



POLICY BRIEF 2021:7

Perspectives into topical issues in society and ways to support political decision making.

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Cost-effective means to halt the loss of biodiversity in forests

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Reconciling biodiversity and forestry is challenging

Despite the objectives, the loss of biodiversity in Finland has not been halted. Demand for various wood products, and therefore the use of wood, is expected to increase in the future. The increase in logging may lead to a further reduction in the biodiversity of forests. Therefore, the strengthening of existing biodiversity measures and policy instruments is required, along with the development and introduction of new ones.

The project "Cost-effective means to halt the loss of biodiversity in forests (KEIMO)" funded by the Government's analysis, assessment and research activities gathered information on forest living environments and the structural characteristics of forests requiring additional safeguarding of biodiversity. Based on the scenario analyses, the economic and ecological impacts of various measures safeguarding biodiversity at the stand level and at the level of Finland were assessed. Furthermore, assessments were made of changes in the operating environment for safeguarding the biodiversity of forests and the feasibility of measures through information guidance and incentive systems. The project was carried out by the Natural Resources Institute Finland, Metsähallitus, Pellervo Economic Research, the Finnish Wildlife Agency, and the Finnish Environment Institute.

In the long term, a high increase in forest protection and nature management in forests available for wood production can result in the shortage of domestic wood to be used by the forest industry in Finland. The high increase in the area of protected areas and nature management in forests available for wood production would also entail significant costs to the state if compensation was also paid for nature management. A simultaneous increase in the demand for wood would further rise the costs, because the rise in prices would increase the costs related to the acquisition of protected areas. In addition to the area objectives, the cost-effective increase in forest protection and nature management requires that the sites which are currently best in terms of safeguarding biodiversity and the sites which have minor importance for wood production, but which can be developed to promote biodiversity, are able to be identified.

Raising awareness of the METSO and Helmi programmes, and increasing the funding of programmes and relaxing the criteria for selecting sites would bring more areas under protection. Through a nature management plan made at forest property level, the nature management measures could be allocated into those forest owners' forests who are interested in safeguarding nature values. Furthermore, support schemes should be established as a mechanism to take into account the structural characteristics of forests that are important for biodiversity when determining the eligibility of an area. Compensation mechanisms similar to those for compensating for greenhouse gas emissions could also be developed to safeguard biodiversity.

Safeguarding the diversity of forest nature requires the increase of protected forests and the development of

nature management in forests available for wood production

The Government's decision-in-principle on Finland's sustainable biodiversity management strategy for 2012-2020¹ has determined that the loss of biodiversity in Finland has been halted by 2020 and that the favourable state of biodiversity has been ensured by 2050. The same objective has also been mentioned in The National Forest Strategy². However, according to the results of the endangerment assessment of species, the endangerment of forest species has continued³. The EU Biodiversity Strategy 2030⁴ has defined that 30% of land and 30% of marine areas must be protected at EU level. According to the strategy, one third of these protected areas should be strictly protected.

Measures to safeguard the biodiversity of forests have included increasing the area of protected forests, developing the nature management of forests available for wood production, and the restoration of protected forests². At the moment, most of the protected areas are located in northern Finland. Safeguarding the biodiversity of forests requires increased protection, especially in southern Finland. Furthermore, the level of nature management in forests available for wood production is currently insufficient to halt the endangerment of species and habitats. Many species which are dependent on large dead trees are endangered. All the old and rotten trees, especially deciduous trees, are important for forest species. The level of nature management of forests available for wood production could be improved, inter alia, by favouring a more abundant mix of deciduous trees in the forests, and by leaving more and larger retention trees and deadwood.

Impact assessments of increased conservation and nature management in forests available for wood production

The economic and ecological impacts of increased conservation and nature management of forests available for wood production were studied using scenario analyses up to the time horizon 2051. The calculations were carried out at the country level using the EFDM (The European Forestry Dynamics Model) model⁵. The input data used in the model was the National Forest Inventory (NFI) data. Ecological impacts included changes in the amount of dead wood and changes in lingonberry and blueberry yield and coverage.

Six scenarios were built for the estimations at the country level. The scenarios differed in terms of the set harvesting target and the increase in conservation and nature management measures. In the estimations, conservation and nature management measures were increased in different amounts, and they were allocated differently in different forest vegetation zones. In the study, it was assumed that, for example, old sites and sites having a large average diameter of growing stock on mineral and peat soils were transferred for protection. In forests available for wood production, the nature management measures applied included in particular an increase in the share of deciduous trees and the number of retention trees, as well as an extension of rotation periods compared to current forest management recommendations.

Increased protection and nature management measures meant an increase in the total felling area in order to achieve the harvesting target, which was larger (80 million m³/year) than the current one. According to the study, the lower net revenues resulting from the increase in nature management activities and selection felling could be compensated up to a certain point by increasing the area of the regeneration fellings and the stumpage earnings from them (Figure 1). However, as a result of the increase in fellings, the age structure of forests became younger.

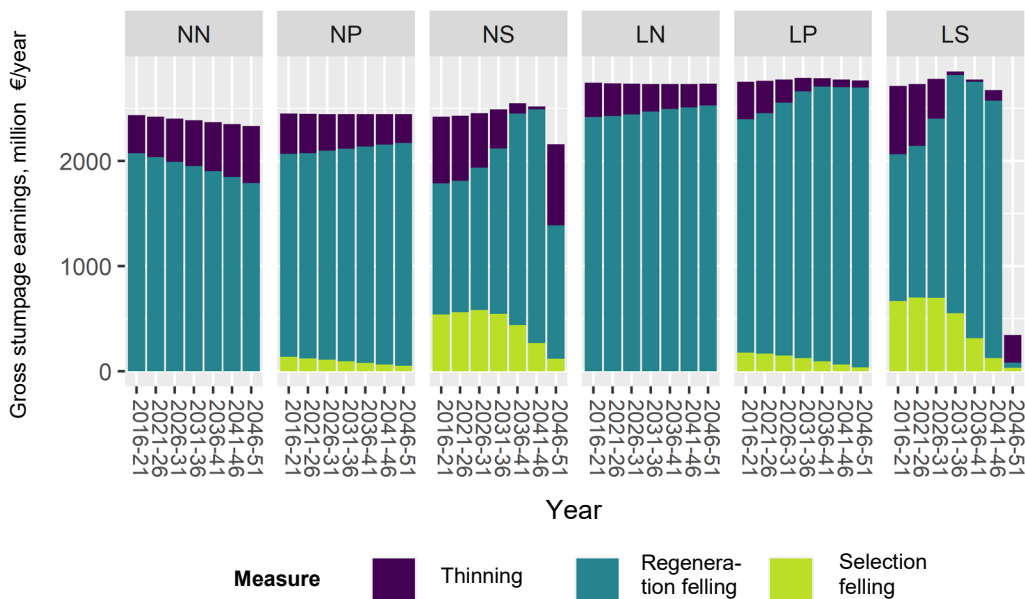


Figure 1. Breakdown of gross stumpage earnings by various measures in five-year time steps in 2016-2051. In the N-initial scenarios, the assumed annual cutting removal target was 72.4 million m³, and 80.0 million m³ in scenarios starting with L. In N-ending scenarios, it was assumed that the area of protected areas will remain at the current level. In the P-ending scenario, it was assumed that the forest conservation

area doubled compared to the current one in the forest and poorly productive forest land in hemi and south boreal and central boreal forest vegetation zones (conservation + nature management measures = 30% of the area of forest and poorly productive forest land). In the S-ending scenario, the increases in the area of conservation and nature management activities in forests available for wood production were even higher. Because of this, the set harvesting target was not achieved in the last time steps and the gross stumpage earnings strongly decreased.

According to estimations, the total volume of dead wood can be increased by increasing the protection of forests and nature management activities in the forests available for wood production. However, fellings in larger areas and an increased area of young forests would be detrimental to grouse, for example, as the blueberry yield would be reduced and their food would be reduced in this respect. An increase in the area of young forests would also reduce the quality of the habitat of grouse.

The higher the demand for wood, the lower the cost effectiveness is of safeguarding biodiversity. This is because protection is more expensive the higher the price of wood is. Furthermore, the leakage of biodiversity is higher. This means that increasing conservation and nature management measures will increase biodiversity on some sites, but fellings are carried out more intensively on the other sites.

The study also assessed the costs of increasing protection and nature management measures to the state. The starting point was voluntary action and the replacement of loss of income for the landowner, which are principles of the METSO programme. In order to be included in the area-based objectives of safeguarding biodiversity in Finland, nature management should be implemented with a permanence that would require an agreement with a private forest owner or other authentication, for example in state's forests. By 2030, doubling the protected area assumed in the scenario analyses would require an increase of more than tenfold in funding for the METSO programme to at least EUR 240 million per year. Furthermore, if nature management measures, such as the number of retention trees, the proportion of deciduous trees and rotation periods were increased, the annual costs would rise to between EUR 460 million and EUR 530 million.

Promoting conservation and nature management in the forests available for wood production

The voluntary means of protection used to implement the METSO programme are widely accepted among forest owners and, also more broadly, among citizens.

Increasing awareness of METSO and Helmi programmes through, for example, a major campaign, could lead forest owners to offer more sites for conservation and to increase their interests in nature management. About two-thirds of private forest owners have heard about the METSO programme⁶. Forest professionals play an important role in raising awareness of the METSO programme and therefore, the commission paid for METSO sites should be high enough to encourage them to advise forest owners on how to safeguard biodiversity in different ways.

Increasing funding for the METSO programme and relaxing the criteria for sites would bring areas with still developing nature values into the protected area. Until now, sites have been available quite well for the METSO programme, but the high increase in the protected area would require much more of an abundant supply. The human resources of organizations carrying out conservation and nature management measures should also be drastically increased, if these measures are increased.

Nature management plan would provide an opportunity to allocate the nature management measures the forests of forest owners who are interested in safeguarding nature values. Such a plan has been presented in the 2008 METSO programme. Implementation of nature management activities as a part of forest management (cf. Monimetsä project) is cost-effective and benefits biodiversity. However, without forest owner's commitment, these measures do not increase conservation area in Finland, if the current statistical criteria are applied. The commitment usually requires administrative actions, compensation and monitoring. The forest owner could prove his/her commitment to nature management measures by implementing the nature management plan.

The development of area-based support based on the structural characteristics of forests important for endangered species and game. The forest owner would receive support by committing to maintain certain structural characteristics in his/her forests for the commitment period.

Introduction of compensation mechanisms to compensate the ecological disadvantages caused by companies. The objectives of safeguarding carbon sinks and biodiversity would be compatible and their joint implementation would be a cost-effective way of contributing to both objectives.

Conclusions

In the long term, a high increase in forest protection and nature management of forests available for wood production can result in the shortage of domestic wood to be used by the forest industry in Finland. If forest growth can be increased, for example, through

timely treatment, fertilisation and the use of processed seed and seedling material in forest areas other than those reserved for conservation or natural management, the conditions to simultaneously increase forest biodiversity and fellings will be improved.

Simultaneously safeguarding diversity and increasing wood production entails significant costs to the state. The cost-effectiveness of safeguarding biodiversity could be increased if nature management is based on land owner's desire, and nature management is carried out in those areas where the preconditions for this are good. Such areas would include areas close to existing protected areas. Particular attention should be paid to the development of criteria and statistics for nature management in order to monitor the development of the quality and quantity of nature management activities.

Raising awareness of the METSO and Helmi programmes would be a cost-effective way to get forest owners to provide more sites for conservation and to increase their interest in nature management. Increasing funding for these programmes and relaxing the criteria for sites would bring areas that are still developing in terms of nature values under protection, thus increasing the supply of potential sites. The nature management plan made at forest property level would also be one instrument to safeguard biodiversity in private-owned forests. Area-based incentive schemes could be developed for nature management in order to preserve and increase those structural features that are important for forest biodiversity. Furthermore, compensation mechanisms similar to those developed to compensate for greenhouse gas emissions could be developed to safeguard biodiversity.

In addition to safeguarding the biodiversity of forests, other forest use objectives, such as recreational use, increasing carbon sinks, and promoting the management of game habitats, should be taken into account, and measures and policy instruments should be developed to achieve several objectives at the same time. The regional targeting and design of measures can contribute effectively to safeguarding biodiversity.

Further reading

Kärkkäinen, L., Hynynen, J., Rätty, M., Horne, P., Juutinen, A., Korhonen, K.T., Koskela, T., Maidell, M., Miettinen, J., Miina, J., Määttä, K., Otsamo, A., Punttila, P., Svensberg, M., Syrjänen, K. *Kustannusvaikuttavat keinot metsäluonnon monimuotoisuuden köyhtymisen pysäyttämiseksi.* (in Finnish) Government publication series 21 /2021. Available at: <http://urn.fi/URN:ISBN:978-952-383-217-6>.

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Policy instruments for safeguarding biodiversity: Research Director Paula Horne

More information: <https://www.ptt.fi/henkilosto.html#17>

The project Cost-effective means to halt the loss of biodiversity in forests has been implemented as part of the implementation of the Government's Plan for Analysis, Study and Research for 2020.

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