



LAND AND CLIMATE CHANGE: HOW DO THEY RELATE TO ONE ANOTHER? A FOREST SECTOR PERSPECTIVE.



Soils can turn into a net sink, but also into a net source of greenhouse gas emissions. In other words, in relation to climate change, they represent part of the problem, but also part of the solution. We addressed experts from all partner countries of the LIFE OrgBalt project to better understand this two-fold relationship, with a focus on the forest sector.



Soil ecosystems can act as absorbers, reservoirs and emitters of greenhouse gas emissions”, this is the opinion of Dr. Olgirda Belova, member of the Department of Forest Protection and Game Management, Institute of Forestry LAMMC, partner in the LIFE OrgBalt project, who added, “current greenhouse gas emissions generated by human activities include land use and land use changes in agricultural and forest systems, industrial development, and urban expansion. All of them have contributed to disrupt the carbon and nitrogen cycles in forests and agricultural lands. Today, this makes greenhouse gas emissions from soils a key topic in global climate change issues, and for agricultural and forest management”.

But, what’s the cause of this multifaceted role?

From Dr. Paavo Ojanen, researcher at the Department of Forest Sciences of the University of Helsinki, point of view “organic soils are typically carbon dioxide sinks

because their wet, anoxic (lacking oxygen) soil conditions restrict the decomposition of the organic matter in the soil, in which carbon dioxide is stored. Thus, organic matter accumulates into the soil, keeping more and more carbon away from the atmosphere”. Forest ecosystem in particular represent an important terrestrial stock of organic carbon and their management together with different uses of harvested wood, play a crucial role in the regulation of the concentration of atmospheric carbon dioxide[1]. Drainage and land-use change activities can enhance decomposition, and organic soils, especially drained nutrient-rich ones, can turn into net greenhouse gas sources. “Organic carbon losses are often caused by land-use change (in the Forestry sector for example by deforestation)”, claimed Dr. Bärbel Tiemeyer, research-group- leader at the Thünen Institute. “In the case of peatlands instead drainage is the main driver for high carbon dioxide emissions. Peatlands are especially important in this context, as they globally store more carbon than all forests together. On the one hand, accumulation of carbon can continue

over thousands of years, and therefore, in their natural state, they remove carbon dioxide from the atmosphere for a long time. On the other hand, drainage of peatlands causes the release of very large amounts of carbon dioxide. For example, in Germany, the annual emissions from drained peatlands are approximately as high as those from all flights taking off in the country in one year”.

Forests cover more than 40% of the terrestrial surface of the EU and all of them are managed, therefore they have an indisputable role in mitigating climate change[2].

We asked experts what do we mean by climate change mitigation measures and which are their potential. “By climate change mitigation measures”, explains us the research team of the Latvian State Forest Research Institute “Silava”, leading partner in the LIFE OrgBalt project, “we mean such organic soil management practices that could allow a decrease of greenhouse gas emissions from drained nutrient-rich organic soils managed for agriculture





or forestry purposes. Scientific evidence in fact shows that luckily, we could significantly reduce greenhouse gas emissions just by changing the way in which organic soils are managed. The initial, approximate calculations prior to the LIFE OrgBalt project measurements, indicate a potential decrease in greenhouse gas emissions due to sustainable management of up to 50%. The project will test this potential in practice in the project countries by in situ greenhouse gas measurements in 51 sites in Estonia, Finland, Latvia and Lithuania”.

Which are the main challenges faced by researchers in estimating the role that organic soils play in reducing greenhouse gas emissions?

The lack of consistent data is certainly an important aspect, according to Dr. Olgirda Belova, which stressed the need to have scientific sound greenhouse gas emission factors to reduce uncertainties in greenhouse gas inventories. This is one of the main goals of the LIFE OrgBalt project which aims to improve greenhouse gas calculations from drained nutrient-rich organic soils by including project territory specific activity data and emission factors. However, there are further challenges faced by researchers. “Greenhouse gas emissions from organic soils”, claims Helen Karu, LULUCF Senior Specialist at the Estonian Environment Agency, “are highly variable between sites and years, therefore, long-term measurements are required to estimate the average greenhouse gas balance of organic soils and also assess the impact of climate change mitigation measures. However, such measurements are rare as most research projects only last for 1-2 years”. Referring specifically to the challenges faced by researchers

within the forest sector, measuring the net greenhouse gas balance of forest ecosystems is one of them, according to Dr. Paavo Ojanen, “as trees cannot fit into typical measurement chambers, - a widely used method to measure greenhouse emissions from soils, by trapping them in a chamber and collecting samples from it - expensive measurements and complicated calculations are needed. In addition, the different greenhouse gases have different life times and climate warming effects in the atmosphere. Thus”, from Dr. Paavo Ojanen point of view, there is not a single answer to the question: “What is the best way to manage organic soils to mitigate climate change?”. The answer depends strongly on the chosen time scale, current land-use and properties of the organic soil”. Focusing on nutrient-rich organic soils and forest management practices it’s of primary importance to understand the difficulties faced by the forestry sector, such as the damages caused by climate changes, the role played by sustainable management from a foresters’ perspective and forest mitigation potential.

Insects and diseases, storms and drought have been the main climate change related challenges faced by forests in the last years, according to many representatives of the forest sectors.

Hardo Becker, Climate Change Specialist at the Climate Change Department of the State Forest Management Centre in Estonia, identified storm damages and bark beetle as the main damages caused by climate change to Estonian forests. Bark beetles are tiny insects that have existed for a long time and live and reproduce under the bark of trees. However high temperatures, and extreme weather linked to climate change — including droughts and

storms — weakened trees, and this has created a habitat for the bark beetle which are increasingly spreading causing severe damages to forests. Forest pests, all living organisms such as plants, animals and pathogenic agents, such as bacteria, fungi, algae, detrimental to the forest health, have been mentioned also by Nerijus Kupstaitis, head of the Forest Policy Group of the Ministry of Environment of the Republic of Lithuania, as the main factor damaging not only Lithuanian, but in his opinion all European forests. Andreas Baumgart, from the Federal State Forestry Agency Mecklenburg-Western Pomerania, reported on some data on the damages made by forest pests in Germany in the last years. We report few of them. “As a consequence of the very dry and extraordinarily warm summer 2018, 2019, Germany lost about 30% of their territory spruce stands due to the spread of the bark beetle. As an indirect impact of climate change and globalism” continued Andreas Baumgart, “strange fungi have appeared in the last years. One of them, the fungus chalara fraxinea started appearing in early 2000, and brought ash dieback, a devastating disease, that in Germany has been responsible for destroying two third of ash trees. Within 15 years 130.000 m3 of ash wood had to be cut only in state forest. Private forest had to cut at least the same amount.” Knowledge has a key role in forest management and good forest management can be a great ally against forest detriment. “Forest owners”, according to Aiga Grasmane, executive director of the Latvian Forest Owners' Association (LFOA), “should have the possibility to be trained in order to acquire the necessary knowledge





to develop their long-term forest management plans and adapt their forest management practices so to make forests resilient to climate change”.

But is the role of sustainably managed forests as natural carbon sink sufficiently recognized nowadays?

In the representatives of the forest sectors opinion there’s a lack of awareness at society level on the important role played by forest sustainable management. Therefore, it’s very important to raise awareness within the society, but also among forest operating companies and forest owners. “There are quite different opinions about forestry management.”, claims Andreas

Baumgart. “On the one hand many people think that forests have biggest carbon sink function only when forestry management stops. Others think that only sustainably forest management can increase carbon sink function.” Also, in Nerijus Kupstaitis opinion opposite views on the necessity of managing forests exist. “However,”, he continued, “in our European conditions and having in mind our forests, for every forester the answer is clear: sustainably managed productive forests, together with long-term wood products derived from those forests, can be seen as the main natural carbon sink, especially in such countries like Lithuania”.

Forest management can do a lot to mitigate climate changes, believes Hardo Becker. Trough forest management, selective tree breeding, we are able to grow more productive forest, which act as a better carbon sink. “In Estonia, he continues, “there are good regulations for sustainable forestry, according to which the forest which are managed and cut have to be planted again. However, forest aging is not getting enough attention. It is well known that the higher the production of a forest, the better it sequestrates carbon. By harvesting it is possible to lock carbon in wooden products and grow new future forests, able to mitigate and adapt climate changes.”



Further research, closer interdisciplinary cooperation and guidelines for foresters, the key actions needed by the forest sector to reach its full mitigation potential.

According to our interviewee further research and closer interdisciplinary cooperation between scientists are needed. The need of data and tools for foresters to evaluate the potential economic return of their forest management has also been highlighted to promote the implementation of new innovating climate change mitigation measures. The role of communication has also been stressed in raising awareness within the society on the role played by forests in storing carbon and on the greenhouse gas reduction potential that better management could bring, making forests healthier and





more resilient to climate change. We need scientific knowledge to understand what happens in our forests and soils”, stressed Tiina Törmänen, Climate specialist in Silviculture at TAPIO, provider of forest management related advisory and consulting services in Finland. In her opinion, “compromises must be made to find solutions acceptable for all actors, but brave decision needs to be made as well, to try new management practices and learn from the past mistakes. A lot has been already done to improve forest management, but continuous research is fundamental to find even better solutions and put the best available knowledge quickly into practice. Furthermore, research should focus on organic soils potential and on how to stop deforestation”. In line with this Andreas Baumgart stressed how in north-eastern Germany there is a wide public consensus on the need of new forestland. Forests moreover, in his opinion should be preserved and a sensitive and

sustainable forest management should be implemented, as while vital trees are important carbon sinks, dying trees produce more carbon dioxide. Hardo Becker, highlighted also how, from his point of view, in a changing climate we need to find the right balance between forest sites protection and management potential so to allow forests to adapt to the new forming ecosystems and to climate change. Aiga Grasmane, continuing on the importance of having resilient forests, claims the importance of the elaboration of guidelines for forest owners. “Forest owners should be able to evaluate the potential of their forests and to understand which are the correct measures to put in action to achieve them. The role of policy makers in this respect is of high importance to make forest owners aware about the asset they are holding and to work on policies that could comply with management goals on property level as well as with EU policies”.

LIFE OrgBalt team

- [1] Statistics Explained (<https://ec.europa.eu/eurostat/statisticsexplained/>) - 04/12/2019, https://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:Forestry_and_climate_change
 [2] Statistics Explained (<https://ec.europa.eu/eurostat/statisticsexplained/>) - 04/12/2019, https://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:Forestry_and_climate_change



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This article has been produced with the financial support of the LIFE Programme of the European Union and the State Regional Development Agency of Latvia within the Project "Demonstration of climate change mitigation potential of nutrient rich organic soils in Baltic States and Finland" (LIFE OrgBalt, LIFE18 CCM/LV/001158).

The developed article reflects only the LIFE OrgBalt project beneficiaries' view and the European Commission's Executive Agency for Small and Medium-sized Enterprises is not responsible for any use that may be made of the information they contain.

