

## Forest Multifunctionality

To meet all demands and challenges that we, as a society, exert on our forests, knowledge-based cross-sectorial interdisciplinary research is needed to move forward. Areas are becoming scarce; stakeholders are in conflict, but, multiple use approaches point at integration and synergy opportunities. Accordingly, there is an increasing need for science-based policy support for EU decision-making concerning multiple uses of forests. In the end, future-proofing Europe's forest is an aspiration we all share.

### Policy recommendations and future research needs:

- Existing forestry models are generally oriented to a single demand - wood biomass production. Forest planning and management systems need to point at optimizing multiple use when feasible.
- The scientific base for new business models like payment for ecosystem services and carbon storage need to be further explored.
- Long-term biophysical and socio-economic monitoring is needed. The need to combine the historical knowledge with new experimental hi-tech dataflow is imperative.
- Flexibility in local solutions is needed. European countries differ significantly in ecological conditions as well as economic importance of different forest benefits.





## Trilemma

Climate and biodiversity goals are emphasized in many EU initiatives; at the same time global population growth and the transition from fossil-based economy to a circular bio-economy include an increased demand for wood and wood-based products. As diverse and diverging demands exceed the available forest resources, there is a need to find science-based solutions for integration and synergy opportunities.

## Climate change

Forests have an important role as a carbon sink and carbon storage. However, climate change also has a fundamental impact on forests. The rate of changes caused by climate change exceeds the typical rotation period in the Nordic-Baltic region, increasing the risk of extensive impacts on the forest ecosystem functions. It is crucial to work on long-term stabilizing measures that delay and reduce the adverse effect of climate change on forests. In the effort to increase our knowledge about climate adaptation in forests, it should also be recognized that forests play a central role in societal safety, including protection against landslides, erosion, and flooding with negative effects on other land uses like agriculture, infrastructure, etc. Increased knowledge about climate adaptation and forests should also include technical, economic, and societal solutions relevant to these changes.

## The need to communicate -

A fact-based and transparent debate is needed to ensure that a wealth of ideas is put forward.

## Biodiversity

Organisms, communities, and ecosystems are resilient, i.e. have natural ability to recover from disturbances and stress. Functional ecosystems are less likely to lose resilience with environmental fluctuations. In contrast, in man-made production stands, e.g. single species and even aged, resilience reduces and the risk for ecosystem services loss, loss of multifunctionality and ecosystem degradation increases.

In the Nordic-Baltic region, the palette of native species is largely still present. The emphasis in recent history has been on commercially interesting tree species. There is an ongoing effort to increase the share of mixed forests in many parts of Europe. In the Nordic-Baltic region this diversification is restricted by the fact that there is only two native coniferous forest species and few alternatives for deciduous.

Trees are regarded as foundation species, having a strong role in structuring vegetation communities. However, diversification of managed forests should not be limited to tree species, but also the increase of structural elements related to old-growth forests and deadwood, providing habitat to different species and hence supporting ecological processes.



## Wood production

Design and monitoring of closer-to-nature forestry should be based on facts and grounded in a solid understanding of forest ecosystem functions.

Forests and forest sector constitute an important part of the economy, in particular the bio-based economy in most of the Baltic and Nordic countries, not least in rural, usually forested, regions. The importance of the forest sector is much higher there than in the other parts of Europe. Forests also serve as a source of raw materials for significant portions of activities aimed at reducing the use of fossil and less environmentally friendly resources. When changing forest management practises there is a need to take into account also industrial wood use and the future needs of sustainable wood-using industry.

## Water

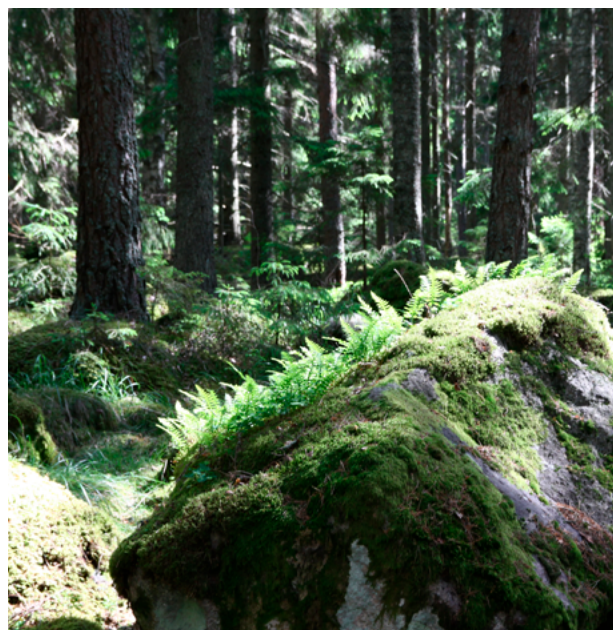
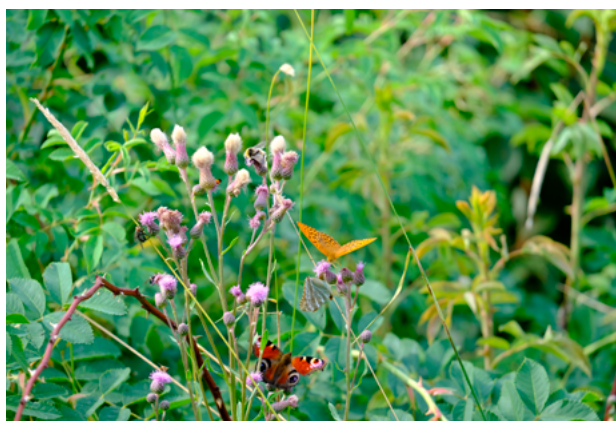
Water run-off from forests is usually of good quality. Forests and woodlands are used for protection of fresh water supply in many places, with management schemes aiming for maintaining water quantity and quality.

Forest and water are inter-dependent. The connection of between forests and waters is multi-faceted involving both temporal and spatial scale considerations as well as geographical differences including differences in climate and land use.

It is needed that forest operations, regardless of management strategies, are based on water protection strategies.

## Multifunctional forest management

There is a need to find common understanding of how to balance the use of the forest landscape: where to combine multiple functions and where to separate them (intensified forestry, set-asides for nature conservation), known as the land sharing versus land sparing concepts. Regarding the pres-



sure on land and the expected increase in global demand for forest products and for sequestering and storage of carbon, it seems straightforward to prioritise efficiency of forestry. Yet, in the light of climate change, ecological resilience and the importance of ecosystem integrity, it is essential to find that efficiency within the limits set by natural processes. This can be achieved by e.g. a wise choice of tree species adaptation of harvesting patterns and stand rotation length in line with disturbance regimes inherent to the region or the forest type, and use of mixtures or micro-mosaics to create more diversity in the landscape.

## Future research needs and policy recommendations

Forests provide both market and non-market benefits. Market benefits, like roundwood, are more easily observable than non-market benefits, and thus also easier to take into consideration in decision-making. However, new policy measures have been developed to take better into account more intangible non-market benefits, e.g., by creating markets to them or by using other policy tools. Evolving carbon and biodiversity credits as well as EU taxonomy are examples of this.

Making non-market benefits more visible and recognising their economic value, enables a more balanced use of natural resources. It also brings out the increasing need for multifunctional forest management. As for forest ownership structure, ecological conditions as well as economic importance of different forest benefits differ between European countries; there is a need for flexibility in local solutions in order to reach the best possible solution at European level.

How to balance between the different interests is a political task - the role of the scientific community is to highlight risks as well as integration and synergy opportunities, to provide possible solutions and to improve the scientific base for decision makers.

Further, to present possible new mechanisms and policy tools, examine their pros and cons from different perspectives, and to provide guidance on their usability in differing circumstances.

## Executive Summary

**Nordic-Baltic forests are multifunctional; they provide wood, store carbon, harbour biodiversity and ecological functionality and produce different benefits to people.**

**Different stakeholders have different viewpoints and priorities, some that are actually or potentially conflicting. Some stakeholders expand strongly whereas others tend to become marginalized.**

**Forest management can help sustain multiple goals, but we need to recognize unavoidable trade-offs as well potential co-benefits.**

**Sustainable forest management is feasible only with holistic and comprehensive views of governance and management of forest and forest landscapes. New policy measures are still needed to encourage forest owners towards multifunctional forest management.**

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## The PROFOR Network

The Nordic-Baltic research network PROFOR focuses especially on the 'Trilemma' approach, which is trying to meet simultaneously; i. enhanced carbon storage and sequestration, ii. increased production of round-wood for wood-based products to substitute fossil-based raw materials and iii. maintained forest biodiversity with capacity to deliver multiple ecosystem services important for human wellbeing.

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