

GLOBAL PROBLEMS WITH DEFORESTATION. EVALUATION OF SUSTAINABLE FOREST MANAGEMENT IN BULGARIA

Ekaterina Serafimova¹, Vilma Petkova^{2,3}

¹University of Chemical Technology and Metallurgy - Sofia, Engineering Ecology

²New Bulgarian University

³Institute of Mineralogy and Crystallography – Bulgarian Academy of Sciences
e-mails: ekaterina_sr@abv.bg; vpetkova@nbu.bg

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Abstract: Forests cover almost a third of the Earth's surface. This provides many environmental benefits, including a major role in the hydrological cycle, soil conservation and biodiversity conservation. In recent years it reaches to the ecological crisis because of deforestation. The most significant challenges to the forest sector are related to the impact of climate change, forest conservation of natural disasters, fires and illegal activities.

Bulgarian forests perform multiple economic, environmental and social functions essential for sustainable development. They are a key factor in the formation and maintenance of habitats. Over the past twenty years, the absorption of greenhouse gases from forest areas offset between 10.7% -18.9% of total greenhouse gas emissions in Bulgaria. The growth of tree species is a largely net carbon accumulation, so that the assessment and forecasting of the condition and productivity of forests is essential to analyze the development of carbon emissions. Over the past 21 years, the absorption of greenhouse gases in the sector offset the 11.35% -19.9% of total greenhouse gas emissions in Bulgaria. The greatest role and storage of carbon (94-95% of the total absorption for the sector) are the territories occupied by forests.

ГЛОБАЛНИ ПРОБЛЕМИ С ОБЕЗЛЕСЯВАНЕТО. ОЦЕНКА НА УСТОЙЧИВОТО УПРАВЛЕНИЕ НА ГОРИТЕ В БЪЛГАРИЯ

Екатерина Серафимова¹, Вилма Петкова^{2,3}

¹Химикотехнологичен и металургичен университет, София, Инженерна екология

²Нов български университет

³Институт по минералогия и кристалография – Българска академия на науките
e-mails: ekaterina_sr@abv.bg; vpetkova@nbu.bg

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Резюме: Горите покриват почти една трета от земната повърхност. Това осигурява много ползи за околната среда, включително основна роля в хидроложкия цикъл, опазване на почвата и опазването на биологичното разнообразие. Въпреки това се достига в последните години до екологична криза заради обезлесяването. Най-значимите предизвикателства пред горския сектор са свързани с въздействието на климатичните промени, опазването на горите от природни бедствия, пожари и незаконни действия.

Българските гори изпълняват множество икономически, екологични и социални функции от особено значение за устойчивото развитие на страната. Те са ключов фактор за формирането и поддържането на жизнена среда. През последните двадесет години поглъщането на парникови газове от горските територии компенсира между 10,7%-18,9% от общите емисии на парникови газове в България. Растежът на дървесните видове представлява до голяма степен нетно натрупване на въглерод, така че оценката и прогнозирането на състоянието и производителността на горите е от съществено значение за анализиране развитието на въглеродните емисии. През последните 21 години, поглъщането на парникови газове в сектора компенсира 11,35%-19,9% от общите емисии на парникови газове в България. С най-голяма роля за и складирането на въглерод (94-95% от общото поглъщане за сектора) са териториите, заети от гори.

1. Introduction

Today forests cover about 312 million ha, which is 33% of the area of the continent. Half of this territory is located in the European part of Russia. The distribution of forests in different countries is different - from 6% in Ireland to 66% in Finland [1-4].

Forests provide a broad variety of environmental, economic and social benefits, including forest products from timber and non-timber forest products and environmental services essential for humankind, such as maintaining biodiversity and ecosystem functions and protecting the climate system [5,6]. Due to the growing demand for timber and timber products on the global and simultaneous weaknesses in institutions and governance in the forestry sector in many producing countries, illegal logging and related trade became a major issue that generates more but less concern for the environment. It poses a significant threat to forests as it contributes to the process of deforestation and degradation of forests, which is responsible for about 20% of global emissions of CO₂, threatens biodiversity, and undermines sustainable management and development of forests [7,8]. It poses a serious threat and leads to desertification and soil erosion and can exacerbate extreme weather events and flooding. It also has social, political and economic implications, often undermining progress towards good governance goals, threatening the livelihood of forest-dependent communities [9,10]. Deforestation due to logging their fires, pollution, erosion, acid rain, mining, urbanization/industrialization and infra-structure, wars and role of the military, tourism, Overpopulation and poverty, fuel wood and etc [1,11].

Deforestation in the world - and cause problems

Earth has lost 18 million hectares woody cover in 2014, with the greatest losses of forests were reported in the basin of the Mekong River in Asia and in West Africa. Losses - equivalent to an area twice applied over the area of Portugal [6]. These are the most serious losses since 2001. 16 countries have relatively large forest area of about one million hectares each, and three of these countries, namely Chad, Iran and Mongolia have ten million hectares of forest. The forest area remained fairly stable in North and Central America as it expands in Europe in the last decade [8]. A decrease of more than 0.5% in forest area are reported across Central and South America, across North Africa. Decrease between 0.2 and 0.01 percent a year is celebrated across North America, Delta. Amazon river, much of continental Africa. Brazil is home to the largest rain forest biome in the world, the Amazon, containing by far the largest portion of remaining rain forest. The legal Amazon covers 60 percent of the Brazilian territory, with some 21 million inhabitants, or about 12 percent of the population, nearly 70 percent of whom live in cities and towns. Brazil also has the largest freshwater reservoir in the world, with the Amazon region alone containing up to one fifth of the world's fresh water [2, 7]. Over the last 500 years, Brazilian forests have been subject to the unsustainable extraction of high quality timber such as rosewood, as well as non-timber species such as palm heart. Anthropogenic large-scale forest fires are also a common feature of Brazilian forest history. The dynamics of deforestation and land use in the Amazon are fairly similar to those which have been observed in other biomes of Brazil, such as the Atlantic rainforest, which is about 93 per cent deforested [3]. Between 1990 and 2010, Zambia lost an estimated 6.3% of its forest cover or around 3,332,000 hectares [4].

Almost no change is not recorded in Australia. The highest forest cover (over 70%) in Africa Gabon and Guinea, and the lowest Egypt and Libya. In North and Central America's highest forest cover of Belize - 88%. Very low (0 to 20%) has forest cover of the islands. In South America, Suriname has 95%, Guyana - 94%. Lowest forest cover is Uruguay - 5%. In Asia, the highest forest cover is Brunei - 87%. More than 60 percent forest cover have yet Bhutan, Cambodia, Indonesia, Japan and Korea. Iraq has very low forest cover between 0 and 1% [1, 4, 12].

Solving problems with deforestation - good practices

Ways to reduce deforestation must go hand in hand with improving the welfare of people on the border of the forest. There are no general solutions and strategies to address the problem of deforestation, as they will differ in terms of the region, and change over time. All strategies require effective implementation of strategies, development of management plans, monitoring and enforcement [1-4].

Strategies should include an increase in the forested area of the country, improvement of forests and forest resources, compliance with generally accepted criteria and indicators for sustainable management and improve forest health, including their capability for adaptation to climate change and anthropogenic stresses through [5-9]:

- Restoring forest on deforested areas, afforestation threatened by erosion and abandoned lands;
- Increased sustainability and productivity of forest plantations in order to adapt to climate change and the needs of society for forest products and healthy living environment;
- Conservation and sustainable management of forests;
- Application of Natural friendly cultural systems based on natural regeneration potential of forests;
- Strengthen international efforts and processes related to the conservation of biodiversity, mitigation of climate change, conservation and sustainable management of forests;
- Certification in forest management [10].

2. Methodology and statistical data

Problems and cause and effect relationships of deforestation in Bulgaria. Bulgarian forests perform multiple economic, environmental and social functions essential for sustainable development. They are a key factor in the formation and maintenance of habitats. Over the past twenty years, the absorption of greenhouse gases from forest areas offset between 10.7% -18.9% of total greenhouse gas emissions in Bulgaria. The growth of tree species is a largely net carbon accumulation, so that the assessment and forecasting of the condition and productivity of forests is essential to analyze the development of carbon emissions. Over the past 21 years, the absorption of greenhouse gases in the sector offset the 11.35% -19.9% of total greenhouse gas emissions in Bulgaria. The greatest role and storage of carbon (94-95% of the total absorption for the sector) are the territories occupied by forests [11, 13, 15].

Forests in Bulgaria

Every day in Bulgaria is cut forest the size of 100 football fields. From 1992 to 2005 the area of forest has decreased by approximately 15%. As a consequence deforestation are floods, landslides, forest fires, risk of adverse weather phenomena such as drought, high winds and tornado, heavy snowfalls, snowstorms, ice and extreme temperatures [15].

Over 21,000 hectares precious ancient forests now fall under the protection of law in Bulgaria. Identified at least 150 forest ecosystems divided into arrays of at least two hectares, the characteristics of forests development in old growth - and are located outside areas of strict protection. Ancient forests, or forests development in old growth have very high importance for biodiversity and play a crucial role in the regulation of the water cycle, i.e. to prevent flooding and to provide water for domestic, agricultural, industrial [13-15].

For the evaluation of the factors affecting desertification uses three types of indicators: proportion of protected areas, forest trees damaged by defoliation and forest growth and fellings. They are given their quantitative data and assessed in this study.

Proportion of protected areas

The indicator represents the share of the protected areas of the country's territory. It is crucial with regard to measures to ensure biodiversity, the overall protection and management of natural resources and to avoid undue exploitation. Country building and ensure the functioning and preservation of the system of protected areas as part of regional and global network of protected areas in accordance with international treaties on environmental protection which part is Bulgaria. In recent years, Environmental protection and biodiversity are among the top priorities of Bulgaria. In 2013 protected areas in Bulgaria is 584 587 ha compared to 2003 has increased by 39,583 hectares. The proportion of protected areas of the country's territory in 2013 amounted to 5.3% and compared to 2003 increased by 0.4 percentage points.

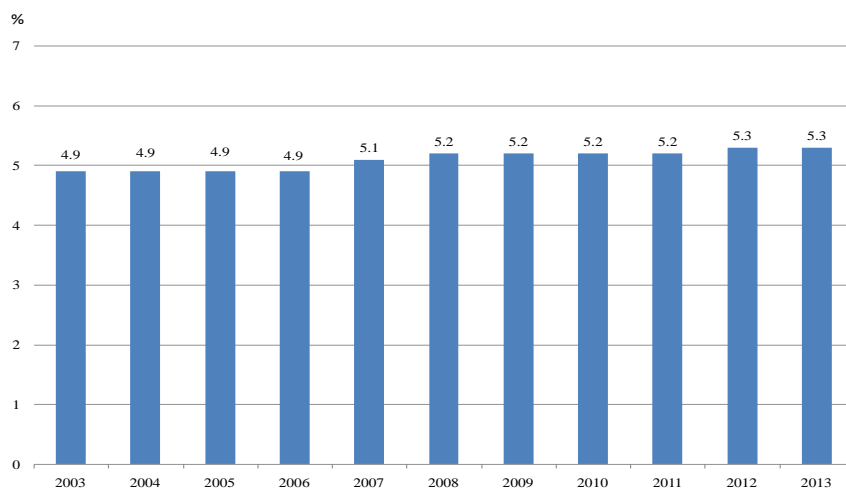


Fig. 1. Proportion of protected areas of the country's territory (Data on protected areas is provided by the Ministry of Environment and Water) [16]

Forest trees damaged by defoliation

The indicator provides information on the proportion of trees in forests affected to varying degrees (low, medium, heavy or dead) by defoliation. Defoliation loss of needles or leaves in the crown of the tree, which is estimated by comparison with reference tree. The process is influenced by climatic factors (especially drought, temperature extremes, storms), insect pests and fungal pathogens, and the condition of the soil, air pollution, greenhouse gases and other [13-15]. Overall for the period 1995 - 2011 the data for Bulgaria showed fluctuating trend towards reducing the value of the indicator. In 2009, the existing surveillance network has been revised. Within this revision of some places that have not been covered are created new sample plots, some test areas not meeting the requirements are replaced. As a result of these developments the value of the index for 2009 fell by about 1/3 and reached 21.1%, which is close to the average indicator for the EU in 2009. In 2012, the value of the indicator again rose and reached the level of 2003.

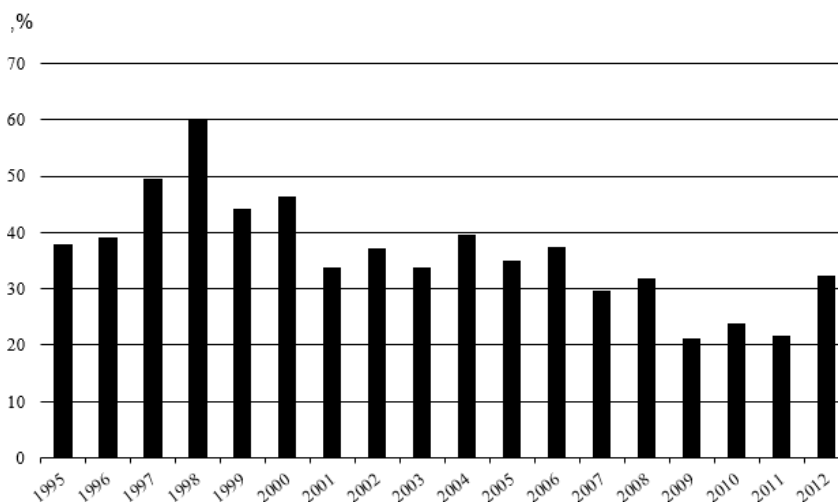


Fig. 2. Forest trees damaged by defoliation [16]

Forest growth and fellings

The index measures the proportion of the annual felling of the annual net forest growth [11]. For the period 1990 - 2005 the values of the indicator for Bulgaria are below the average for EU-27 and are one of the lowest among Member States. In 2005, only Italy, Denmark, Cyprus and Luxembourg data lower than those for Bulgaria.

The value of the indicator for Bulgaria for the last five years (2006 - 2010 years) remained almost at the same level, with a slight downward trend

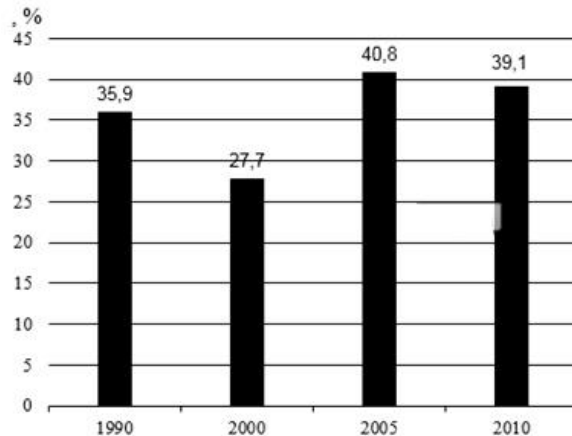


Fig. 3. Growth and forest logging[16]

According to [17] The average annual growth per hectare pine forest is between 2.39 and 4.25 tons or an average of 3.32 tons. This is accumulated pulp a year. The carbon in wood table fluctuates between 40 and 60%, so it can be assumed average of 50%. Obtained that accumulated in a hectare of forest carbon is about 1.7 tons. As trees accumulate entirely atmospheric carbon, it can calculate revised carbon dioxide.

Forest areas of Bulgaria in 2011 to take up 4,148,114 ha or 37.4% of the territory. Of these, 3,774,778 mln. Ha (91.0%) have forests. The area of vacancies of forest trees forest areas is 373 336 ha. Since 2005, total forest area of the country has increased by 71 650 ha (1.73%). Key factors that favor the dynamics of this process are self-afforesting of treeless forest areas and abandoned lands outside forest areas and afforestation of treeless forest areas. Observed the following trends [13-15]:

- 1) increase the area of forests through natural succession processes;
- 2) reducing the forest area created as a result of afforestation - 4 591.0 ha in 2006 to 1 498.3 ha in 2011 .;
- 3) reducing the area of coniferous forests and coniferous plantations

The average age of the forests increased from 49 to 53 years. In coniferous forests with the largest area participation are those aged 21 to 40 years - 42%. Coniferous trees older than 80 years occupying 20.9% of the area of coniferous forests. In deciduous forests, the share of middle-aged and mature trees. The average age of coppice forests for conversion into seed and low-stem forests also increases.

For the period 2005 - 2010 the average annual growth rate increased from 14.1 million m³ to 14.4 million m³.

The reported average annual use of wood up to 50% of average annual growth.

The amount of harvested roundwood during the period varies in the range of 5465 thousand. m³ and 7414 thousand m³, with the exception of the large decline in 2009. The lowest values of the timber marked in 2009 and 2010, which was influenced by the economic crisis. Almost 2/3 of the annual volume of timber harvested in state forest areas with an increasing trend over the period 2007 - 2011 - from 65.8% to 75.1% of the average annual volume of harvested timber. The distribution of harvested during the period 2006 - 2011 year wood categories - large, medium, small and firewood, respectively 20: 18: 4: 57. Compared to 2005, consumption of roundwood in Bulgaria expressed by the value of the indicator 'consumption of roundwood and products increased by 18% [3].

Assessment and sustainable management of forests in Bulgaria

In order to promote sustainable forest management, it must be sustainable, environmentally, economically and socially viable. Achieving environmental sustainability implies that the environmental values of the forest should not be broken, and if possible, they should improve. This means that forestry and management must not reduce biodiversity, soil erosion should be controlled, soil fertility should not be lost, water quality should be maintained and that forest health and vitality they need to maintained.

It is seen that the importance of forests is immense, it is not confined to the reduction of CO₂. According to [15] forests provide about 85% of the water flow in Bulgaria. Increasing forest by 30%

would lead to the absorption of 75% of emitted carbon dioxide without taking into account the benefits of water resources.

SWOT analysis of the forestry sector

To define the objectives and strategy selection is made SWOT analysis, in which the forest sector is subject to strategic analysis and assessment of "strong" and "weak" countries. The environment in which the sector operates, is differentiated, analyzed and evaluated as "opportunities" and "threats". SWOT analysis of the forestry sector are the basis for assessing the strengths and weaknesses at the moment and the opportunities and threats for the future development and the possibility of threat from deforestation. They should be considered in the formulation of strategic priorities and measures of the state policy in the field of forestry.

Table 1. SWOT analysis of the forestry sector

Strengths	Weaknesses
<ul style="list-style-type: none"> • Favorable natural conditions • Sustained increase in the forest area • Increasing share of natural and semi-natural forests • Over 57% of forest areas included in the National Ecological Network • Increasing the average annual growth of wood and realization of use to 50% of growth 	<ul style="list-style-type: none"> • Save the intensity of violations in forest areas • Low efficiency of the application of penal provisions • Underdeveloped information system for forests • Morally and physically obsolete facilities and equipment in logging • Insufficient participation of science to solve the challenges facing the forestry sector;
Opportunities	Threats
<ul style="list-style-type: none"> • Effective absorption of EU funds in the sector • Improving forest management • Maximize the potential of tourism development in forest areas; • Improve the skills and knowledge of those working in the sector; • Construction of optimal information system; • Conducting National Forest Inventory 	<ul style="list-style-type: none"> • The negative impact of climate change • The risk of natural disasters and forest fires; • Expansion of illegal logging and poaching • Excessive use of wood in certain forest areas

3. Conclusions

Maintaining healthy, productive and multifunctional forest ecosystems are an important priority tool contributing to alleviate the negative effects of climate change.

Forests are a major sink for carbon dioxide (CO₂) and have paramount importance in the absorption of carbon through photosynthesis. They are an important link in the global carbon cycle because of their ability to capture CO₂ from the atmosphere and store it in their biomass, dead forest litter / MGA / and forest soil.

The growth of tree species is a largely net carbon accumulation, so that the assessment and forecasting of the condition and productivity of forests is essential to analyze the development of carbon emissions. Over the past 21 years, the absorption of greenhouse gases in the sector offset the 11.35% -19.9% of total greenhouse gas emissions in Bulgaria. The greatest role and storage of carbon (94-95% of the total absorption for the sector) are the territories occupied by forests

Maintenance and conservation of forest resources must be state policy to be directed towards the fight against wind and water erosion, desertification and adverse effects of global warming. Promotion and implementation of preventive measures to prevent forest fires, restoring forests and implementing afforestation activities in order to increase land used sustainably convert low quality abandoned land into forests, reduce soil erosion and improve water balance.

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