

# Are European forests fit for a sustainable future?

A short story about European forests

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### **Background and disclaimer**

This paper is the responsibility of its authors, independent experts who were engaged by the Liaison Unit Bonn to prepare the ground for the Ministerial Conference. It does not represent the official views of Forest Europe, of the Liaison Unit, or of the authors' current and past affiliations.

It should be stressed that this short paper does not propose actions or make recommendations, to policy makers or anyone else, but asks questions and draws attention to the options, opportunities and challenges facing those with responsibility for Europe's forests. The key policy questions arising from this analysis and identified in the paper draw attention to those issues concerning European forests which, in the authors' opinion, deserve high level policy attention. They do not claim to be comprehensive and make no recommendations for actions.

The paper draws on scientific literature, notably the State of Europe's Forests 2020, which presented a synthesis of the situation and trends to 2020. The updated data will be presented in the next State of Europe's Forests Report 2025, and were not yet available for this publication. The paper focuses on the period between the two Ministerial Conferences: 2020-2024.

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# Preface

Forests are high on the agenda again – both in the political domain and public attention, and we find them on a sine curve between panacea and crisis mode. Forests and forest management used to be matters of long-time spans and constant, but not abrupt, evolution. In recent years, the approach to forest issues has become more polarised. With climate change, global biodiversity decline, deforestation and forest degradation as predominant triggers, the nature of the debate on forests and policy responses has changed, and lively discussions on the priorities and optimal use of the forest resource are taking place.

European forests have shown quite constant trends since the beginning of Pan-European reporting in 1990. Overall, forest area is increasing, the economic role of forests to the overall economy is rather stable, and there have been some improvements in biodiversity and climate change adaptation. However, there are many short-term impacts on European forest that are more difficult to grasp.

In essence, the central question remains the same: how to accommodate different demands on forests from society, how to reconcile different, often divergent, policy objectives, and how to find robust solutions that create more synergies than trade-offs for these objectives. Solutions and policies must of course be based on objective analysis and the best possible information.

FOREST EUROPE is a voluntary political process that shares the vision that Sustainable Forest Management (SFM) is an approach that is capable of supporting a balanced approach to European forests. It is the carrier of a common definition on SFM for the Pan-European region, and a major player in reporting and communicating forest information.

This paper is an attempt to discuss the current state of play in and around European forests in the well-accepted framework of SFM and its instruments. The “short story” follows the six Criteria for SFM, which is the DNA of the FOREST EUROPE process. They fully acknowledge the plenitude of multi-objective and cross-cutting issues, hence reflecting the complexity of forest policy making in a changing world. This is not a political publication, but a booklet to present the major forest-related narratives based on the latest stage of knowledge and data in support of the 9th FOREST EUROPE Ministerial Conference in Bonn, October 1-2, 2024.

We wish you an enjoyable read!



# An update on the current state of Europe's forests

European forests are deeply rooted in the reconstruction of vastly devastated landscapes after World War II. Their restoration and the huge need of wood for rebuilding are the heritage of the past that shaped forests until today. At the beginning of the twenty-first century, Europe's forests had recovered after the critical forest situation in the 1980s and 1990s, which was largely caused by air pollution-induced forest dieback. The forest area in Europe increased and forest conversion to structurally rich mixed forests gained momentum. European forests are also a significant carbon sink and the world's largest supplier of industrial roundwood, although only around 75 percent of the growing stock increment is utilized. Alongside agriculture, forests are an important driver of rural development.

Recently, however, the development of European forests has given cause for concern. Records for temperature, drought and rainfall, as well as shifts in precipitation patterns, have shown how quickly climate change and its impacts are progressing in Europe.

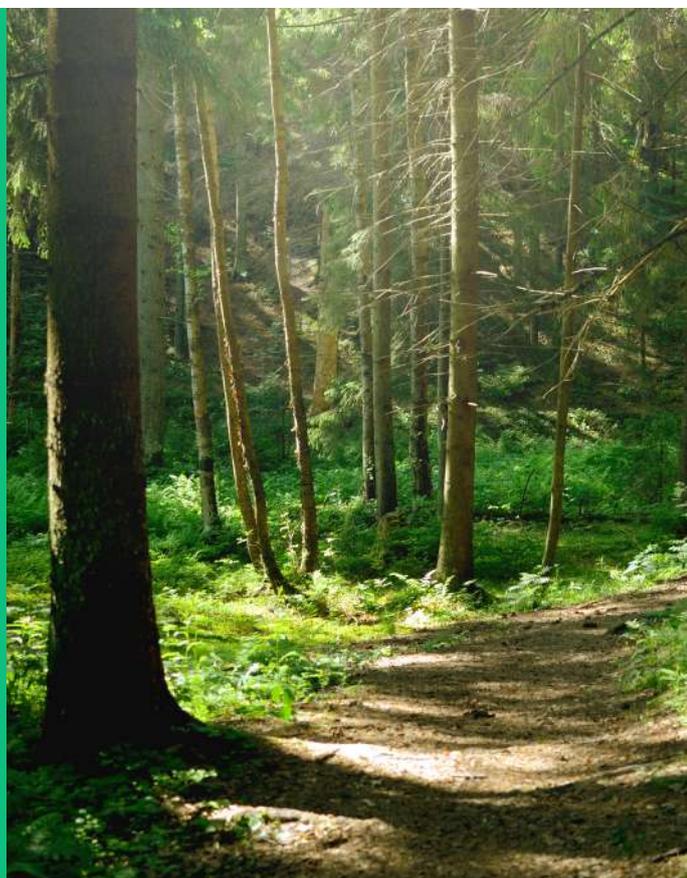
The changing climate conditions for European forests pose significant silvicultural challenges to forest managers, which are further exacerbated by the level of uncertainty surrounding future climate change. Forest managers are increasingly implementing silvicultural techniques that aim at adapting forests to future climate change.

Europe's forests provide a variety of habitats for plants, animals and micro-organisms. Due to targeted management, restoration measures and area expansion, forest habitats make the largest contribution of all land-uses to improving biodiversity trends. However, also biodiversity loss happens in forests, which is still to be better monitored, and verified through concrete actions.

Currently, European forests are a carbon sink. The growing stock and thus the forest C-pool have been increasing despite timber harvesting and emissions due to forest damage (insect outbreaks, storms and fires). However, at least in some parts of Europe, the forest sink, while still positive, may be decreasing or even turning into a source<sup>1</sup>.

Structural changes are taking place in the markets for wood-derived products. While consumption of some products, notably graphic papers, is declining, for others consumption is stable or growing. Innovative new products are appearing, notably a wide range of engineered wood products which have opened new uses for wood, but also man-made cellulosic fibres which seek to replace less sustainable fibres (cotton and oil-based fibres) and wood-based chemicals produced in so-called biorefineries. Innovations in the wood product sector imply a shift in the demand for wood dimensions from larger to smaller timber assortments.

Wood consumption has been influenced by macro-economic trends, but also by the pandemic, including its stimulus measures, which in many cases softened its economic impact (sometimes at the cost of post-pandemic austerity measures). Wood supply and international trade were also influenced by forest damage, and events external to the forest sector like the war in Ukraine and the resulting sanctions against Russia and Belarus.

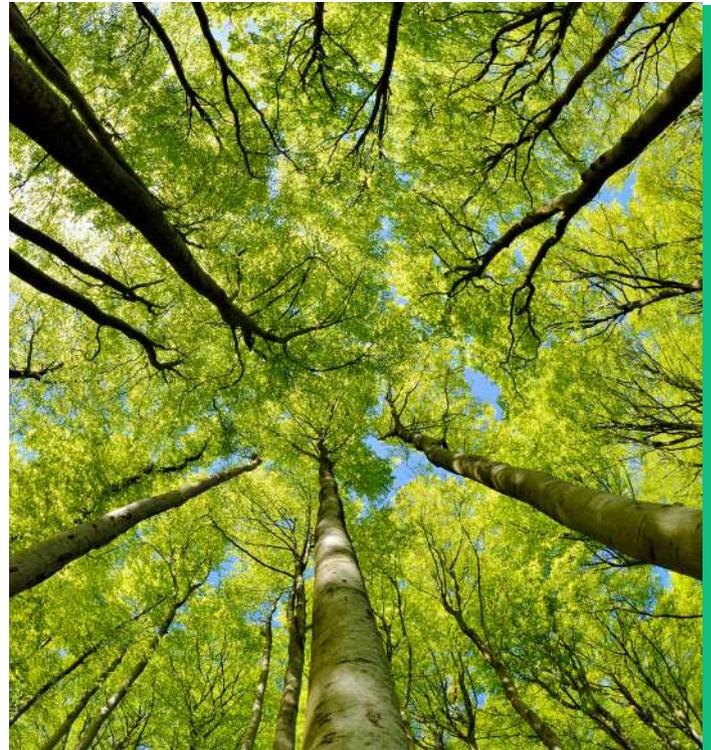


<sup>1</sup> Kilpeläinen, A., Peltola, H. (2022). Carbon Sequestration and Storage in European Forests. In: Hetemäki, L., Kangas, J., Peltola, H. (eds) Forest Bioeconomy and Climate Change. Managing Forest Ecosystems, vol 42. Springer, Cham. [https://doi.org/10.1007/978-3-030-99206-4\\_6](https://doi.org/10.1007/978-3-030-99206-4_6)

## An update on the current state of Europe's forests

Markets for many products are increasingly global and capital-intensive, with fewer major players. Prices of roundwood have tended to be low, creating further problems for forest owners, private and public.

Low wood prices, rising costs, and restraints on public budgets have threatened the livelihoods of private forest owners (especially with small holdings) in some parts of Europe and restricted forest management activities of both private and public forest owners.



# Safeguarding the future sustainability of European forests

Measures to maintain and improve the sustainable provision of all goods and services of the forest have to bring together different perspectives and interests. The multifunctionality of forests inevitably results in complex interdependencies, which can necessitate trade-offs when designing and implementing economic and policy measures. Measures that have a positive effect on the supply of a specific good or service can have a negative impact on the supply of other goods and services. We present below some of the ways in which European forest policy could contribute to safeguarding the provision

of multiple functions by our forests and thereby to a sustainable future for society as a whole. The paper is structured according to the pan-European criteria and indicators for sustainable forest management (C&I). The pan-European C&I were adopted by the Ministerial Conference on the Protection of Forests in Europe in 1998 (and updated since then) and represent a generally recognized approach for assessing the multiple aspects of forest management and sustainability. In the following sections, this framework is used to ensure a comprehensive and balanced approach in the paper.

## Criterion 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles

### Forest area

The forest area in Europe has been continuously increasing, over three quarters of a century, for several reasons. Former agricultural land is being occupied by trees, the forest boundary in higher and northern regions is expanding, due to the changing climate, while reforestation initiatives are creating new forest areas. These trends more than counterbalance the loss of forest area to settlements and infrastructure. In addition, many governments have made high level policy commitments to plant trees for carbon sequestration. This commitment to expanding forest area, and the possible availability of funding from climate change mitigation sources, represents a major opportunity in forest policy, but also a significant challenge in managing the interactions with other land uses, and integrating the new forests into broader strategies for rural development, biodiversity and climate change.

### Forest based pathways to carbon neutrality

As a nature-based solution, forests are an important component in achieving carbon neutrality. Forests play two major roles in society's pathway to carbon neutrality:

- carbon sequestration and storage by the forest ecosystem, and storage in harvested wood products; and
- supply of renewable raw materials and fuels to substitute for materials and fuels based on fossil fuels, thus reducing overall GHG emissions.

There are unavoidable trade-offs between these two roles and between management for mitigation of climate change and management for the other goods and services of the forest. There are many options and high uncertainty about how to integrate these

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## Criterion 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles

desirable objectives, while taking account of the great diversity in the conditions and potential of different forests, and of possible consequences in other parts of the world. These are briefly explored below.

### Mitigation through the forest ecosystem

CO<sub>2</sub> sequestration in the forest value chain takes place in the forest, not further down the value chain. Measures are needed to maintain and, where possible, increase CO<sub>2</sub>-uptake by production of forest biomass. There are two problems here:

- climate change, notably more frequent and severe droughts, can reduce biomass growth and thus the sequestration of CO<sub>2</sub>, and
- damaging events such as storms, insect calamities or fires can lead to a higher mortality in forests and thus to a collapse in sequestration capacity and spontaneous release of carbon to the atmosphere.

The forest C-storage capacity is also determined by human management actions. Forests are not an eternal, constantly growing CO<sub>2</sub> pool. The question arises as to how the atmospheric CO<sub>2</sub>, once bound, can be retained in terrestrial C pools in the long term. For the managed forest ecosystem, this is determined by rotation length (in even-aged stands) or volume of fellings (in uneven-aged stands). Lengthening rotations, setting aside certain forests and reducing harvest levels generally increases the forest carbon stock, but may increase risks of damage, and thereby the sequestration rate, and the economic sustainability of forest management. It is also necessary to take a global perspective: reducing use of timber from European forests, while there is constant or growing wood demand, will stimulate wood supply from other regions, and thereby prevent any net change in global atmospheric carbon emissions, even though the European forest carbon pool has been protected.

### Mitigation through carbon storage in harvested wood products

Beside forest C-sequestration, C-storage in wood products is an additional climate mitigation factor. By harvesting and timber processing, part of the carbon from the forest can be transferred to wood products and thereby stored. This C-storage takes place in the

long term, for example through construction timber, or through recycling chains such as paper and paperboard - although there are emissions arising from processing and use. Many forest products, including most graphic and packaging paper and paperboard, pallets and concrete framing have a rather short life in use and the stored carbon is rapidly released back to the atmosphere.

### Mitigation through substitution for fossil-rich products and fossil energy

The forest-wood chain contributes to achieving carbon neutrality not only by increasing C-sequestration. In many applications, wood products cause fewer emissions along their life cycles (from the forest, through processing and use, to recycling and final disposal) than comparable products from non-renewable materials. Replacing fossil-rich pathways with pathways based on renewable wood therefore contributes to net emission reductions. However, there are quite wide differences between the emissions of



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the various (wood and non-wood) pathways, so making operational decisions and implementing effective and equitable policy measures may be quite complex. In addition, both wood and non-wood value chains are working intensively to reduce their GHG emissions, and renewable and non-renewable materials are very often combined in specific applications.



There has been a heated debate around the energetic use of wood. Indeed, burning wood to generate energy releases the carbon stored in the wood. For this reason, the use of wood for bioenergy is increasingly seen in a negative light by some stakeholders. However, bioenergy is one means to substitute fossil fuels at least for the transition phase towards a carbon neutral economy. By means of sustainable forest management using CO<sub>2</sub> that has been removed from the atmosphere by tree growth, the use of wood as an energy source does not increase the atmospheric CO<sub>2</sub> concentration over the medium to long term. However, caution is needed to avoid excessive use of primary wood fit for other purposes. The aim is to create opportunities for marketing formerly non-

commercial timber while improving energy efficiency and promoting the cascading use of wood resources.

### Trade-off: carbon storage and substitution

There is a trade-off between fostering the production and use of wood-derived products (for substitution) and the maximisation of forest carbon storage. Carbon cannot at the same time be retained in the forest ecosystem and be harvested for use as a substitute for fossil-rich materials. On the road to climate neutrality, it is essential to look beyond the forest boundaries and carefully weigh up C sequestration rates of forests with the emission reduction potential of wood products. At present, insufficient data and analysis are available to guide these trade-offs, especially if consequences for global wood supply and demand are also factored in<sup>2</sup>. Weighing up these trade-offs, on the basis of objective analysis and providing detailed guidance for market actors is a significant challenge for the policy making and research communities.

### Tree planting for climate change mitigation

Many countries have made high level political commitments to plant trees to mitigate climate change. This applies both to the planting of trees outside forests, for example in cities or as roadside greenery, and in new forests for carbon sequestration and storage. There are still many uncertainties about how these commitments will be implemented. In addition to the question of sufficient areas for afforestation, it must be ensured that other valuable habitats (e.g. on marginal land) are not displaced by newly planted forest areas. Clarification of financing has to go hand in hand with clear management objectives for the new forest areas. Planting forests that are primarily intended to restore biodiversity is more costly than planting forests that are primarily intended for carbon sequestration or timber production. In a few cases, expanding forest area can have negative effects on mitigation: for instance, in boreal regions, forests have lower albedo than snow; as a result, increasing forest area would tend to increase absorption of solar radiation in those areas<sup>3</sup>.

<sup>2</sup> Forest Sector Outlook Study, 2020-2040, ECE/FAO, 2021, Geneva Timber and Forest Study Paper 51. This study made a first analysis of these scenarios, but much further work is needed)

<sup>3</sup> T. Manninen and E. Jääskeläinen, "The Effect of Snow on Boreal Forest Albedo," IGARSS 2018 - 2018 IEEE International Geoscience and Remote Sensing Symposium, Valencia, Spain, 2018, pp. 5184-5187, doi: 10.1109/IGARSS.2018.8517671.

# Safeguarding the future sustainability of European forests

## Criterion 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles

### Threats to the European forest carbon sink

For many years, the European forest has been a carbon sink, as area increased and only about  $\frac{3}{4}$  of the increment was harvested. In recent years, there have been reports from forest inventories that the sink has been declining, or even, in a very few cases, the forest has become a source, not a sink of carbon<sup>4</sup>. These declines have been attributed to increased forest damage (insects, fires, storms) as well as to high harvest levels, partly due to the damage, and partly due to market conditions. Given the importance of maintaining and increasing the European forest sink, policy makers, forest managers and market actors are confronted with increasing requests for management strategies to maintain the sink capacity of forests. This is not a trivial question. For instance, old growth forests have a high C storage capacity and high biodiversity, but in the long term a low C fixation capacity and a high risk of forest damage. If the growth of forests continues to decline, the conflicts between timber utilisation and increasing forest C-pools will intensify. It is not yet clear whether the declines in carbon sinks are temporary or structural.



### Key Policy Questions

- Should Europe's forest area be increased? To what level? If so, where and with what management objectives?
- What is the optimum contribution European forests can make to achieving carbon neutrality? How should the trade-offs between carbon sequestration and storage, in forests and harvested wood products, and substituting fossil-rich materials and fuels be resolved?
- What measures are necessary to protect the European forest carbon sink? Should forests be understood only as a C-sink or as a C-pump<sup>5</sup>?
- How should the commitments to plant trees be achieved? On what land? With what management objectives? With what funding? How can it be ensured that new forest areas do not displace other unique, non-forest habitats?

4 LINDROTH, A., LAGERGREN, F., GRELLE, A., KLEMEDTSSON, L., LANGVALL, O., WESLIEN, P. and TUULIK, J. (2009), Storms can cause Europe-wide reduction in forest carbon sink. *Global Change Biology*, 15: 346-355. <https://doi.org/10.1111/j.1365-2486.2008.01719.x>

Booth, M.S. (2022) Burning up the carbon sink: How the EU's forest biomass policy undermines climate mitigation, and how it can be reformed. Partnership for Policy Integrity. <https://forestdefenders.eu/wp-content/uploads/2022/11/PFPI-Burning-up-the-carbon-sink-Nov-7-2022.pdf>

Pilli, R., Alkama, R., Cescatti, A., Kurz, W. A., and Grassi, G. (2022). "The European forest carbon budget under future climate conditions and current management practices." *Biogeosciences*, 19(13), 3263-3284

5 Köhl, M., Martes, L.M., 2023. Forests: A passive CO<sub>2</sub> sink or an active CO<sub>2</sub> pump? *Forest Policy and Economics* 155, 103040.

# Criterion 2: Maintenance of Forest Ecosystem Health and Vitality

Climate change is profoundly modifying the environmental conditions for European forests. Nature responds to changing environmental conditions with three strategies: adaptation, migration or extinction. All three strategies are accompanied by significant shifts in ecosystem processes, which must be taken into account and promoted by management measures. However, all these processes take place over long periods of time, usually several decades. As there is no time for long-term experiments, the effects of climate change are already clearly manifest, and the third option (extinction of existing forest ecosystems in the absence of human-led adaptation) is probably unacceptable to society, all available adaptation measures must be taken to safeguard the multiple forest functions. This seems appropriate given that almost all European forests are cultural landscapes characterized by human intervention.

Healthy and vital forests are a basic prerequisite for the provision of ecosystem goods and services, but are increasingly affected by damages and disturbances<sup>6</sup>, which can have biotic (living organisms) and abiotic (e.g. storm, snow, drought) causes<sup>7</sup>.

## Resilience of European forests faced with climate change

Faced with the rising damage to forests, the challenge is to increase the resilience of each forest ecosystem, taking account of its specific characteristics, and the possible threats to it. Resilience will be a key concept to maintain forest functions and services for the future, and a lead topic of FOREST EUROPE, e.g. via its FoRISK Facility<sup>8</sup> starting in 2025. Resilience implies the ability of a system to absorb or withstand changes and disturbances, while also maintaining important ecosystem processes and functions. In times of climate change this might not result in a return to an original state. The major challenge is however the need to manage uncertainty about future conditions in a changing climate, which deprives managers of the benefit of lessons drawn from the past.

Forest managers have a portfolio of options to adjust to potential threats and a changing climate, thus maintaining the health and vitality of the forests. This may include pro-active management to prevent forest disturbances and mitigate future impacts, integrating climate change adaptation with forest restoration (“pre-restoration”), and consideration of how to make forest value chains resilient to changing material supply<sup>9</sup>.

## Adaptive forest management

Adaptive forest management aims to respond to a situation where forest managers are obliged to take decisions with very long-term consequences despite insufficient and uncertain knowledge of



6 There is an important difference between the two terms disturbance and damage: disturbance is ostensibly value neutral. Damage relates to negative impacts to human values. For example, under this distinction, tree mortality would be considered as disturbance within ecological process, or as damage due to economic loss of merchantable wood.

7 FAO/ECE, 2024: Reporting on forest damages and disturbances in the ECE region. ECE/TIM/SP/57, Geneva.

8 [Pan-European Forest Risk Facility - FOREST EUROPE](#)

9 [Forests for the future: How can forest resilience support Sustainable Forest Management? | Policy Brief](#)

## Safeguarding the future sustainability of European forests Criterion 2: Maintenance of Forest Ecosystem Health and Vitality

future conditions. The guiding principle of adaptive forest management is to consider possible scenarios of future climate and their impacts on specific forests, take decisions based on this estimation and thereafter closely monitor developments, ready to adapt the choices made in the light of experience. To understand risks and take appropriate action is facilitated by knowledge sharing, between forest managers, and between regions, in order to benefit from the experience of regions which already have the climate which is expected.

While public agencies, and a few large private forest owners have the resources to develop and put in place their own strategies for adaptive forest management, this is not the case for smaller private owners, who will need support, notably in the form of guidelines suitable to the particular circumstances of their region.



### Key Policy Questions

- What is the best strategy to improve the resilience of European forests faced with climate change?
- How can policy makers best promote and support adaptive forest management?



# Criterion 3: Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood)

## Market consequences of large-scale forest damage

Forest damage as discussed above has market and socio-economic consequences as well as silvicultural ones. An urgent question for forest owners facing calamities is whether it is possible to salvage some wood from the area, to limit further infestation, and to provide some revenue. Salvage harvests are sometimes contested on ecological grounds, which has led to bitter technical and legal disputes. The volume of salvage harvests appears to have increased in recent years. The arrival of large unplanned volumes of wood, on markets which are already weak, depresses prices, for the affected owners, as well as for unaffected areas where harvest was planned, causing livelihood problems for many small forest owners. It also disrupts trade patterns, creating new roundwood flows, thus giving bargain opportunities to some buyers while complicating sales for those unaffected by catastrophe.

Measures can be taken to reduce market disruption and economic loss when catastrophes bring large volumes of roundwood suddenly onto the market. Fluctuations in wood supply can be reduced by wet storage, thus spreading release of the wood onto the markets over a longer period and reducing GHG emissions from the decomposition of the damaged trees. Financial compensation can be offered to those whose livelihoods have been affected, and guidance supplied on harvesting (often dangerous for forest workers, especially after storms), storage and marketing of salvage timber as well as regeneration of the forest. Ideally, all these measures should be implemented rapidly: authorities and other agencies (e.g. forest owner associations) should therefore prepare the ground, and plan measures which can then be put into effect quickly. This could concern strategies, communication (with the owners, the public and between agencies), legal measures, financing systems etc. If, as seems likely, this type of damage becomes more frequent, planning and preparation become even more necessary.

## Wood supply for innovative wood-based products

Over the past decades, many innovative wood-based products have been developed and brought to market, which typically require more advanced mechanical and chemical processing than the traditional forest products, in more capital-intensive factories. These plants often have strict quality requirements for their raw material, and need large volumes, to justify the capital involved. Often, the private sector companies installing the processing capacity are global players and able to choose where the capacity is installed, in Europe or elsewhere. They usually require wood supply which is homogeneous, high quality and at an acceptable price. If Europe is to continue to have wood processing industries which provide cutting edge products capable of substituting fossil-rich materials, it must ensure wood supply adequate for their needs. In many cases, this could imply a single species/species group, concentrated around the mill (to reduce transport costs), managed at a large scale (or with streamlined arrangements with private owners), all at an attractive price. Usually this involves one or more large suppliers (e.g. state forest services or large forest owners), who can provide long-term security of supply, and/or coordination of smaller



# Safeguarding the future sustainability of European forests

## Criterion 3: Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood)

scale suppliers. There may well be trade-offs between the silvicultural requirements for a homogeneous wood supply from intensively managed resources for innovative wood products and the requirements to maintain and develop other forest functions, notably biodiversity, but also carbon storage in the forest, amenity values and recreation. This consideration is linked to the discussion about spatial segregation vs. integrative management discussed below.

### Sustainability of intensively managed forests

There are millions of hectares of intensively managed planted forests in Europe, which supply wood of the right quality, at the right price, to capital-intensive processing plants. They are characterized by the priority given to wood production, and often contain only one or two species, sometimes introduced, which have been planted or coppiced, often in lines for easier thinning and harvesting. They play an important economic role for employment and source of revenue, and as the basis for processing plants which add much value to the raw material they use, often in rural areas which have few other sources of income. Nevertheless, these intensively managed forests are harshly criticised by many parts of society, mainly because of their lack of biodiversity, and over-simplified ecosystems, as well as their lower resilience in the face of climate change (e.g. prone to drought and damaging agents).

The future role of intensively managed forests in Europe will need an emerging societal consensus within the scope of sustainable forest management.

### A level playing field for wood from all sources

As markets for forest products, roundwood and pellets have become increasingly global, European wood suppliers have found themselves in competition with raw material and products from outside Europe.

There have been concerns that the competitiveness of extra-European wood sources is based not only on climate, location and scale of operations, but also on forms of silviculture which would not be acceptable in Europe, in particular intensively

managed monospecific plantations. It is also claimed that in some countries these plantations have been established without the consent of indigenous peoples or that indigenous peoples are not included in management decisions or the benefits derived from the plantations. There have been many calls for a global “level playing field” to prevent a race to the bottom as regards biodiversity, deforestation, indigenous peoples and other issues, and some policy measures to achieve this end have been put in place, notably the EU Timber and Deforestation regulations. In the absence of a globally agreed official standard of sustainable forest management, the countries concerned have responded that it is not for European countries to impose their standards on other regions, and that measures to impose European forest management standards on other regions are simply non-tariff measures to protect European wood suppliers.

Measures to achieve a level playing field based on controlling access to European markets while



## Safeguarding the future sustainability of European forests

### Criterion 3: Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood)

retaining compliance with international trade law have proved complex to implement, because of difficulties in defining criteria and thresholds applicable worldwide, and in tracing millions of small-scale flows of raw material and products. On the other hand, governance approaches such as FLEGT and REDD have been applied to reduce non-sustainable forest management and deforestation.

This experience demonstrates the complexity of ensuring a level playing field for European wood producers, while respecting the rights of all those concerned, including small forest owners and those

outside Europe, and finding an agreement on the nature of sustainable forest management which is applicable worldwide. It takes its place alongside other tensions about the negative consequences of globalisation, on livelihoods, the environment and social equality. This debate touches every region and every sector and constitutes one of the major ongoing international uncertainties. For policy makers responsible for European forests the challenge is to navigate between conflicting interests and values, while respecting the existing international framework of trade law.

## Key Policy Questions

- How to put systems in place to reduce market disruption due to large scale forest damage?
- How to ensure a reliable wood supply suited to innovative products based on wood from European forests?
- What measures should be implemented to ensure a level playing field on global markets for wood and products from Europe and from other regions?



# Criterion 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems

Biodiversity is one of the most hotly debated forest related topics. Biodiversity of forest-dwelling species is altered by forest management, and impacts have different directions over time and space. Large canopy openings (e.g. clear-cuts) and removal of woody debris affect species depending on continuous forest cover, large trees and deadwood such as saproxylic<sup>10</sup> beetles, fungi, lichens, or bryophytes<sup>11</sup>, while vascular plants are generally favoured by forest management. It has been shown that fungi and wood-dwelling beetles depend on the diversity of tree species and not on the amount of deadwood<sup>12</sup>. The response of birds is heterogeneous as their habitat is often influenced not only by the forest but also by the surrounding landscape patterns. The common bird index has developed much better for forest birds than for those of other habitats, notably agriculture<sup>13</sup>.

In Europe, the UNCBD ecosystem approach is implemented through close-to-nature forest management in the context of SFM that results in structurally rich, uneven-aged mixed species forests and maintains a sufficient supply of deadwood and habitat trees. Nevertheless, it may be necessary to place particularly valuable and unique forest sites under protection and discontinue their utilisation.

## Long term perspective

The management of forests requires a long-term perspective. Most even-aged stands that are ready to be harvested today were established 80 or more years ago. During this period, social and political

attitudes towards Europe's forests and demands for ecosystem services have fundamentally changed<sup>14,15</sup>. Forest management, which is tied to the long-term development of stands, cannot react immediately to these changing attitudes, but only with a time lag. National and local biodiversity measures need therefore to be based on a long-term perspective and be designed to last for decades with support from a broad social consensus.



10 Pertaining or related to dead or decaying wood

11 Mosses, liverworts, hornworts

12 Edelmann, P., et al. (2022). "Forest management affects saproxylic beetles through tree species composition and canopy cover." *Forest Ecology and Management*, 524, 120532.

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13 <https://www.eea.europa.eu/en/analysis/indicators/common-bird-index-in-europe>

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14 Millenium Ecosystem Assessment (2005). <https://www.millenniumassessment.org/en/Condition.html>

15 Sheppard, J.P., et al. (2020): Sustainable forest management beyond the timber-oriented status quo: transitioning to production of timber and non-wood forest products – a global perspective. *Current Forestry Reports* 6:26-40

# Safeguarding the future sustainability of European forests

## Criterion 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems

### Principle of the local

There is no such thing as the “European forest”. There exists a variety of natural forest types in Europe<sup>16</sup>. Site conditions can change on a small scale. The heterogeneity of European forests requires an assessment of biodiversity based on local conditions. For this reason, there can be no uniform top-down specifications for biodiversity, such as a minimum proportion of deciduous trees or a minimum amount of dead wood. Key biodiversity parameters and baselines calibrated for European forest types need to be implemented that allow for monitoring progress towards biodiversity<sup>17</sup>.



### Climate change and restoration of biodiversity

Climate change is a major challenge for biodiversity conservation in forest landscapes, as it can alter forest ecosystems and the distribution of species, and

increase the risk of forest fires and other disturbances by changing the basic parameters of each site. Biodiversity restoration is undergoing a paradigm shift in times of climate change. The “natural” vegetation of a site can change due to changing temperature and precipitation patterns. Measures to maintain and enhance biodiversity must take account of local site conditions and their change over time, and not aim simply at restoring a previous situation, which may no longer be compatible with the new climate. Adaptation to changing conditions is an essential part of biological evolution, but it takes time, especially in long-lived forest ecosystems, and climate change is progressing fast. It is important to connect and coordinate activities around SFM, restoration and adaptive forest management in order to avoid the multiplication of pathways with similar purposes.

### Areas set-aside for biodiversity conservation

A frequently voiced demand for the protection and restoration of biodiversity is the designation of areas where utilisation and human intervention are completely suspended so that forests are left to natural ecosystem processes and not constrained by management. However, natural processes in set-aside areas do not rule out drastic developments such as the collapse of entire forests. Such developments can be observed in the German Harz National Park, for example. In view of the uncertainties surrounding future climate change the potential for drastic developments, which may be perceived negatively by the general public, should not be underestimated. This could pave the way for new, adapted forests, but also for non-forest ecological communities.

Clear guidelines for the selection of areas where human intervention is completely suspended are needed. These might take into account the suitability of forests for the various objectives and consider the needs of different interest groups affected by forest development. Ultimately, guidelines could serve to balance unrestricted, natural development processes with the need to preserve multiple forest functions.

<sup>16</sup> European Environment Agency (2006). European forest types. Categories and types for sustainable forest management and reporting. EEA, Report No. 9/2006.

<sup>17</sup> Hawkins, F., Beatty, C. R., Brooks, T. M., Church, R., Elliott, W., Kiss, E., Macfarlane, N. B. W., Pugliesi, J., Schipper, A. M., and Walsh, M. (2024). “Bottom-up global biodiversity metrics needed for businesses to assess and manage their impact.” *Conservation Biology*, 38(2), e14183.

# Safeguarding the future sustainability of European forests | Criterion 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems

## Roadmaps for biodiversity management

Everyday choices in managing forests play a key role in promoting biodiversity. At the forest management unit level, there is a need for roadmaps which may pursue several objectives: (1) guidelines for site-adapted and integrated forest management to create conditions that enhance biodiversity in managed forests, (2) criteria for the selection of set-aside areas, and (3) measures to increase competence and co-operation between different stakeholders<sup>18</sup>. Existing roadmaps may well need revision in the light of new knowledge, of climate change, and of changing societal expectations for forests. Equally important will be the consideration of genetic diversity and its management for the adaptive capacity of tree species for future forests.



<sup>18</sup> Metsäteollisuus (2024). Roadmap for the wood processing industry - more biodiverse forests, available at <https://www.metsateollisuus.fi/newsroom/roadmap-for-the-wood-processing-industry>

## Key Policy Questions

- Should policy on biodiversity be modified in the light of climate change?
- Should the concept of biodiversity restoration be seen as aimed at restoring a past state or as promoting biodiversity under changing environmental conditions?
- Should the balance between protection and use be implemented at the level of individual forest sites or in a landscape context?
- How to develop clear, and site appropriate, guidelines for setting aside areas for biodiversity?
- How can local conditions for biodiversity be incorporated into forest policy initiatives?
- What levels of biodiversity protection should be mandatory for forest owners? On what areas?
- Should private forest owners be financially rewarded for efforts to protect biodiversity?



# Criterion 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management

The protective functions of forests are often underestimated notably because they are a cross-cutting issue with system boundaries which are not always clear. Very often it is not forest stands that are in the focus but entire watersheds or smaller regions.

However, protective functions are one of the key ecosystem services forests provide and can also be linked to a broader spectrum of welfare services such as soil and water protection as well as air quality, climate regulation and health aspects.

for forests' protective role. For instance, melting permafrost and excessive precipitations lead to erosion and landslides which destroy forests and reduce their capacity to protect mountain populations and infrastructure. Drought can encourage desertification, reducing forests' ability to provide shade and protect watersheds. These developments have significant policy consequences, as the forests' protective functions - often taken for granted by the public - play a crucial role in many situations, protecting lives, livelihoods and very valuable infrastructure.

In many areas, notably in mountainous and dry regions, the protective role of forests cannot easily be replaced: in some cases, forests could in theory be replaced by engineering measures (e.g. tunnels, avalanche barriers), but these are typically much more expensive, slow to construct and need considerable maintenance, not to mention their effect on landscape and biodiversity. In some of these regions, the protective functions provided by forests are essential to human habitation: if they are lost, the village or other installation may have to be abandoned. This justifies extreme silvicultural measures to maintain the forest, and funding, perhaps from non-forest sources, to cover these expenses.

## Protective role of urban trees and forests

Urban forests and trees are increasingly recognized for their role in regulating temperature and humidity, as well as providing amenity and health services for city dwellers. Delivering these benefits in an urban environment is complex and expensive, because they address multiple objectives in limited space. Also, public perception of forests and green infrastructure differs in urban communities compared to rural areas. Hence, management of urban trees and forests requires rather different approaches than traditional forest management and must be fully integrated into urban planning processes. Agencies responsible for forest management must work closely with agencies responsible for vegetation in an urban setting. Overall, the protective functions of urban trees and forests need additional attention in an increasingly urbanized society. This requires a different governance and management set-up, while opportunities for communication and education on forests and forest services could be excellent spin-offs.

In principle, we can distinguish three categories of protection: (a) the protection of the forest ecosystem as such (e.g. prevention of erosion, droughts), (b) the provision of goods and services (e.g. drinking water), and (c) the protection of human infrastructure and welfare against natural hazards (e.g. flooding, landslides, avalanches).

## Special focus on areas with protective functions

Several effects of climate change, especially in mountainous areas, have negative consequences



# Safeguarding the future sustainability of European forests

## Criterion 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management



### Key Policy Questions

- In certain forest areas, should the protection of infrastructure and people take precedence over other forest functions?
- How should the conservation of protective forests be financed?
- Does the area of protective forests need to be expanded in view of climate change?
- What measures are necessary to expand the protection provided by urban trees and forests?



# Criterion 6: Maintenance of other socioeconomic functions and conditions

## Bioeconomy: the contribution of the forest value chain

The bioeconomy is at the centre of many long-term strategies for sustainable development, and favours the use of renewable and recyclable materials, like wood. The forest value chain is already making major contributions to the objectives of the bioeconomy.

Nevertheless, forest sector policy makers should consider whether the forest value chain can increase its contribution to the bioeconomy beyond “business as usual”, where this improvement could take place, and how it should be developed and funded. Priority areas for increasing the contribution of the forest value chain to the bioeconomy could include the substitution of products based on fossil-rich materials by wood derived products, further increases in recycling and reduction of waste throughout the value chain, and innovative products and systems based on wood and other renewable materials. In all

these areas the private sector can take the leading role but there is a need for coordination and stimulus from policy makers.

It is also important to communicate strongly that the forest value chain is both renewable, in accordance with its traditional values, and innovative in playing its role in a rapidly evolving society and economy.

## Payment for ecosystem services

Forests have a wide range of functions and provide many benefits, to their owners, and to others who benefit directly or indirectly from their services. The costs of providing these benefits are still almost exclusively borne by forest owners, while many benefits are accessed free of charge, for instance in the case of public goods such as protection, health and welfare services. Sometimes additional costs linked to the supply of benefits are even imposed on the owners (e.g lost profits due to the establishment of habitat trees or set aside areas, reduced harvest volumes with unchanged silvicultural costs).

Payment for ecosystem services (PES) is an emerging approach to resolve the problem of providing ecosystem services while sharing burdens and remuneration fairly. However, PES<sup>19</sup> although seen by some as a market-based game changer, has not yet transformed the basic situation, or attracted significant volumes of extra funding, at least for European forests.

The reasons behind this lack of progress are manifold, including technical issues of valuation and monitoring, identification of beneficiaries and suppliers of the specific service, the legal framework for these payment systems, and shortage of funds.

Payment for forest ecosystem services will not expand significantly without a much stronger regulatory, legal and social infrastructure, not to mention the willingness of beneficiaries to pay for services which until now they have received free of charge. This will require a major change in mentalities, significant funds and political will. Nevertheless, systems of payment for forest ecosystem services has the potential to remove distortions, reward sustainable forest management and attract new sources of income.



19 Defined strictly as transfer of resources for an identified and quantified service, rather than a general subsidy system.

# Safeguarding the future sustainability of European forests

## Criterion 6: Maintenance of other socioeconomic functions and conditions

### Circular use of wood and forest products

The record of the wood-based value chain in the circular economy is broadly satisfactory: manufacturing by-products are often used as raw material for other products, recycling of paper is well advanced, and wood-based products such as palettes are increasingly also recycled. Residues at all stages are often recovered and used as raw material or a source of energy. Wood itself is biodegradable – although wood-derived products may not be. However, there is considerable potential for further improvement in the contribution of the wood-based value chain to the circular economy. Recycling of wood-derived products could be increased, as shown by experience in a few European markets. Wood consumption can be reduced through efficiently engineered wood products. Products can be designed for easy dismantling as a preparation for reuse (e.g. temporary housing) or more complete recycling (by keeping materials with different characteristics separate from each other).

However, investments and policy measures are necessary to accelerate these developments. Research and investment in processing, design of “reuse friendly” products, structuring of systems of recovery and reuse with many actors, public and private, would all stimulate this work.

### Carbon markets

Carbon markets are a specialized and highly structured form of payment for ecosystems services, by which payments are made for activities which sequester or store carbon, through a wide variety of systems, public and private. In fact, many of the projects, notably on the voluntary carbon market, have concerned carbon sequestration by trees. Recently, however, carbon markets have encountered significant problems, of trust and of effectiveness. At a technical level, these problems concern monitoring of projects, ensuring that the payments reward additional carbon sequestration (not only what that ecosystem would have done in any circumstances), and the permanence of the carbon storage, notably, for forests, at the end of the rotation, when the trees are harvested, or if there is forest damage. In addition, some market actors, intermediaries, and certifiers

have been accused of lack of transparency, even criminal behaviour. This applies in particular to the definition of reference areas and benchmarking. To be effective, the carbon price should be at levels which make carbon sequestration, storage, and substitution economically viable. In recent years, however, it has been rather low. Measures are in hand to address these problems, but it is too early to say what will be the outcome. In the recent past most forest-related carbon transactions were based outside Europe, so that, at present, very little funding from carbon markets has gone to European forests.

Nevertheless, in a situation of shortage of funding for sustainable forest management, the principle of rewarding carbon sequestration by European forests could be a central part of European forest policy, as it would focus on one of the major contributions by forests to climate mitigation and could attract new sources of funding. To make this a reality it would be necessary to put in place a robust and transparent system of contracts and monitoring, adapted to



# Safeguarding the future sustainability of European forests

## Criterion 6: Maintenance of other socioeconomic functions and conditions

European conditions. In addition, since carbon markets reward only one of the forest's functions - carbon sequestration - agreement would be necessary on how best to combine management for carbon with the other dimensions of sustainable forest management, notably biodiversity conservation and wood production.

### Livelihoods of forest dependent people and communities

Many livelihoods in Europe depend on forests and the wood value chain: forest owners and workers, and employees of wood processing plants. Many of these people have relatively low revenue and live in remote rural areas with the associated social problems. In a few areas in Europe, forestry alongside agriculture is the main source of livelihoods. Recent years have seen wood prices at low levels, while inflation has continued to raise costs, increasing the pressure on livelihoods. It appears that in some areas, forests are not at present in a position to provide the socio-economic benefits which are an essential part of sustainable forest management. Increasingly, land abandonment is observed as a consequence (e.g. in Eastern Europe), which has negative impacts both on the demographic development of regions but also on the means to implement land use policies.

Where this is the case, authorities and state forest agencies have tools at their disposal to promote the economic sustainability of forest dependent people and communities, including payment for ecosystem services, support for investment in forest related

enterprises, and improving the socio-economic situation of forest dependent communities. The main challenge at present is to make the case for these communities, in a situation of limited overall public funding, and competition for that funding from many other deserving communities.

### A sustainable work force

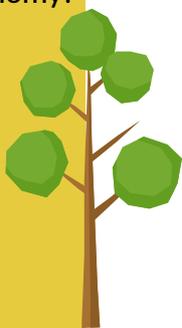
Despite improved productivity and widespread mechanization, there are concerns about attracting and retaining sufficient workers, with appropriate skills. At present the workforce in many countries is ageing, and sometimes does not have the skills necessary for more highly skilled functions, including managing advanced equipment and being increasingly in contact with the public. The required skillset has been changing, and there appears to be a need to move towards a smaller, but better qualified workforce, with skills also in communication and administration.

Forest work itself remains one of the most dangerous activities, despite continuous efforts in many countries. To address these challenges, it is necessary to improve the conditions of the forest workforce: income, contractual and social status etc. The highest standards of occupational safety and health should be applied to everyone working in the forest, including contractors and casual labour.

There is a move to promote "green jobs" in the manufacture of products, technologies and services that prevent environmental damage and conserve natural resources.

## Key Policy Questions

- What measures are needed to help the forest value chain increase its contribution to the bioeconomy beyond "business as usual"?
- How to develop and put in place systems for payment of ecosystem services?
- What policy measures are needed to increase the forest value chain's contribution to the circular economy?
- How to attract funding for the protection of the livelihoods of forest dependent people and communities in Europe?
- What measures are needed to put the forest workforce on a sustainable basis and to ensure satisfactory occupational safety and health of forest workers?



# Cross-cutting issues

## Monitoring

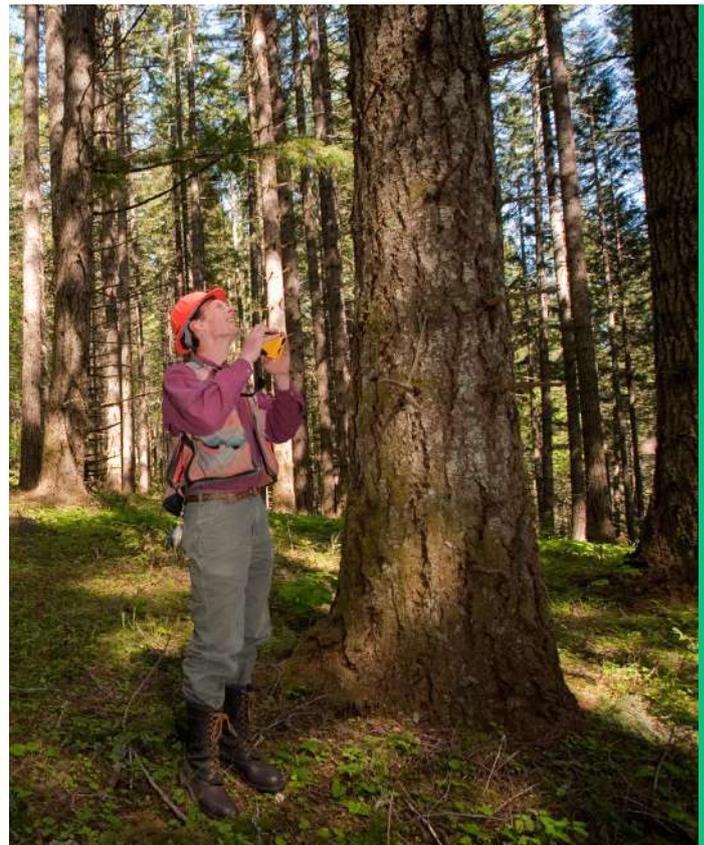
National forest inventories (NFIs) play a crucial role in Europe by providing comprehensive and reliable information about the status, trends, and characteristics of forests in the region. NFIs are systematic and periodic assessments of forest resources conducted at the national level, with standardized methods and protocols to ensure consistency and comparability over time. Although forest inventories have been carried out regularly in most European countries since more than four decades, policy makers concerned with forests often state that they have insufficient information to make their decisions, as several elements which have considerable policy priority are difficult to describe by representative indicators and sometimes, data collection and processing takes a long time.

On the socio-economic side, the number of forest dependent people and their economic importance is relatively small in Europe, compared to, for instance, farmers, making it difficult to justify the expensive data systems underpinning decisions on agricultural and other policies. There have been many efforts to improve the situation, notably the creation of national and international indicator sets for sustainable forest management, broadening the scope of national forest inventories, and the increased use of remote sensing technologies, but there are still gaps and delays. It appears necessary to ensure that more reliable, meaningful and transparent information is provided on a time scale appropriate to decision making on policy.

## Towards consensus on the main objectives of sustainable forest management

There have been passionate debates, at the policy level, and inside society, in Europe about a number of forest related topics, including the conservation of forest biodiversity, the acceptability of intensively managed plantations and the role of wood energy, forest damage, and Europe's role in global deforestation. These debates have cast light on differences of opinion inside society on what is the fundamental nature of a forest, what society expects from a forest. Those different perceptions and values cause challenges in formulating and implementing

forest-relevant policies which will have the full support of the public. These differences of opinion stem from fundamental changes in the values of society, and problems of communication between different groups: young/old, rich/poor, rural/urban, level of education etc. as well as social, institutional and ecological differences between countries, or regions within countries. To improve social consensus on these issues, and the broad objectives of sustainable forest management, debate should be transparent and open, and not exclude any group. Furthermore, it should be based on objective analysis and the best possible information. Failure to go through this phase of comprehensive transparent discussion would probably result in further tension and contestation of policy decisions.



## Spatial segregation or integrative forest management

Different approaches are being discussed to maximize the efficiency of biodiversity maintenance and enhancement. One approach is spatial segregation that assigns priority functions to individual forest areas and designates areas where timber harvesting

is suspended or limited. An alternative approach is integrated forest management<sup>20</sup> that aims to fulfil multiple objectives at different spatial scales (single trees, groups of trees, stands, landscape levels) and different time horizons (e.g. temporary or long-term protection of individual trees or entire forest areas)<sup>21</sup>.



Integrative forest management is a suitable way to implement the UNCBD Ecosystem Approach by combining on the same area biodiversity protection and utilization of the resource. Segregation, on the other hand, can only be implemented at the landscape level. However, there is a risk with the segregation approach that biodiversity conservation will be strictly focused on set-aside areas and the utilization function will be too strongly prioritised in other areas, for example by industrial plantations. If spatial segregation is chosen as the approach, it is imperative to develop criteria for the selection of set-aside areas worthy of protection.

20 [See also Integrate Network - Promoting the integration of nature conservation into sustainable forest management](#)

21 Krumm, F.; Schuck, A.; Rigling, A. (eds), 2020: How to balance forestry and biodiversity conservation – A view across Europe. European Forest Institute (EFI); Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Birmensdorf. 640 p.

If a fixed percentage target for set-aside areas is decided, there is a tendency for forest owners to select areas for set-aside that generate a low economic yield or are state-owned, rather than the areas with priority for biodiversity conservation. If the proportion of timber produced in private forests increases due to a large amount of set-aside areas in public forests, private forest owners can exert a much stronger influence on timber markets through price demands and marketed timber volumes. This would have an impact on the introduction of the bioeconomy, which is expected to result in an increase in wood consumption. However, greater protection of the biodiversity of European forests must not lead to a “not-in-my-backyard” attitude, which would displace biodiversity decline to regions outside Europe.

### **Investing in research and development, and in industrial capacity**

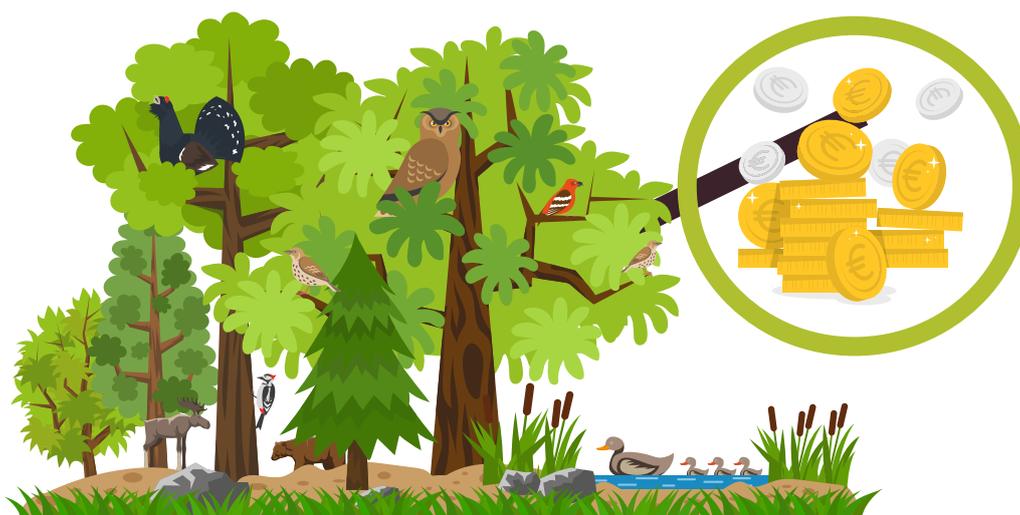
Innovative products derived from wood are needed to provide outlets for European wood supply and to substitute for fossil-rich products, as described above. These products include engineered wood products, paper and paperboard grades with specialised qualities, man-made cellulosic fibres, and products of biorefineries. Innovation may well develop other products. While the forest sector is not perceived as overly innovative, the forest-based value chain is. It will be necessary to bridge this gap and make the entire forest-based sector an essential backbone of a fossil-reduced bioeconomy.

To achieve this will require very considerable research and development by the private sector, and investment in manufacturing capacity. European countries will seek to keep the revenue from both the research and development, and the capacity within the European value chain, to the benefit of the communities where they are based. Governments and the EU may play a role in facilitating these investments, while maintaining the requisite standards for forest management, pollution, worker safety and health.

## Innovative structures and new funding sources

Many of the measures mentioned in this paper imply new funding for sustainable forest management or other parts of the value chain, to keep the whole sector on an economically sustainable basis. Yet most European governments are at present in a phase of limiting public funding overall, after the major outgoings - and increased indebtedness - during the pandemic, and increased defence spending as a reaction to the war in Ukraine. This situation poses severe constraints on traditional sources of public funding for forests. To expand the funding available, it

will be necessary to find new and innovative sources. Possibilities could include, as discussed above, payment for ecosystem services, improved access to carbon markets, or the large post-pandemic recovery funds, like the EU Green Deal. To access these funds, forest managers and authorities will have to make the case that their activities are in line with the objectives of the new funding source, while maintaining the commitment to sustainable forest management in all its dimensions. This will require flexibility and excellent communication.



## Key Policy Questions

- How should monitoring systems to be improved to provide policy makers with relevant and objective information, in time to be useful for decision making?
- What actions and measures are needed to construct a social consensus about the main objectives of sustainable forest management, supported by all major groups in society.
- How best to combine the approaches of spatial separation and integrative forest management to optimise the provision of the multiple benefits of European forests in a sustainable way?
- Where should the necessary funding be found for investment in research and development as well as manufacturing capacity?
- What innovative sources and structures could increase the funding for sustainable forest management in Europe?



# Conclusions

This report has identified many opportunities and challenges for European forest management. These opportunities and challenges address all the pan-European criteria of sustainable forest management. They are complex and interact with each other and with challenges outside the forest sector. Many are cross-cutting in nature. Almost all of them are linked to the greatest challenge of the age – the response to man-made climate change. Many will require in-depth analysis, international cooperation and the commitment of significant resources to protect the sustainability of forest management in Europe. The magnitude and complexity of the challenges as summarised in this short paper have brought forest related questions to the attention of the wider public, outside the circle of “forest specialists”.

Finding solutions to these challenges is increasingly complex, because in recent years the raised profile of forest-related policy issues has been accompanied by a lack of consensus on the nature and broad objectives of sustainable forest management. There is increasing concern about the effects of climate change and loss of biodiversity, which have created significant divergences as to the general direction of policy for forests.

Some of these major forest policy questions are mentioned at the end of the thematic chapters. Despite the increased recognition of the importance of European forests, the time has come for a comprehensive and transparent discussion of these issues, aimed at achieving a broad societal consensus, as a basis for political action and social change. The achievement of such a consensus on these objectives and the values underlying them as well as a willingness on all sides to search for solutions seem to be essential preconditions for meaningful and dynamic action on the many issues related to European forests and forest policy.

