Forestry development as an instrument for implementing the climate policy of Russia

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Abstract. The Paris Agreement is the legal basis for the current stage of regulation of greenhouse gas emissions aimed at preventing further climate change. The Russian Federation has declared its national climate commitments taking into account the carbon absorption capacity of forests. It has been established that the current stage of development of the national economy is accompanied by an increase in greenhouse gas emissions, which will require additional measures to implement Russia's climate policy. The article assesses the contribution of the Russian forestry to the fulfilment of the national obligations under the Paris Agreement. A negative tendency towards reduction of carbon sequestration in Russian forests has been revealed. As the main factors influencing the dynamics of greenhouse gas emissions and their absorption in the forest ecosystems, the study identified forest fires, logging activities and the scale of reforestation. The article substantiate the expediency of the development of forestry as a condition for the implementation of the climate policy of both the country as a whole and its business entities. By implementing forest projects aimed at compensating for greenhouse emissions, representatives of the Russian business will be able to avoid the risks of losing the investment attractiveness of their enterprises and reducing the competitiveness of their products in international markets.

1. Introduction

The current stage of the development of the global economy is characterized by a rapid transition to a low-carbon economy, which is associated with the desire of the international community to prevent global climate change. Changes in the global climate are caused by an increase in the level of greenhouse gases in the Earth’s atmosphere; about 80% of the greenhouse effect is due to the emission of carbon dioxide (CO₂). Currently, the total amount of greenhouse gas emissions in the global energy sector, which is their main emitter, is estimated at 33,890.8 million tons of CO₂ equivalent and has a tendency to increase [1], necessitating the measures to regulate the carbon balance of the planet.

The Russian Federation, as a full member of the UN Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, has undertaken the following national obligations: to limit greenhouse gas emissions at 70-75% of 1990 levels by 2030, subject to the maximum absorption capacity of forests[2].

It is generally recognized that forests and forestry have a significant impact on carbon concentration in the Earth’s atmosphere [3, 4]. Being terrestrial ecosystems, forests act as carbon sinks, providing a positive effect on the atmospheric carbon balance. At the same time, logging and
forest fires increase concentration of greenhouse gases in the atmosphere. Ranking first in forest area and second in timber stock, Russia provides a significant net carbon sink. In 2005-2016, the absorption of greenhouse gases by Russian forests was estimated at 594-746 million tons of CO₂ equivalent. Consequently, the forests of the Russian Federation fulfil the most important climate control function and assist in meeting the country's obligations to prevent global climate change, which determines the relevance of the present research.

The purpose of the study is to assess the contribution of forestry to the fulfilment of the climate obligations of Russia and its business entities at present and in the future.

2. Methods and Materials
We used methods of approximation and analysis of statistical data to assess the Russia's prospects for fulfilling the declared obligations to prevent climate change and the contribution of forestry, as well as a logical method of systematizing data and presenting final conclusions. The information base of the study was composed of international and national regulatory documents, reports, scientific articles and analytical reviews in the field of greenhouse gas emissions regulation. We used graphic and tabular methods of presenting information.

3. Results and Discussion
The legal basis for the current stage of regulation of carbon dioxide, methane and other components of greenhouse emissions is the Paris Agreement (PA). PA participating countries undertake to ensure that the increase in global temperature is significantly less than 2° C, and, taking into account the seriousness of the existing risks, strive to limit the temperature increase to 1.5° C. The obligations of the parties to the agreement are called “national contributions” and should be reviewed every five years in the direction of tightening (increase).

Russia signed the agreement on April 22, 2016, simultaneously with 174 member countries of the UNFCCC, but the Russian Federation became a full member of the PA only after its adoption in accordance with the Government Decree of September 21, 2019 No. 1228 [5]. The climate obligations of Russia are quite “soft” in comparison with the declared national contributions of developed countries to the global goal, as evidenced by the data in table 1.

Table 1. Comparative analysis of Russia's obligations on climate change and those of developed countries – participants of the PA [2].

| Country (regional association) | Base year | National contribution,% reduction in greenhouse emissions by 2030 |
|-------------------------------|-----------|-----------------------------------------------------------------|
| Russia                        | 1990      | 25-30<sup>a</sup>                                              |
| EC                            | 1990      | 40                                                             |
| Canada                        | 2005      | 30                                                             |
| Japan                         | 2013      | 26                                                             |
| South Korea                   | 2025<sup>b</sup> | 37                                                          |

<sup>a</sup> - taking into account the absorption capacity of forests.
<sup>b</sup> - baseline scenario (in the absence of environmental protection measures).

In the following paragraphs we present the results of the analysis of the level of fulfilment of the declared obligations of Russia on climate change and the contribution of forestry (taking into account forestry activities) to the fulfilment of those obligations. According to various experts [2, 6, 7], the Russian Federation will be able to fulfil its obligations under the so-called “inertial scenario” [6], which takes into account only the current measures to stimulate the low-carbon development of the Russian economy. According to this scenario, in 2030 the level of greenhouse emissions will be 74.1% of that in 1990, taking into account the absorption of greenhouse gases by forest ecosystems. At the same time, the dynamics of emissions is taken into account starting from 1990, which is traditionally
accepted in Russia as the base year for defining climate obligations; that is, a significant reduction (almost 1.5 times) in emissions caused by a decline in production during the transition to market economy in 1990-1997 is taken into account.

To determine the dynamics of emissions, we analyzed data on greenhouse gas emissions from 1998 to 2018 in the Energy sector, which dominates the emissions throughout the country [1]. During this period, the volume of emissions ranged from 1440-1570 million tons of CO$_2$ equivalent. However, the reliability of the approximation when building trends for 1998-2018 did not exceed 0.6. Therefore, the analyzed interval was reduced to the period 2009-2018. In this case, the obtained trend line (figure 1) has a high approximation confidence value of 0.9493 and shows a potential increase in greenhouse gas emissions in the future. The potential increase in emissions will require additional measures to ensure the fulfilment of climate obligations by Russia, one of which should be the development of the national forestry.

Figure 1. Greenhouse gas emissions in the Russian Federation.

Figure 2. Greenhouse gas absorption by the forest lands of the Russian Federation (taking into account emissions from logging).

Obligations of countries related to regulation of greenhouse emissions can be fulfilled both as a result of technical and technological measures to reduce emissions, and through carbon sequestration by terrestrial ecosystems as a result of anthropogenic activities [8]. According to the PA, to prevent climate change, its Parties should take actions to protect and improve the quality of carbon sinks and reservoirs of greenhouse gases, including forests. This provision confirms the possibility of fulfilling the national obligations of countries by increasing carbon sequestration by forests.

The need to develop the country's forestry is also justified by the decrease in carbon sequestration by Russian forests, which is clearly shown in figure 2. The main drivers of greenhouse emissions in forest ecosystems are forest fires and logging activities. According to the national inventory of sources of anthropogenic emissions and sinks of greenhouse gases, over the past 10 years the annual value of fire emissions in managed forests of Russia was about 200-270 million tons of CO$_2$ equivalent, or 15-20% relative to emissions of the dominant Energy sector. It should be noted that, despite a fairly significant amount of fire emissions, a negative trend towards its increase was not observed in the period 2009-2017 [9].

The second most important source of emissions in Russian forests is timber harvesting. Studies have shown that there is no direct relationship between greenhouse gas emissions in the category “Harvested Timber” and harvesting volumes (see table 2). This is due to the fact that part of the greenhouse gas emissions is “exported” by the Russian Federation together with various types of
forest products. Against the background of increasing transportation of timber (fuel and industrial), there is an increase in exports of such commodity items as lumber, wood boards, plywood, pulp, etc. in physical terms.

Table 2. Carbon footprint of logging in Russia [9].

| Indicators                              | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|-----------------------------------------|------|------|------|------|------|------|------|------|
| Emissions in the Harvested Timber category, mln tons of CO_2 equivalent | 5.2  | 7.2  | 6.8  | 5.5  | 6.3  | 7.0  | 5.9  | 5.4  |
| For reference: Wood harvesting, million m^3 | 151.4 | 175.5 | 191.2 | 192.1 | 194.5 | 203.0 | 205.5 | 213.8 |

a compiled by the authors of the article on the basis of FAO statistics of annual forest products [10, 11].

Having analysed the magnitude and trends of greenhouse gas emissions in the Forestry sector associated with forest fires and logging (the main causes of greenhouse emissions in forest ecosystems) in comparison with the general dynamics of carbon sequestration by forests, we came to the following conclusion. The negative dynamics of the net carbon sink to the forests of Russia is due, first of all, not to the increase in greenhouse gas emissions in forestry, but to the reduced ability of forest ecosystems to absorb carbon. If the current trend of reducing net greenhouse gas absorption in the Forestry sector continues, there will be a need for additional technological measures to decarbonize the national economy, which, as a rule, are expensive.

Currently, measures related to prevention (mitigation) of climate change are being implemented in forestry within the framework of the State Program of the Russian Federation “Forestry Development”, the main goals of which are to increase the efficiency of use, conservation, protection and reproduction of forests, as well as ensure stable supply of forest resources and benefits while maintaining economic and environmental potential of forests and their ecological functions [6]. However, the data in figure 2 indicate a reduction in the contribution of Russian forests to the climate-regulating function of terrestrial ecosystems. This is largely due to insufficient volumes of reforestation and afforestation, as stated by the Strategy for the development of the forest complex of the Russian Federation until 2030 (hereinafter - the Strategy for the development of the forest complex) [12].

Since 2011, clear-cutting area has consistently exceeded the reforestation area. At the same time, the supply of forest regeneration services has been decreasing and in 2016 amounted to only 74%. The share of artificial reforestation also tends to decrease. Currently, this indicator is only 21-22%. The supply of young stands with thinning is about 30%. There is an accumulation of areas not restored after felling and a decrease in forest productivity. Current afforestation efforts are minimal and occupy an area of about 13 thousand hectares. In many regions, such as Volgograd, Astrakhan and other areas, these activities have been almost completely discontinued.

The forest complex strategy for the implementation of the country's climate policy provides for forestry activities to ensure carbon sequestration by forests through reforestation and afforestation. To achieve that, the following measures are required:

- reforestation in magnitudes ensuring full reforestation after logging, accompanied by the implementation of the necessary agrotechnical care for forest plantations;
- increasing the proportion of forest plantations created by using plants with a closed root system;
- modernization of the material and technical base of the fleet of forestry machinery and mechanisms;
- implementation of a set of measures for the care and protection of existing protective forest belts and the creation of new forest belts on lands of different use categories.

The national climate policy to help reduce greenhouse emissions and increase its absorption by Russian forests provides for attracting investment from business entities. Potential investors in forest carbon projects aimed at increasing the absorption capacity of forests and reducing greenhouse emissions are export-oriented companies of the fuel, metallurgical, chemical and several other sectors.
of the Russian economy [13]. This will give companies an opportunity to reduce the carbon footprint when exporting products to world markets.

It should be noted that the practice of compensating for greenhouse gas emissions by preventing deforestation, while promoting reforestation and afforestation has already been successfully applied abroad. The greatest progress has been made by China, which is a leading emitter of greenhouse gases and pursues an active climate policy [14]. In China, carbon forest projects are not only being implemented, but the rights for carbon sequestration by forest ecosystems are being drawn into the carbon market.

In our opinion, the timber industry enterprises, which are involved in a single cycle “forest production - forest use”, may show the greatest interest in the implementation of carbon forest projects. Under the current global trend of transition to a low-carbon economy, representatives of the forest business, as well as of other areas of the national economy, may face the following risks:

– decrease in investment potential of businesses with high carbon footprint. This is due to the fact that many foreign investors consider the price of greenhouse gas emissions as one of the cost components, regardless of whether the greenhouse emission fee is mandatory in the country implementing the project or not;

– reducing the competitiveness of Russian timber products in the global market with the introduction of carbon customs duties on goods, the production of which is accompanied by uncompensated emissions of greenhouse gases.

The introduction of the carbon tax (greenhouse gas emissions charges) and other restrictive measures concerned with greenhouse gas emissions regulations in the forest sector may affect the pulp and paper industry (PPI) to the greatest extent. The greenhouse gases emitted by the pulp and paper industry are estimated at 6.8 million tons of CO$_2$-equivalent, and their share in the Industrial Production and Construction sector has increased from 2% to 4% since 1990[9]. In addition, the innovative (priority) scenario of the Forestry Development Strategy explicitly prescribes export orientation, primarily of the pulp industry. By 2030, relative to 2016, the growth rate of pulp production should be about 430%, and its export, more than 510%. It will be possible to ensure the above pace of the development of the pulp industry only by attracting additional investments, including foreign ones.

Currently, the global economy is experiencing withdrawals of investment from carbon-intensive industries. By the end of 2016, 688 companies of 5.4 individuals from 76 countries with a total assets of more than 5 trillion US dollars joined this initiative [15]. In the presence of such a trend, carbon-intensive pulp and paper mills will lack investment for their development.

In order to minimize the risks associated with the carbon intensity of production, a number of timber enterprises are already implementing their corporate programs for managing greenhouse gas emissions. The Arkhangelsk Pulp and Paper Mill is the leader of the trend. It is advisable to include in such programs projects related to the development of forestry in areas that serve as the raw material base of pulp and paper mills and other forestry enterprises. Forest carbon projects may include the following elements:

– complete restoration of clear-cutting areas (with a constant increase in the share of artificial reforestation);

– creation of new forests, provided that the plots transferred to forestry enterprises for use have a reserve for afforestation,

– implementation of forestry activities that increase forest productivity,

– changes in the organization of logging by shifting to selective logging.

Representatives of the forest business can use the above activities as an instrument of their own policy in the field of greenhouse gas emissions management.

**4. Conclusions**

Given the above, we can draw the following conclusions:
the forests of Russia perform the most important climate control function, by absorbing greenhouse gases; this is reflected in the obligations of the Russian Federation to regulate greenhouse emissions;

- there is a negative trend towards the reduction of the contribution of the Forestry sector to the implementation of national climate commitments;
- the main factors causing greenhouse gas emissions in Russian forests are forest fires and logging, with no tendency to increase emissions from these sources;
- reforestation volumes do not compensate for deforestation resulting from clear-cutting. In Russia, afforestation has been minimized. As a result, there has been a decrease in the carbon absorption capacity of forests;
- in order to prevent a reduction in the contribution of Russia's forestry to the fulfilment of its obligations to prevent climate change, it is necessary to improve conservation and protection of forests, reforestation and afforestation;
- forestry development can be used not only as a tool to fulfil the country's climate obligations, but also as an element of the policy of individual business entities in the field of managing greenhouse gas emissions;
- in the transition to a low-carbon economy, the implementation of forest carbon projects by Russian business entities will be able to partially or fully compensate for the carbon footprint, ensure competitiveness on the international market and help attract investment.

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