost all countries of the world signed the UN Framework Convention on Climate Change. In addition, in 1997, an additional agreement was developed in the Japanese city of Kyoto to counteract global warming, and already in 2015, instead of the Kyoto agreement, the Paris Climate Agreement was presented, which implies even greater restrictions on greenhouse gas emissions for the sake of nature conservation. In addition, the United Nations, which implements the sustainable development goals (UN SDGs), makes a significant contribution to solving the problem of environmental problems. The concept of sustainable development combines economic, social and environmental solutions for the qualitative and

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safe development and existence of the world society. This concept assumes the adoption of measures that are aimed at the optimal use of limited resources and the integrity of biological and physical natural systems. And one of the UN SDGs, namely UN SDG No. 13, was "Take urgent action to combat climate change and its consequences", providing for a common, but differentiated responsibility for climate change [1]. The United Nations hopes that by joint efforts of all countries it will be possible to solve the problem of the rapid warming of the planet. Gradual increases in global average temperatures are leading to unpredictable weather patterns that are jeopardizing food production, causing sea levels to rise, and increasing the risk of natural disasters, all of a global nature and on an unprecedented scale. Due to climate change, more frequent extreme weather events and the expansion of deserts are occurring (Fig.1).

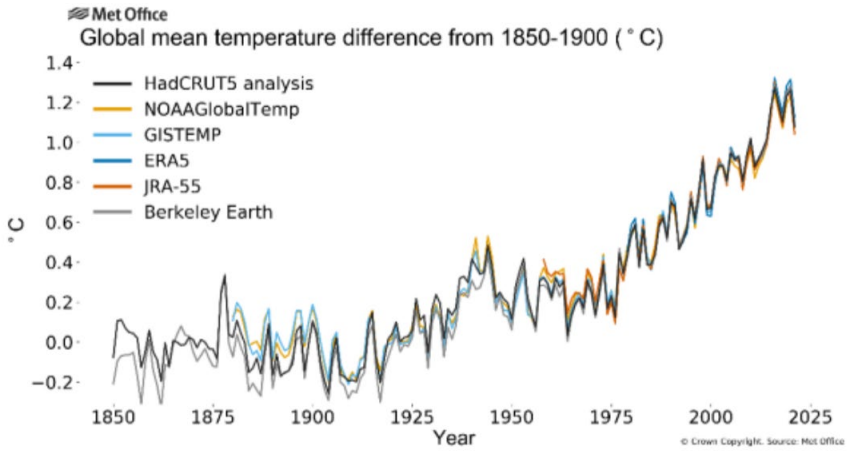

Fig. 1. Global annual average temperature difference relative to pre-industrial conditions (1850-1900) for six global temperature datasets.

In general, in the long term, climate change may lead to unpredictable consequences that are unlikely to be positive. However, there is another aspect of the fight against greenhouse gas emissions, which is directly related to the economy. In view of the general fight against global warming, many countries introduce various taxes, duties and fines tied to the volume of greenhouse gases emitted during production. Commitment to the Paris Agreements of the countries that are world economic leaders creates a certain environmental framework for industries around the world, beyond which it is not economically profitable to pass. The European Union is the clearest example of the economic fight against greenhouse gas emissions. In addition, the Parliament of the European Union adopted the Green Deal: a program that aims to massively reduce carbon dioxide emissions and achieve zero net greenhouse gas emissions by 2050 [2]. Duties on products with a higher carbon footprint are part of this program. The European carbon tax on goods is a big problem for manufacturers from other countries, especially Russian ones. The EU countries account for 42% of Russian exports: it is based on oil, gas and metals [3]. However, Russian industry in almost all areas has a Soviet industrial base, which does not meet modern environmental standards. By the standards of the European Union, Russian production is “dirty”, so it is planned to impose high duties on exports. According to the audit company KPMG, Russia's trade losses can range from 6.25 billion euros per year [4]. Considering that such losses go through the largest trade channel in Russia, this state of affairs will have an extremely detrimental effect on the Russian economy. In addition, the countries of the European Union are gradually reducing the consumption of oil as a "dirty" source of energy. In addition, in the coming years, the profitability of Russian oil supplies

to the EU may decrease by 10–20% [5]. The Green Deal also plans to phase out natural gas as an energy source [6]. This creates even more risks for Russia.

2 Research Methodology

The research on "Carbon Farming as a New Climate Change Management Tool in Russia" involves the use of various methods and approaches to analyze, assess, and understand the effectiveness of this innovative climate change management tool in the Russian context. Here are some research methods that can be applied:

1. Literature Review: Conduct an extensive analysis of scientific articles, reports, publications, and academic research related to carbon farming and its implementation in Russian conditions.
2. Statistical Data Analysis: Examine existing statistical data on greenhouse gas emissions in agriculture and farming in Russia, as well as data on soil carbon levels.
3. Field Surveys: Conduct local research on various agricultural sites in Russia to evaluate the effectiveness of carbon farming methods, such as soil carbon sequestration and agroforestry.
4. Economic Analysis: Investigate the economic aspects of implementing carbon farming, including costs, investments, potential benefits for agriculture and rural areas, and issues related to the monetization of carbon credits.
5. Sociological Research: Assess the opinions of rural communities, farmers, regional authorities, and other stakeholders regarding the prospects and challenges of implementing carbon farming.
6. Comparative Analysis: Compare carbon farming practices in Russia with experiences from other countries and explore advanced methods and technologies.
7. Ecological Monitoring: Evaluate the impact of carbon farming on ecosystems, water resources, and biodiversity.
8. Political Analysis: Analyze the political, legislative, and regulatory aspects influencing the development of carbon farming in Russia.
9. Modeling: Utilize computer models to forecast the outcomes and consequences of implementing carbon farming in different Russian regions.
10. Case Studies and Practical Observations: Study specific cases of carbon farming in Russia and analyze the practical experiences of farmers and agricultural enterprises.

Effectively using these research methods will provide a comprehensive understanding of the potential and limitations of carbon farming as a climate change management tool in Russia.

3 Results and Discussions

According to the authors, carbon landfills solve a very serious economic issue - reducing the tax burden on Russian enterprises. However, in our opinion, carbon polygons and their activities are also of great scientific importance. While most of the developed countries were working on new sources of energy, green technologies, the use of which to a lesser extent affects the environment, Russia preferred to stick to its traditional types of fuel: oil, coal and gas. Over time, the refusal to explore new types of energy could lead to a serious scientific and technical lag of the Russian energy and industry from developed countries, which again affects the welfare of the country. The Ctrl2GO company itself claims to be "one of the largest providers of data analysis solutions in Russia." She specializes in the development and implementation of digital products in the industry. Many of the developments of this company are partially used in the agro-industrial complex of Russia -

and all of them are tied to the use of modern digital technologies, which significantly increase labor productivity. The same company is the initiator of the carbon landfill project. In addition, the activity of carbon landfills, according to the authors, increases our knowledge about the sequestration potential [10] (for greenhouse gases) of the territories. Also, their activities increase our knowledge of adaptation to global climate change and global warming - this is the adaptability of natural or anthropogenic systems in response to real or expected climate change, which allows you to reduce your own vulnerability and use favorable conditions about their adaptive capabilities and use favorable conditions. In addition to the above, a scientific complex is being created that is able to automatically measure the level of absorption of carbon dioxide (as well as other components of greenhouse gases) in various climatic and natural zones.

However, there has been increased appreciation of blue carbon ecosystems (BCEs), including seagrass meadows, mangrove forests, tidal marshes and, potentially, seaweed beds, since 2009. BCEs are widespread, highly productive coastal habitats that host diverse ecological communities and support human well-being, providing food and coastal protection against erosion and sea-level rise, influencing the livelihoods of millions (Fig.2).

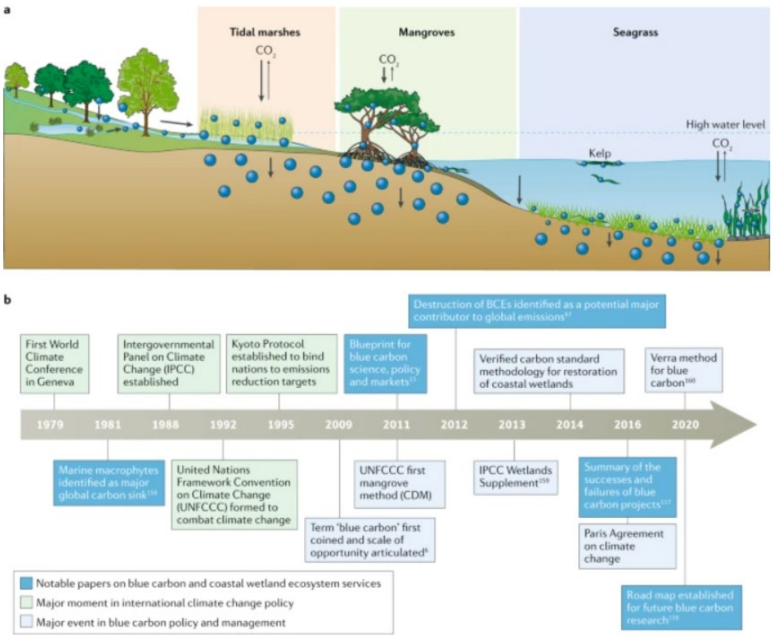

Fig. 2. Blue carbon cycling and notable publication.

Such measurements are essential for a domestic manufacturer, since in Russia there are no state methods for assessing the level of absorption of greenhouse gases. Deputy Minister of Economic Development Torosov said that the methodology for calculating the carbon footprint, which the European Union plans to apply, remains largely closed and incomprehensible, since it takes into account only the level of carbon dioxide emissions on the territory of the state: there are no calculations for its consumption by nature. At the expense of the carbon landfill project, the state plans to develop an alternative scheme for calculating fees for the carbon footprint and propose adjustments to the European Union. This project on the analysis of greenhouse gas emissions and consumption is not unique in the world. There are a number of other projects in different countries that track and collect data on the planet's climate change. In the United States of America, there are two programs created by business in parallel.

1. The first one is Google Climate Trace. It is owned by the largest holding Alphabet, which has a large amount of scientific and financial resources. The project was not created on purpose: initially, these were NGOs from different countries that were engaged in regional monitoring of climate change, but after a grant from Google, the NGOs united and began to work under the leadership of the holding. By uniting in Google Climate Trace, the specialists received a wide range of tools: from advanced information technologies to spacecraft. Thanks to this, the company's probes and satellites track carbon dioxide emissions in real time and transmit data to the laboratory, where they are analyzed by specially created artificial intelligence. The results of the company's work are used by relevant US government agencies and environmentally oriented organizations [6].

2. The second climate project was developed by Microsoft Corporation - "AI for Earth". Unlike Google Climate Trace, Microsoft does not directly analyze climate change. This company presents its computing power to researchers in the field of climate change. In addition to free access to advanced artificial intelligence, project participants can receive a grant for the development of ideas from the company. Microsoft uses information received from partners to develop its own solutions aimed at minimizing carbon dioxide emissions [7].

3. Another analogue of such a program is the program of the European Union - "Copernicus Program". Unlike the United States and Russia, business is not its initiator. The initiator was the European Space Agency, which is an international organization. The Copernicus Program is a lot like Google's project: global environmental monitoring from space using satellites. They also collect real-time data and transmit it to laboratories where it is analyzed using computer algorithms [7]. Large-scale change tracking allows you to monitor the weather, climate, track and predict natural and man-made disasters. Google Climate Trace was created in 2019 and has huge budgets from the Alphabet holding; AI for Earth - in 2017, owned by one of the largest IT companies in the world, i.e. the budget is also extremely large; The Copernicus Program was developed in 2008 and launched in 2014, funded by the European Union; Ctrl2Go carbon polygons - launched only in 2020, the company does not have large incomes. Such a cursory comparative analysis will allow us to more correctly correlate the achievements of the projects at the moment. Clearly, Europeans are the world leaders in tracking and calculating carbon emissions. They were the first to launch satellites that constantly monitor the situation, so they had more time to determine the impact of emissions on the climate. American companies are not far behind: they have a serious technological base, which they use to develop their technologies. Russia looks a little behind on this list, as it lacks a wide array of satellites to monitor climate change, an incredibly powerful IT sector to quickly analyze data, and even cover the entire country with polygons. On the other hand, the lagging behind, as a rule, develops faster due to already known technologies. The company Ctrl2Go proposed an option that does not require large investments in spacecraft. It is enough to extend the polygons to a greater number of climatic zones, collect data and simulate the level of carbon dioxide air pollution as close as possible to reality. The carbon landfill project has not yet been launched at full capacity, it is too early to draw conclusions, but the beginning is at least impressive with its technological solution. Special attention should be paid to the legal regulation of the process of creating a carbon landfill project. The organization of research and scientific and technical activities on the territory of national parks is mainly regulated by the Federal Law "On Specially Protected Natural Territories", the Federal Law "On Science and State Scientific and Technical Policy". Also, for the implementation of activities, it is necessary to obtain the consent of the director for scientific work of the nature protection zone and Rosprirodnadzor. Activities in specially protected natural areas should be carried out by methods that do not violate the rules of nature protection in these areas. In the future, the legal regulation of the project may change due to the planned cooperation with universities

and research and educational centers (RECs) in different regions and the Ministry of Natural Resources. According to the authors, there is no doubt that RECs should participate in the carbon landfill program, since they have all possibilities for this. And it is important that RECs interact with business and unite regions that are diverse in terms of natural and climatic parameters. For example, the West Siberian REC has already announced that it will take part in the program. This is one of the 15 RECs planned for creation, which is already operating and whose specialization includes: biological safety of humans, animals and plants; Arctic research; digital transformation of the oil and gas industry. The West Siberian Research and Educational Center has identified several priorities for scientific and technological development, which include counteracting technogenic, biogenic, and sociocultural threats [8]. In general, the interest in the carbon landfill project corresponds to the specialization of the REC and can help both in the implementation of the national project "Science", according to which in 2024 Russia should enter the top five countries carrying out research and development, and in solving environmental problems that are a priority. In 2019, the Government of Russia approved the “National Action Plan for Adaptation to Climate Change for the period until 2022”, which provides for the implementation of Russia’s international obligations under the UN Framework Convention on Climate Change and other international environmental treaties. To accelerate the spread of the carbon landfill project, the Ministry of Education and Science of Russia sent a proposal to the Russian Ministry of Natural Resources to include carbon landfills in the plan to reduce greenhouse gas emissions. Since the carbon landfill project is based on the widespread use of digital technologies, Ctrl2Go can qualify for concessional loans and other types of government support [9]. This right is granted to it by the Government Decree “On Approval of the Rules for Granting Subsidies from the Federal Budget in the Framework of Supporting Projects to Transform Priority Sectors of the Economy and the Social Sphere through the Implementation of Domestic Products, Services and Platform Solutions Created on the Basis of End-to-End Digital Technologies, Using Concessional Lending”, adopted within the framework of the national project “Digital Economy”. The problems of interaction between the state and the Ctrl2Go company are quite difficult to identify due to their recently launched cooperation. But it is quite possible to assume that they were the same as for the rest of the business in Russia: insufficient level of industry and managerial competencies; frequent refusal of authorities to listen to the position of business; problems with communication with authorities; non-transparency of decision-making procedures [10]. However, it is known that the project for the distribution of carbon polygons appeared in the course of discussions between various ministries and the presidential administration, which could significantly reduce the number of problems. The company usually works with the business. According to the first experience in the construction of a carbon polygon It's hard to say what the problems were.

4 Conclusions

Since in the near future the Russian Government plans to expand the carbon program to other regions of Russia, and therefore actively cooperate with Ctrl2Go, there may be problems in interaction. It can be assumed that the legal part of the problem will not arise due to the corporatist model of interaction between business and the state in Russia: the state has great social obligations to society, therefore it allows itself to put forward some requirements for business and change the rules of its conduct in order to provide the necessary result in which society is interested [9]. However, funding problems may arise. The carbon landfill itself is not profitable - it is a non-commercial project, but the planned future construction of 80 landfills will require a considerable amount of various resources. Since the first landfill aroused high interest from the Government of Russia, it is likely that

it actively participated in the expansion of the project. But it is impossible to predict exactly in what form the cooperation will take place. Most likely, the project will continue to exist in the form of a public-private partnership. Since the project is quite important for Russia, it can be assumed that cooperation will be based on the interaction of government and business using various models that exist today. In particular, according to the authors, this can be a PPP, including various forms of concessions, as well as life cycle contracts. There will also definitely be a staffing issue. Ctrl2Go

The project has great prospects, its implementation will definitely make a great contribution to the digitalization of the Russian economy, create tools to control the state of nature, allow for a better assessment of the anthropogenic impact on warming, potentially save Russian producers from carbon duties and possibly give Russia the opportunity to earn money on the sale of emission quotas. According to the authors, the implementation of the project for the creation and operation of carbon polygons lays down a mechanism for managing climate change in Russia [10]. An important result of the project implementation will be the creation of a system for calculating the carbon balance of Russia, which will bring greater clarity to the degree of influence of Russian nature on the ecology of the world, which generally meets the interests of the rest of the planet. Summing up, we can say that the project of carbon polygons appeared just in time. Russia urgently needs to catch up with other countries in the field of green economy, so as not to fall into another crisis situation, when it is impossible to profitably sell their goods. It is also interesting that not only the state understands the need to develop green technologies: domestic business makes a great contribution to development. The period of a strong state in the economy has naturally ended, as an incredible number of areas have appeared that require special attention.

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