Implementation of “green” economy principles in the forest sector

E A Yakovleva and A Sh Subhonberdiev

Department of World and National Economy, Voronezh State University of Forestry and Technologies named after G F Morozov, 8 Timiryazeva Street, Voronezh 394087, Russian Federation

E-mail: elena-12-27@mail.ru

Abstract. This work focuses on the principles of green economy in relation to the role of the forest sector in combating the effects of climate change. The threat to humanity comes from deforestation and forest degradation, leading to an increase in global carbon dioxide emissions. It is indicated that the implementation of the “green” principles of forestry development is aimed at reducing carbon emissions, efficient use of resources and social integration. The key elements of the developed mechanism are institutional and economic tools, “green” principles, indicators and a set of measures for the preservation and increase of natural capital, carbon sequestration, prevention of loss of ecosystem services and biodiversity, income growth and employment. Green economy is an important subsystem of sustainable development that integrates low-carbon, resource efficiency and social welfare. It has been proven that criteria and indicators are an important tool for the implementation of forest policy. Introduction of the green economy principles in the forest sector is aimed at fulfilling international obligations, introducing a system for regulating greenhouse gas emissions, obtaining additional income from tax collections, land rent, protecting the interests of all stakeholders, including the population and forest workers, efficient use of resources forests, taking into account the value of ecosystem services when making decisions.

1. Introduction

Forest management with low greenhouse gas emissions is aimed at achieving sustainable, economically efficient, environmentally responsible and socially oriented forest management and forest exploitation. Forests provide regulatory services to reduce the impact of climate change. Forest ecosystems are vulnerable to climate change. Therefore, the adaptation strategy should integrate a biophysical approach, involving the conservation of biodiversity, forest management and reforestation, as well as a social approach. It consists in providing the population with greater opportunities for awareness and increasing the level of education [1].

The article is based on the working hypothesis of the need to create an efficient forest management system reducing emissions from deforestation and forest degradation, as well as sustainable forest management, conservation and increase of carbon stocks in forests, implementation of green economy principles and tools.

The purpose of the research is to develop a mechanism for the implementation of "green" principles for the forestry sector development.
The research methodology is based on the analysis of international and national legislation, scientific publications and ongoing forest management projects to achieve sustainable development goals.

In the European forestry sector, decision-making processes are characterized by a wide variety of institutional and legal framework conditions [2]. The UNEP report provides an overview of the role of forests in a green economy. It shows successful projects. It is concluded that (in order to realize the benefits of forests in a green economy) it is necessary to create incentives and policies for the conservation of forests, which include legislation at the national level, subsidies and subsidies, development of information infrastructure, favorable international trade rules [3]. The functions of forestry are also related to the management of clean water resources and sanitation, biological diversity and the provision of ecosystem services, food security, fight against climate change and production of energy from biomass. A green economy can help solve various social and economic problems by providing new employment opportunities in the forest sector [4].

One of the most promising international negotiations on forests is the European process for the conservation of European forests, which is implemented at the level of European forestry ministers. It was organized by European countries as a regional political process, based on intergovernmental agreements. The 7th Ministerial Conference on the Protection of European Forests (Madrid, 2015) adopted an updated set of pan-European indicators of sustainable forest management, both quantitative and qualitative ones [5].

The European Forests Ministerial Conference coincided with the release of the next joint report of the Food and Agriculture Organization of the United Nations (FAO) and the European Forest Institute (EFI) “The State of European Forests” (2015), which has significant potential to create green jobs related with the production of energy from renewable sources, waste management and rational use of water resources, improvement of air quality, restoration and conservation of biological diversity, creation of green zones and infrastructure for ecotourism, as well as with the development of “green” infrastructure [6].

Separate studies relate to the management mechanisms such as PES (payment for ecosystem services) and REDD (reduction of emissions from deforestation and forest degradation) (Özden Görücü) [7]. S N Bobylev and V M Zakharov talk about the need to introduce payments for ecosystem services into Russian practice [8]. The role of PES in the conservation and sustainable management of forests, as well as in creating additional income for the local population, is proved. The main characteristics and features of PES that distinguish them from other types of payments (V Nemova) [9] are given. Legislative, geographical, economic and economic aspects of ecosystem services are justified. (J B Ruhl, S E Kraft and C L Lant) [10]. Recommendations on the creation of the necessary regulatory and institutional structure of ecosystem services have been developed. (T Greiber) [11]. A methodology for assessing forest resources at the regional level is proposed, taking into account qualitative and structural changes in ecosystems (V A Noskov and M A Shishelov) [12]. A program to reduce emissions from deforestation and forest degradation plus sustainable forest management, conservation and enhancement of the carbon-absorption forest fund (REDD +) is an important component of global mitigation measures. FAO assists developing countries in implementing REDD + processes and transforming political commitment, outlined in national reports, to concrete actions at local levels [13]. Problems in achieving equitable results and benefits are associated with the disproportion between deforestation factors and mitigation measures, the divergence of perceptions of justice among REDD + stakeholders, and complexity of property rights [14]. According to scientists and politicians, the effectiveness of REDD + is controversial, so it is necessary to use different approaches for further research [15].

The Rovaniemi Action Plan for the Forest Sector in a Green Economy, adopted on 13 December 2013 in Finland, describes how the forest sector in the UNECE region could lead the way towards the emerging green economy at the global level. It provides an overall vision, objectives and specific activities, and identifies potential actors, who might contribute to achieving the stated objectives. It is not a binding plan, nor does it contain prescriptive recommendations to Governments, international organizations or stakeholders, who are free to adopt, adapt, in full or in part, or not to implement the
Action Plan as they wish. Specific goals and measures are formulated for each sector of the economy, as well as possible participants in the implementation of these goals [16].

The report “The State of the World's Forests – 2018” examines the role of forests in achieving the goals of sustainable development of countries. The information is about the strong interlinkages between forests and other objectives of the Agenda for the period up to 2030, allowing policymakers to properly balance the activities, investments and partnerships in the interest of food security, poverty alleviation, and conservation of ecosystems [17].

The EEC Committee on Forests and Forestry, together with the FAO European Forestry Commission noted that there is no generally accepted benchmark level of forest sustainability in the Forest Management Evaluation System (SEMAFOR). National and local conditions vary greatly. The developed assessment system, which includes 20 evaluations, 27 contextual and 5 reference parameters, enables to determine whether forest management is sustainable. Estimates set thresholds to identify the possible problems [18].

The problem of introducing “green” principles is relevant for Russia. Although it is one of the main forest countries in the world, where more than 45% of the territory is forest, Russia loses more than 1.5 million hectares of primeval forests due to logging, man-made fires (according to WWF) every year. Russia is among the top three world leaders in terms of speed and area of loss of primeval forests [19,20]. There was a deterioration in the state of the forest fund according to the assessment of the forest state on the territory of the Russian Federation for 2013-2017. It indicates the ineffectiveness of the state policy in the field of forest relations. Reducing the quality of forests and the efficiency of forest use is not in the interest of the public need [21,22].

Despite many problems noted in the national forestry, economic activities (for the period 2005-2016) in land and forestry use mainly ensured the flow of greenhouse gases (Table 1) [20].

| Table 1. Greenhouse gas emissions by sectors             | 2005 | 2010 | 2015 | 2016 | 2005 |
|--------------------------------------------------------|------|------|------|------|------|
| Power industry                                         | 2037.23 | 2137.89 | 2162.06 | 2175.36 | 2037.23 |
| Industrial processes and the use of industrial products | 207.63  | 196.87  | 218.77  | 218.50  | 207.63  |
| Agriculture                                            | 138.17  | 140.20  | 135.80  | 134.18  | 138.17  |
| Land use, changed land use and forestry                | -496.26 | -629.52 | -603.05 | -634.45 | -496.26 |
| Waste products                                         | 89.18   | 98.23   | 113.26  | 115.79  | 89.18   |
| Total (excluding land use, changed land use and forestry) | 2472.21 | 2573.18 | 2629.88 | 2643.82 | 2472.21 |
| Total (including land use, changed land use and forestry) | 1975.95 | 1943.67 | 2026.83 | 2009.36 | 1975.95 |

Carbon sequestration projects in forests are relevant for the state, business, and society. According to the world trend of Russia, it is necessary to create an economic mechanism for the transfer of absorbed tons from the Russian forest sector to other sectors of the domestic economy. Two types of projects can compensate for greenhouse gas emissions by removals in forests: by planting new plantations and by preserving the already accumulated carbon in the forest and soil.

2. Methods and materials
The introduction of green economy principles in the forest sector is associated with sustainable forest management, establishing payments for ecosystem services, reducing energy consumption, biofuel production, increasing the sale of by-products and secondary forest products, creating green jobs,
developing ecological tourism, and government and business interaction and societies. In relation to the forest sector, we formulate the following “green” principles (figure 1): resource efficient and sustainable use of forest resources; preservation, protection, development, adaptation of forests to climate change and an increase in their contribution to the absorption of greenhouse gases; improving living standards through the creation of green jobs; development of payment schemes for forest ecosystem services based on criteria for sustainable forest management.

**Figure 1.** “Green” principles of the forest sector.

The mechanism for introducing “green” principles in the forest sector primarily involves the development and improvement of institutional tools. As a global environmental resource, the sustainable production of forest ecosystems, which result in the deposition of carbon dioxide and a decrease in the greenhouse effect, is determined by international agreements and provided the institutional and regulatory framework for the forest sector development. International organizations, agreements and treaties in the field of environmental protection and sustainable development of the forest sector ensure the implementation of international and national forest policy. Forest policy is the result of a national stakeholder dialogue and a common vision of the state of forest resources and prospects for the development of forest management and forest management. The forest policy is developed in accordance with the norms of legislation, as well as with generally recognized principles and norms of international law and international treaties. The forest cadastre, which reflects data on changes in the carbon budget of the forest fund, and forest monitoring, which takes into account climate change and the goals of sustainable forest management (figure 2) are components of the institutional environment of the “green” principles of the forest sector.

Addressing climate challenges through the forest sector requires using a set of tools, including developing forest investment programs to mobilize more funds to reduce carbon emissions from deforestation and forest degradation, and promote sustainable forest management to protect the carbon-absorbing fund, improve tax collection methods, subsidies, loans and payments for ecosystem services.

An important condition for the successful attraction of investments in order to introduce sustainable forest management methods has been determined to develop an appropriate strategy and create a regulatory framework and effective management structures and institutions related to forestry intensification. It includes the results of reforestation, stand growing parameters of the given qualities.
Figure 2. The mechanism of "green" principles implementation in the forest sector.

From the point of view of a “green” economy, innovations that can contribute to the formation of a bioeconomy, green building and increased use of forest products while ensuring their sustainable management are of great interest. Low-carbon trajectory depends on the development of resource-saving and waste-free technologies for the processing of raw wood, taking into account the increasing requirements for the protection of the environment, innovative technologies for the deep processing of raw materials.

Commission for Europe/FAO has developed a measurement system based on six key areas to assess the progress of the forest sector on the green economy principles the United Nations Economic [23-25].

3. Results and discussion
As a part of the international baseline indicators, we offer a set of measures when introducing the principles of a green economy into the Russian forest sector.

To preserve the natural capital of forests, it is necessary to ensure their management on the principles of sustainability and rationality. This is facilitated by forest management taking into account the requirements of international forest certification standards, measures to preserve forests and improve their quality. The Federal Law of July 19, 2017 No. 212-FZ “On Amendments to the Forest Code of the Russian Federation and certain legislative acts of the Russian Federation in terms of improving the reproduction of forests and afforestation” reflects the mechanism of compensatory reforestation [26]. The principle of forest conservation is implemented through their protection, conservation,
reproduction, and afforestation. The objectives of reforestation and afforestation, the requirements and procedure for the reproduction of forests are determined.

Multi-factor productivity and efficient use of resources depends on technical re-equipment of forestry and logging industries, production of high value-added products, the use of logging waste generated during logging in logging and other rational use of non-timber forest resources [27,28].

Contribution to the mitigation of climate change provides a system of measures to increase the absorption of atmospheric carbon dioxide by forest resources, to ensure sustainable long-term carbon sequestration in forest pools and sequestration of forest lands, the formation of an effective system to reduce carbon dioxide emissions into the atmosphere. It is more profitable to preserve existing forests from the point of view of the investment effectiveness in the forest sector. From the point of view of a long-term policy, it is necessary to make up such conditions for business when planting new forests becomes profitable.

Accounting for externalities and charging for forest ecosystem services is based on developing recommendations for introducing a compensation mechanism for ecosystem services, creating additional sources of funding for activities aimed at preserving and increasing the volume of forest ecosystem services provided.

Achieving the sustainability of the labor force employed in the forest sector is ensured by increasing investments in education and training of forest sector workers, improving the system of monitoring occupational safety and health of workers, and adhering to relevant legislation.

Organization of management and making informed decisions related to the creation of a mechanism for managing environmental risks is based on preventive technical measures and economic instruments. Due to the changing climatic conditions, the expected increase in the threat of forest fires, the development of pests and forest diseases, the increasing volume of logging and recreational forest use, improved methods and means of protecting and protecting the forest with the introduction of automated video surveillance systems, pheromones, biologics, etc. are required.

According to the national socio-economic conditions, the introduction of “green” principles contributes to the increasing role of the forest sector in increasing the level of well-being of the population, receiving income from the production of wood and non-timber products, and the provision of ecosystem services. The transition to a low carbon development trajectory determines the change in the forest management system. The forest sector, carrying out socio-ecological-economic functions, expands intersectoral cooperation with organizations and structures of the environmental and social spheres, agriculture and local people.

In the concept of a “green” economy, the forest acts not only as a resource component of the production process, but also as an element of the ecological and social infrastructure of territorial development. This enables to provide a long-term, multi-faceted solution of the forest resource state, rational use and improvement of the environment with the involvement of a wide range of stakeholders. When developing a project for introducing “green” principles in the forest sector, it is necessary to raise awareness of public and local residents about the processes of improving the national forest policy and the forest relations system, developing and implementing management decisions taking into account promising tasks of the country's socio-economic development, resource-related environmental and environmental potential of forests traditions, legal rights and interests of citizens, as well as the obligations of the state arising from international agreements.

4. Conclusion
The introduction of green economy principles in the forest sector enables to provide the inflow of additional investments, sustainable production and consumption of forest products, the introduction of environmentally friendly and resource-efficient production technologies and consumption patterns of forest products, including waste recycling and wood consumption. Climate change mitigation is achieved by forest carbon sequestration and replacement of non-renewable materials and fuels with renewable materials and wood-based fuels. The creation of green jobs in forestry provides for the improvement of workers' skills and the provision of occupational safety and health. Management
decisions are based on the assessment of ecosystem services, including the introduction of payments for forest ecosystem services and compensation to suppliers of ecosystem services, ensuring social justice, improving the set of state policy instruments to support organizations engaged in environmental innovation.

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