Sustainable Forest Management as a Mechanism of Low-Carbon Development

Schavinska Anna

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Schavinska Anna*

Abstract

The study presents a brief dynamics of carbon emissions up to the last 10 years. The article outlines the main approaches to the management of the forest sector that needs to be developed. Outlines the shortcomings that hinder the development of carbon in the forest sector. The main ways to improve forest and environmental policy and the basics of low-carbon forest use are outlined.

Keywords : *sustainability, forest management, low carbon development, reforestation.*

Formulation of the problem

Today there are progressive changes in the functioning of the planet's climate system. Scientists unanimously note that climate change on Earth depends on solar activity and the amount of greenhouse gas emissions into the planet's atmosphere. The role of the latter in global warming is estimated at 10–15%. Forests play an important role in the planet's climate due to the absorption of carbon contained in the biosphere. They bind billions of tons of CO2 annually, which in

* PhD student in Economics, ORCID: 0000-0002-1211-0034, e-mail: schavinskaa@gmail.com;

Institute of Agroecology and Environmental Management NAAS, 12, Metrologichna Str., Kyiv, Ukraine, 03143

equivalent terms is billions of dollars. In addition to strengthening the role of forests in ensuring the production of biomass for renewable energy, forests are highly valued as natural objects that create carbon stocks.

In Europe as a whole, land use patterns, land use change and forestry reduce net emissions by almost 6%, and this reduction is largely due to forests. This contribution is particularly significant in Central and Eastern Europe, where forest area growth and relatively low emissions from other sectors of the economy are observed. In addition, Europe has initiated a market approach in this area, in the introduction of emissions trading [1].

The basic principles of sustainable forest management were laid down at the UN Conference on Environment and Development, which took place on June 3–14, 1992 in Rio de Janeiro. In the adopted document "Agenda for the XXI century" a separate section "Conservation and rational use of resources for development" was highlighted, where a separate item provided a set of measures to combat deforestation. At the United Nations Conference on Sustainable Development (Rio +20) in 2012, UN member states initiated a process to develop common sustainable development goals for a balanced consideration of the economic, social and environmental aspects of sustainable development; these goals should be in line with the UN's post-2015 development agenda. The development of sustainable development goals provides a great opportunity to assess the role of forests in ensuring sustainable development. The outcome document of the United Nations Conference on Sustainable Development, entitled "The Future We Want", recognizes the need to further promote sustainable development at all levels and to integrate its economic, social and environmental components and take into account their interrelationships [2].

Reforestation directly affects such important services of forest ecosystems as strengthening the water protection and water regulation capacity of forest planta-

tions, carbon deposition, mitigation of erosion processes, conservation of biodiversity, increasing recreational and aesthetic, spiritual and cultural value of landscapes, etc. which occur in the process of afforestation are external, they are not evaluated by the market and therefore are not taken into account by forest enterprises［3］.

Analysis of the lasts research and publications

Research of problems of low-carbon development of forest use and nature management improvement of organizational and economic bases of forestry management is reflected in works of scientists: Butrym O.V［4］., Deyneka A.M.［1］, Shlapak M.M.［5］, Drebot O.I.［6］ and other international scientists. In Ukraine, the issue of low-carbon development is given a lot of time and reflects different scientific views, but to date the issue of forest use development to reduce greenhouse gas emissions and their absorption is not widely disclosed.

The article aims to identify promising ways to develop and improve forest management to ensure carbon sequestration.

Presentation of the main research material

In recent years, Ukraine's carbon dioxide emissions have been gradually declining, reflecting current policies against climate change（Fig.1）. Greenhouse gas emissions in Ukraine in 2015 amounted to 323.36 million tons of CO2-eq. except for the land use, land use changes and forestry sector, which is 66.4% less than in the base year 1990 and 12.3% less than in 2014. Taking into account the land use, land use changes and forestry emissions in 2015 amounted to 308.64 million tons of CO2-eq. and decreased compared to the base year by 66.1%, and compared to 2014 - by 13.2%［7］.

When considering forest use and climate change, a number of governance

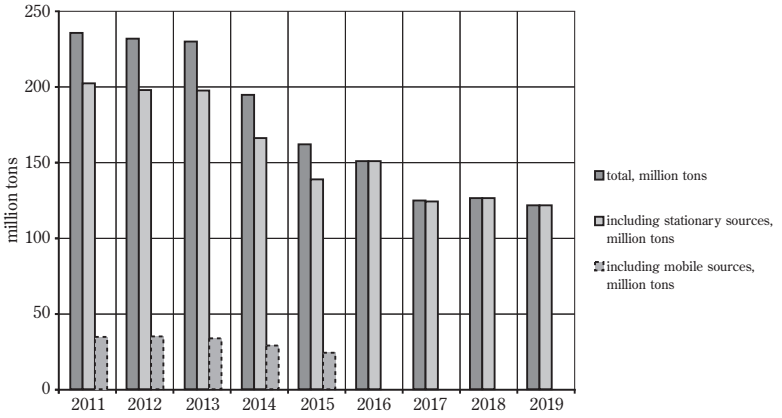

Fig. 1. Emissions of carbon dioxide into the atmosphere in 2011–2019

Source: formed by the author based on [8].

mechanisms should be considered to help reduce greenhouse gas emissions and adapt nature to climate change, namely the revision of legislation and institutions. Necessary administrative organization involvement of forestry, public organizations, professional associations and non-governmental organizations, research and educational institutions. Information policy plays a significant role in the development of low-carbon policy.

In forestry sector, legislative changes should be made both to the Forest Code of Ukraine and bylaws. These include the development and implementation of: the state program for afforestation of degraded lands of the forest zone of Ukraine, an inventory of self-forested agricultural lands and transfer them to forest land category, and the provision of state funding for forest protection measures. Forest cultivation, sustainable forestry and reduction in the loss of forest cover are the most appropriate activities to increase greenhouse gases emissions absorption in forest sector. Of agricultural practices, the optimum include non-exhaustive farming, cattle grazing and organic soil restoration. Ukraine's specific

feature include imbalanced land usage structure, excessive ploughness of territory, and also low level of forest cover of the territory.

Forestry in Ukraine is the only sector in the economy where carbon sequestration exceeds emissions. Our forests absorb about 7% of the total greenhouse gases. This is 15.9% of forest cover. Whereas in the European Union, the absorption of greenhouse gases by forests is 10% —for the average forest cover 42% [9]. That is, the productivity of Ukrainian forests is quite high, there is potential for increase. But in order to implement it, an appropriate policy is needed.

Policies and national measures should be aimed at implementing and supporting best forest management practices that take due account of climate change and are aimed at preventing carbon sequestration from soils in the agrocenosis, increasing forest productivity and sustainability, conserving and accumulating carbon in forest and soil. The main ones should also be the improvement and preservation of protection of forests and protected areas, green vegetation in settlements, preservation of field protective forest strips and other reclamation forests for storage of accumulated carbon.

However, official statistics take into account only the lands of the state forest fund. This means that the areas of self-contained agricultural and other lands that do not have the legal status of a forest fund, but are in fact young natural forests, forest belts are not taken into account. An inventory of such areas is just beginning [10]. Given that young forests have the greatest capacity to absorb atmospheric carbon, it is necessary to implement a state program of inventory of self-forest lands and their inclusion in the category of forest lands, which will ensure their proper protection in the status of forests (Fig.2.).

Analyzing the approaches to solving the problems of Ukraine's transition to the principles of sustainable forest management, it can be noted that the main focus is on the justification of targets and strategies to achieve it. At the same time, in-

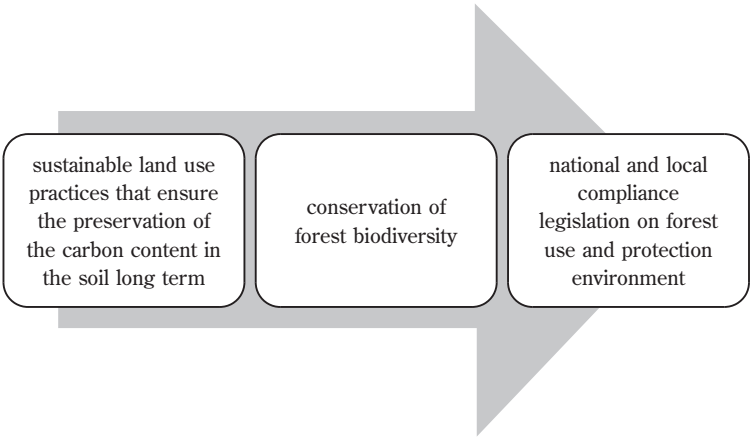

Fig. 2. Basic conditions of low-carbon forest use
Source: formed by the author based on [*10*].

sufficient attention is paid to the formation of appropriate organizational, financial, legislative, institutional and information support for the implementation of the whole set of measures towards sustainable forest management based on the current political and economic situation in society and global challenges. It is also important to study the experience of neighboring countries in this area to minimize or eliminate possible risks [2]. Optimizing the carbon sequestration capacity of national forest ecosystems is best achieved in the case of sustainable forest management. Under such circumstances, other useful properties of the forest are improved and the positive effect of forests on the surrounding areas is enhanced: groundwater supply is improved, runoff is cleaned, slopes are strengthened, the risk of floods and landslides is reduced, populations of various plant and animal species are increased. Improving the ecological functions of forest ecosystems is directly proportional to improving the economic and social functions of the forest, as the costs of floods and floods are reduced, water supply and water treatment processes are reduced.

The development of forestry to increase the carbon sequestration capacity of forests is fully consistent with the economic, environmental and social situation that exists around the world［11］. As the function of absorption and retention of greenhouse gases by forest ecosystems in the current ecological situation acquires new features - a means of attracting additional funds, the improvement of forestry can contribute to the overall recovery of the economic situation in the country. Increasing the area and improving the quality characteristics of forest ecosystems in general have a positive impact on the environment, which cannot be said about the consequences of industrial enterprises.

Conclusions

Climate issues must also be at the forefront of future forest management strategies. According to various estimates, a single deciduous tree, reaching the age of forty, can absorb more than a ton of carbon dioxide during its lifetime. That is, forests operate as giant carbon stores, accumulating in the world, by some estimates, about half of the carbon of the biosphere on land. Deforestation is responsible for almost 20% of global carbon emissions. However, forests, influencing the climate on earth, are just as sensitive to its changes. In recent years, the effects of climate change on forests can be observed in Ukraine. Given the further dynamics of rising average temperatures and the displacement of natural areas to the north, as well as Ukraine's commitment to reduce greenhouse gas emissions, the need to change large-scale continuous felling practices and create additional forest stands becomes apparent.

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