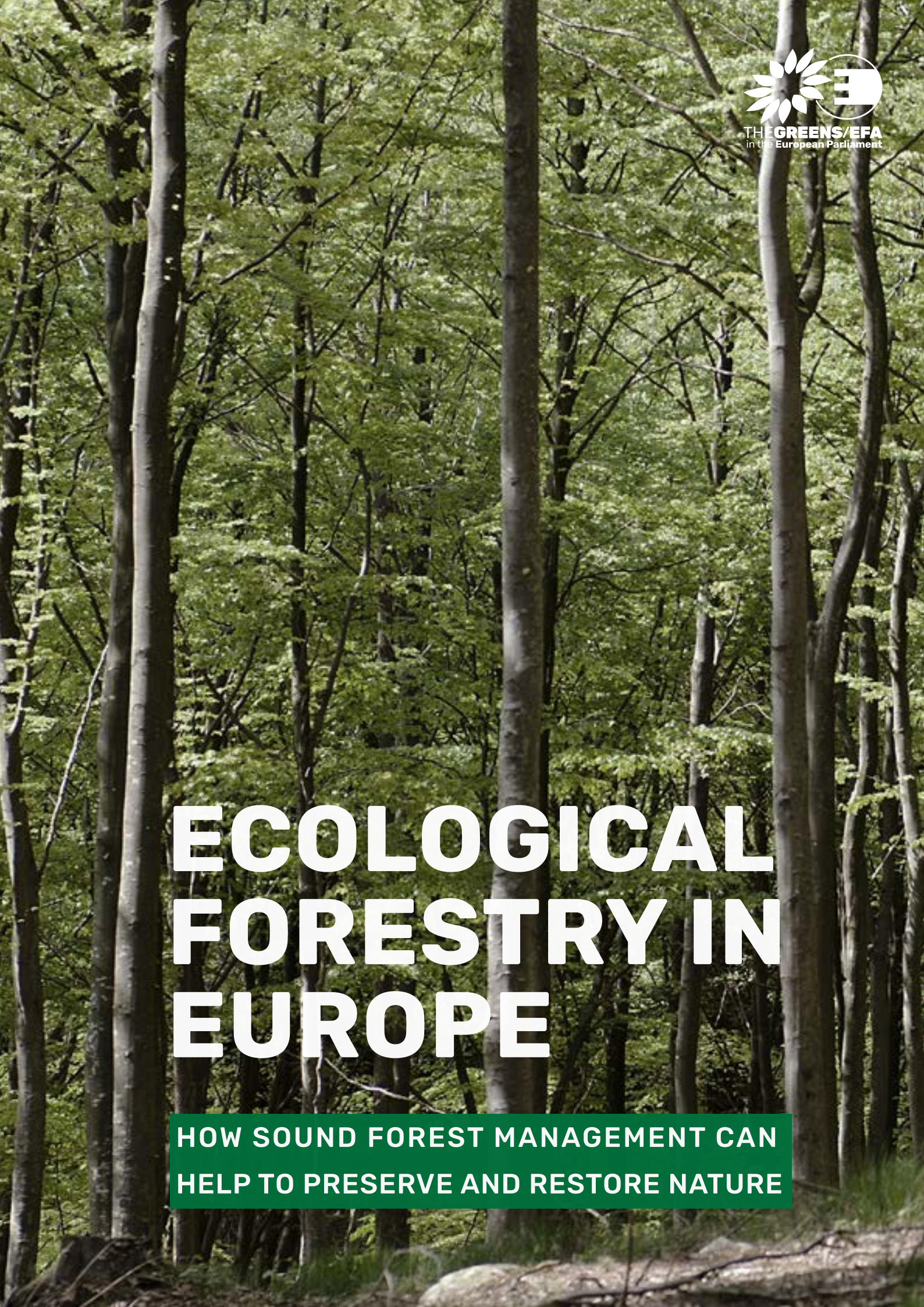

THE GREENS/EFA in the European Parliament

ECOLOGICAL FORESTRY IN EUROPE

HOW SOUND FOREST MANAGEMENT CAN HELP TO PRESERVE AND RESTORE NATURE

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Mixed forest. Photo: Christian Pedant/Adobe Stock

Cover: Beech forest in Sweden. Photo: Jonas Löwgren/Flickr (CC BY 2.0)

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SUMMARY

Forests are crucial to our attempts to avert climate catastrophe and restore nature. But the European Union's forests are in poor condition. They are losing wildlife and the capacity to absorb and store carbon, and succumb more easily to climate-related pressures. The main reasons are excessive wood harvesting and poor forest management, alongside a lack of forested areas that are strictly shielded from any logging.

Ecological forest management helps us preserve forests' vital ecosystem functions whilst meeting our needs as humans.

Close-to-nature forestry, here also called ecological forestry, is a model of forest management that emphasises maintaining or restoring a healthy and resilient ecosystem. It helps us preserve forests' vital ecosystem functions whilst meeting our needs as humans. This report sets out the main silvicultural principles behind this model. These include partial harvesting rather than clear-cutting, with younger and ecologically significant trees left to grow and fill gaps; a preference for natural regeneration rather than planting; developing structural diversity (different trees of different heights) and spatial variability within forests; fostering mixed species stands rather than monocultures; the maintenance of biomass in the forest (including deadwood) and avoiding intensive practices such as soil cultivation, herbicide application and the use of fertilisers.

Ecological forestry approaches are practised on an estimated 22 to 30 percent of the EU's forested area

Today, ecological forestry approaches are practised on an estimated 22 to 30 percent of the EU's forested area, although this varies considerably between countries and regions. It is the predominant model in Slovenia and some German states, and the basis for the management of all public forests in Denmark. But there are only limited cases in Portugal, Ireland, Finland and Sweden. However, even in countries where more invasive forestry practices remain dominant, there are increasingly examples of how a transition can be achieved. The report offers case studies of close-to-nature forestry from Denmark, France, Germany, Portugal and Slovenia.

One of the main objections raised to the expansion of close-to-nature forestry is that it comes at too great an economic cost. The available evidence does not support this assertion, however. Rather, the economic model supported by close-to-nature forestry is different to the one that underpins the predominant model of rotational forest management. Close-to-nature forests combine ecosystem resilience, biodiversity, carbon sequestration

and socio-cultural benefits, which are not necessarily reflected in studies concerning economic benefits. By creating additional jobs and development opportunities in the leisure and tourism sectors, as well as a value chain of non-wood forest products, close-to-nature forestry can also be beneficial to rural economies. Moreover, close-to-nature-forestry lowers economic risks since it is more resilient than the even-aged, same species stands typical of rotational forestry, with greater ability to withstand and recover from natural disturbances, and to adapt to changing climate conditions.

Close-to-nature forest management lowers economic risks. Forests have a greater ability to withstand and recover from natural disturbances, and to adapt to changing climate conditions.

A number of conditions need to be in place for a transition to close-to-nature forestry. Firstly, there is a need for adequate training in ecological forest management techniques in many parts of the EU, which is further hindered by the conservatism of "traditional" forestry schools. Secondly, an urgent priority is to redirect tax breaks and subsidies infavour of close-to-nature forest management, including both production and demand-side measures. Thirdly, there should be a dedicated funding mechanisms to address transition costs, including the investment needed to develop new forest management plans, re-training, and the purchase of new machinery. Eligibility criteria of any new fund should prioritise smaller-scale forest owners and contractors, to ensure that the new system does not disproportionately reward large companies that have benefitted from ecologically harmful practices.

We need a new perspective on the value of forests. Incentives for wasteful uses of precious forest resources, such as bioenergy, must be ended.

Alongside these priorities, it is important that we develop a new perspective on the value of forests. There are already more demands on forests than they can deliver, and close-to-nature forestry should be advanced alongside measures that reduce the demand for wood. Incentives for wasteful uses of precious forest resources, such as bioenergy, must be ended.

Importantly, ecological forestry cannot replace the environmental protection of forests. Primary and old-growth forests, and other forests with high conservation values, should be excluded from all types of forestry.

The EU can play an important role in supporting the expansion of ecological forest management. Specific EU policies that can help boost this type of forestry include: the European Commission's upcoming guidelines for "closer-to-nature forestry"; the proposed nature restoration law; the carbon removal certification law; an upcoming law on EU forest monitoring and strategic plans; and the delegated act on the four non-climate objectives of the EU taxonomy, which should include science-based criteria for forestry and bioenergy.

INTRODUCTION

Forests cover around 40 percent of the European Union's land area.[1] They are home to numerous species of flora, fauna and fungi, help purify the air we breathe and improve water quality, provide jobs and income to rural economies, and absorb and store large amounts of carbon dioxide from the atmosphere.

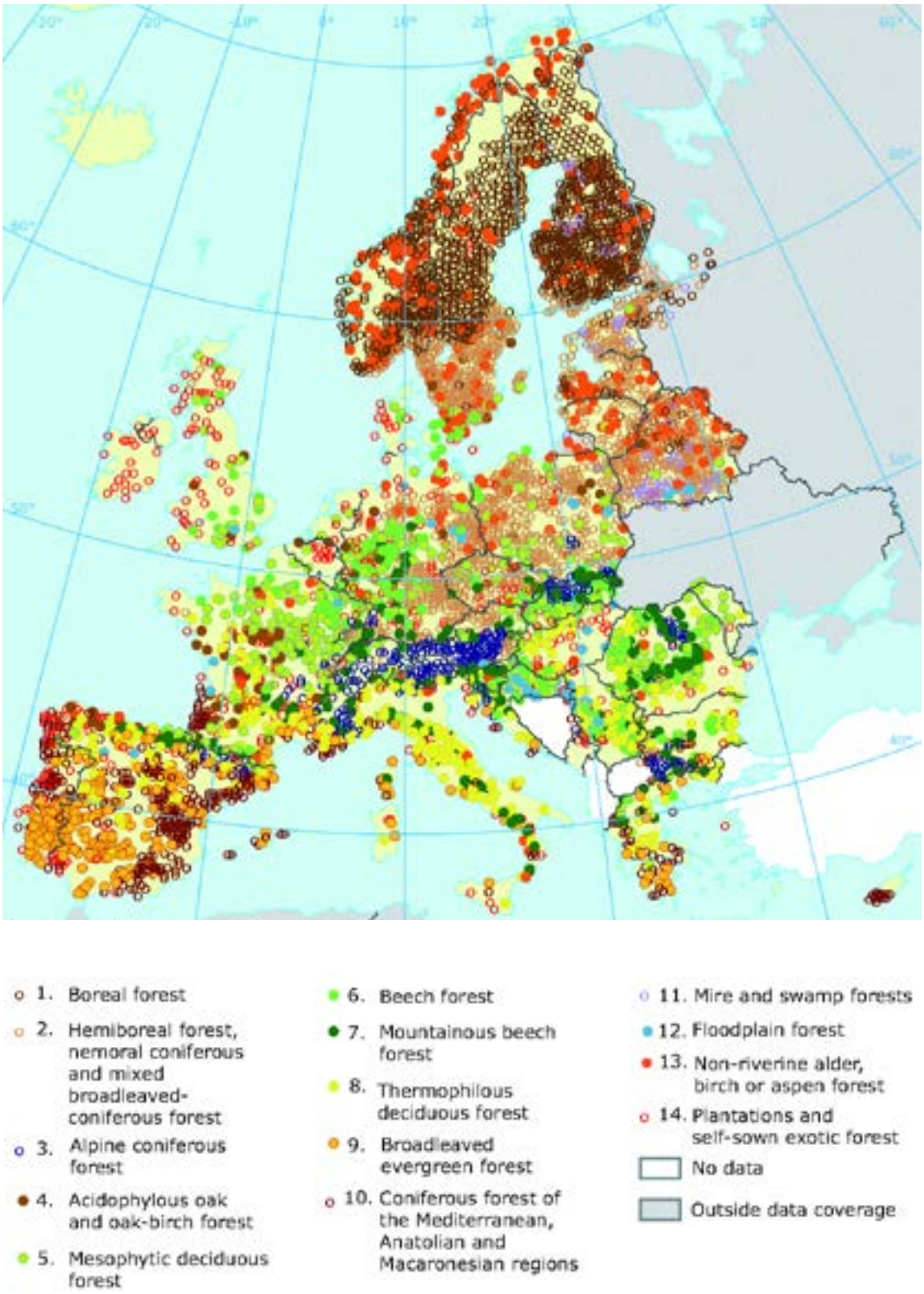
Almost all of our forests are managed forests, meaning they are used for extracting natural resources such as wood. Less than 3 percent of the EU's forest area qualifies as 'natural forest', meaning that ecological processes are undisturbed by human influence.[2]

Whilst there are considerable variations in forest types across the European Union (Figure 1), our forest ecosystems face common problems. They are losing wildlife and the capacity to absorb and store carbon, and succumb more easily to climate-related pressures.[3] In Germany, for example, exceptional drought and bark beetle attacks degraded almost 5 percent of forests in just over three years. Neighbouring countries are facing similar challenges.[4]

1 Eurostat 2021
2 Barredo et al. 2021
3 Maes et al. 2022
4 DLR 2022

Monoculture plantation. Photo: Magnus/Adobe Stock

FIGURE 1. EUROPEAN FOREST TYPES. SOURCE: EEA



Even forests in protected areas are not doing well. Forests in the Nordic region (so-called boreal forests) are doing the worst of all EU forest types.[5]

The poor state of our forests is due to many pressures, including pollution from industrial agriculture and transport, and the impacts of climate change. But the main reasons are excessive wood harvesting and poor forest management, alongside a lack of forested areas that are strictly shielded from any logging.

This report sets out how we can both protect and use our forests at the same time. It shows how we can preserve forests' vital ecosystem functions and meet our needs as humans, if we manage forests in a truly sustainable way that protects the natural dynamics of forests rather than trying to maximise extraction at the expense of nature.

The report advances principles for such an ecosystem-based forest management, which can be tailored to the specific ecology and forest conditions across the EU. We then look at how these principles can be put into practice, including examples of forests that have transformed to this model. We examine the economics of close-to-nature forestry and the conditions for a successful transition. Finally, we discuss how EU policies can support the transition.

The report is based on desk research complemented by interviews with experts from different countries of the EU. A list of interviewees is presented in an annex.

Monoculture plantation in Estonia. Photo: Thomas Waitz

5 EEA 2015

1

WHY DO WE NEED ECOSYSTEM-BASED FOREST MANAGEMENT?

Forests are crucial to our attempts to avert climate catastrophe and restore nature. Healthy forests are home to numerous plant and animal species, they help purify the air we breathe and improve water quality. They protect against soil erosion and flooding, especially in mountainous areas, regulate local and global climates, enhance water retention and facilitate pollination.[6] Moreover, healthy forests provide jobs and income to rural economies (through wood and non-wood forest products), and recreational spaces that benefit our mental and physical health.

But excessive logging and poor management practices have weakened our forest ecosystems. As a result, forests cannot fulfil all their vital ecosystem functions, such as hosting wildlife and absorbing and storing carbon, and are more vulnerable to extreme weather events such as heat, drought or flooding.

Excessive logging and poor management practices have weakened our forest ecosystems.

In the European Union, intensive forest management (also called "rotational" forest management, see Table 1 below) is still more common than less invasive management models like close-to-nature forestry. Rotational forestry is predominant in two-thirds of EU countries, compared to one fifth where continuous cover forestry is more prevalent.[7]

In the rotational forest management system, significant areas of forest are routinely cut down (clear-cutting) using heavy machines that compact and damage the soil. The same areas are then replanted with a small range of productive tree species, after intensive site preparation using herbicides and mineral fertiliser. Rotational forest management aims to produce a maximum of wood at the lowest possible cost.

6 EEA 2016

7 Mason et al. 2021. The remainder is accounted for by other forest types, including unmanaged nature reserves

Clearcut in Finland. Photo: Sointu Räsäinen

Close-to-nature forestry and continuous cover forestry are alternative forest management approaches that consider forests as complex ecosystems and strive to "follow and support nature".[8] They use partial harvesting instead of clear-cutting, favour natural regeneration over replanting and avoid intensive site management practices such as soil cultivation, herbicide application and use of mineral fertiliser. In this report, we use the terms close-to-nature forestry and continuous cover forestry interchangeably, alongside the more general terms ecological forestry and ecosystem-based forestry.

As climate change worsens, the dominant model of rotation forestry is becoming more and more economically risky.

As climate change worsens, the dominant model of rotation forestry is becoming more and more economically risky. According to Professor Timo Pukkala: "In Finland, plantation forestry has become less and less profitable. Silvicultural costs are increasing while the timber price is not following that trend."

Plantation forests created under this model are less resilient to extreme weather and more vulnerable to wildfires, droughts, pests and diseases, and landslides while biodiversity is lost and their capacity to sequester and store carbon is weakened.[9]

NATURAL DISTURBANCES

Disturbances are a natural part of forest development. In European forests, the most common disturbances are windthrows, fires and insect outbreaks. They are amplified by simple forest structures characteristic of rotation forests. Currently, about 60 percent of forest biomass in Europe (including Turkey and European Russia) is exposed to these disturbances. Between 1979 and 2018, forests' vulnerability to insect attacks has increased significantly, whereas vulnerability to fires and windthrows has remained relatively stable.[10]

As climate change progresses, fire danger is projected to increase in Europe, in particular under high-emissions scenarios. Forest fires will still largely affect southern Europe but will also become more frequent in central and northern Europe.[11]

8 Larsen et al. 2022, 9

9 Larsen et al. 2022

10 Forzieri et al. 2021

11 EEA 2021

Forest after wildfire in Spain. Photo: Thomas Waitz

Against this backdrop, close-to-nature forestry is “not an ideological but a pragmatic choice” says Canopée, a French civil society organisation working on forest protection. “With summer droughts becoming more and more frequent, clear-cutting of large areas followed by plantations is an increasingly risky bet, as shown by the record mortality rates in young plantations in recent years.”[12]

“We need to make our forests as ecosystems resilient to changes that are fast approaching with climate change,” according to Sauli Valkonen, senior scientist at the Natural Resources Institute, Finland. “Ultimately, that requires a complete overhaul to adapt ecosystem-management principles and resilience as the primary goal.”

12 Andrieu et al. 2022

2

CLOSE-TO-NATURE FOREST MANAGEMENT PRINCIPLES

"We need to make our forests as ecosystems resilient to changes that are fast approaching with climate change."

Sauli Valkonen

Close-to-nature forestry, here also called ecological forestry, is a model of forest management that emphasises maintaining or restoring a healthy and resilient ecosystem. As the term shows, it aims to create forests that are similar to natural forests (i.e. forests left without human intervention) and display a high diversity of species and other characteristics of healthy ecosystems. Close-to-nature forestry treats forests as multiple-use spaces, as opposed to intensive rotational and timber-centric forest management.[13] A comparison between these two approaches is shown in Table 1.

The silvicultural principles of a close-to-nature approach include partial harvesting rather than clear-cutting, with younger and ecologically significant trees left to grow and fill gaps; a preference for natural regeneration rather than planting; developing structural diversity (different trees of different heights) and spatial variability within forests; fostering mixed species stands rather than monocultures; the maintenance of biomass in the forest (including deadwood) and avoiding intensive practices such as soil cultivation, herbicide application and the use of fertilisers.[14]

Over time, an established close-to-nature forest produces diverse, high-quality wood and supports a range of non-timber products and services, while regulating itself and regenerating with far less input from the forester, and achieving economic benefits.[15]

An established close-to-nature forest produces diverse, high-quality wood and supports a range of non-timber products and services.

13 Mason et al. 2021; Larsen 2012

14 Mason et al. 2021, 2; Puettmann et al. 2015

15 Arold 2021, 7

Forest in Slovenia (Triglav National Park).
Photo: Franziska Achterberg

TABLE 1. COMPARISON OF ROTATION AND CLOSE-TO-NATURE FORESTRY[16]

Characteristics	Rotational forestry	Close-to-nature forestry
Harvesting method	Clear-cutting.	Selective logging, retaining some forest cover at all times.
Stand structure	Even-aged, homogenous stands. Monoculture plantations.	Structural diversity prioritised. Uneven-aged stands with a mix of species.
Species range	Widespread use of non-native species.	Site- and climate-appropriate endemic species are prioritised. Rules out genetically engineered trees.
Regeneration	Soil preparation, seedling cultivation, planting and clearing the undergrowth for reforestation.	Natural regeneration.
Deadwood	Most or all deadwood cleared.	Wood from dead and dying trees retained, according to minimum science-based thresholds.
Forest edges	No specific protection measures.	Maintained and shaped to help protect bird species and pollinators and, in the case of water edges, to preserve water quality.
Control of deer/ grazing animal populations	Control of deer/grazing animal populations is often favoured to maximise economic returns, but no uniform approach is taken.	Requires science-based assessment of capacity of forest areas and edges to sustain grazing animals, as prerequisite for natural regeneration.
Maintenance	Use of intensive operations, such as tilling, fertilisation, weed control and ditch networks.	Excludes use of pesticides or fertilisers (except in specific cases as part of transition planning). Avoids use of heavy machinery that compacts and erodes soil.

16 Elements of this table draw on Arold 2021, 7.

19 Forest in Germany (Kellerwald). Photo: Marianne Spenner Häusling

SELECTIVE LOGGING

Continuous cover is a core element of any type of forest management grounded in natural processes.[17] Continuous cover means that only individual trees are felled and the forest cover is retained at all times.

Close-to-nature forestry avoids clear-cutting, the practice of removing all or most of the trees from an area. The main goal of clear-cutting is fast and efficient timber production. However, there are a range of ecological, as well as economic, reasons why it should be avoided. Clear-cutting reduces the quality and quantity of tree cover as well as damaging biomass and the soil (roots, fungal webs, insects, microorganisms). This contributes to the decline of biodiversity, the release of soil carbon, soil degradation, and disrupts water cycles, as well as reducing the recreational value of forests.[18]

The felling of groups of trees may be required in forests that are transitioning towards a close-to-nature approach. But the reasons for such actions must be justified, for example where light-demanding species such as oak require clearings. Such clearings would qualify as “restorative forest management”. They would typically fall within the range of between 0,1 and 0,5 hectares.[19]

17 Pro Silva 2012

18 Sotirov et al. 2022, 7

19 Sotirov et al. 2022, 4

Selective harvesting in Eastern Finland. Photo: Timo Pukkala

Clear-cutting in North Karelia, Finland. Photo: Timo Pukkala

UNEVEN-AGED STANDS

Encouraging the development of uneven-aged forests is an important element in fostering tructural diversity, which has various ecological and economic advantages compared to uniform, even-aged forests. Forest areas with trees that are a mix of ages are more resilient to pests, forest fires, and other weather extremes caused by climate change.[20] Uneven-aged forests have better capacity to store carbon than those with trees of the same age.[21] Recent studies have also shown that diverse (uneven-aged, multi-species) forests are far better placed to cope with natural disturbances in boreal forest areas, making them more economically valuable.[22] Again, the process of transforming existing forests to an uneven-aged condition might involve temporary even-aged elements.[23]

20 Larsen et al. 2022; Hanewinkel et al. 2014; Seidl et al. 2011

21 Knoke et al. 2020

22 Malo et al. 2021; Knoke et al. 2021

23 Helliwell and Wilson, 2012

Tree Illustrations: Sirintra/Adobe Stock

Uneven-agend stand in Finland. Photo: Sanna Vornanen

Even-aged monoculture plantation in Finland. Photo: Sointu Räisänen

SPECIES MIXTURE

Restoring forests to achieve a mix of species and allowing for natural regeneration offers further protection against pests, wind and snow breakage, extremes of weather and the effects of climate change.[24] Encouraging the development of mixed stands (groups of trees) is a form of "ecological insurance", since diverse species respond differently to various sources of disturbance and stress.[25] When different species co-exist within the same forest area, the resilience of individual species is also increased.[26]

Tree species and genetic diversity are vital to ensure that forests become more resilient to pests and disease outbreaks.[27] This was clearly demonstrated in the case of the devastating bark beetle outbreaks of 2018 that affected forests in much of Central Europe, causing significant economic losses in the process. In Czechia alone, where spruce accounted for over a half of the country's forest composition, the economic loss was €1.6 billion in just one year.[28]

As shown in the case study from Germany below, the close-to-nature forestry approach adopted by Lübeck city forest reaped benefits when it lost a far lower proportion of its spruce trees to bark beetle in 2018-19 (< 2 percent loss in standing volume of spruce) compared to neighbouring areas where there were monocultures or a very limited number of different species, which lost between 6 and 18 percent of their forest cover (by standing volume).

24 Griess et al. 2012; Larsen et al. 2022

25 Yachi and Loreau 1999

26 Neuner et al. 2015

27 Guyot et al. 2015, Vellend and Geber 2005

28 Arold 2021

Mix of different species. Photo: Christian Pedant/Adobe Stock

Spruce monoculture. Photo: Pixar free

SITE- AND CLIMATE-APPROPRIATE ENDEMIC SPECIES

The widespread use of non-native species in intensive forestry has caused numerous problems, including soil fertility loss and erosion and increased fire risks.[29] The 2017 forest fires in Portugal, which resulted in the loss of 64 lives, were a devastating example of the high societal costs of allowing for the spread of large eucalyptus and pine plantations.[30]

Plantations of non-native species have a negative impact on genetic diversity and biodiversity, which has encouraged various initiatives to limit the practice of large-scale planting on monocultures of exotic tree species (e.g. Kew Declaration 2021).

However, the impact of climate change on European forests is already affecting the ability of local tree species to adapt. This is why scientists and foresters are turning to non-native species hoping they would be better adapted to future climate conditions.[31] Proponents of close-to-nature forestry do not categorically rule out the need to introduce non-invasive, non-native species in certain cases.[32] However, the introduction of site-adapted species alongside native species to enhance resilience is very different from the wide-scale plantation of non-native species, which must be rejected.

29 Arold 2021

30 Ames 2017

31 Börnecke 2020a

32 Larsen et al. 2021, 21; Spathelf et al. 2018

Native oak forest in Portugal. Photo: João Carvalho

Non-native eucalyptus globulus plantation in Portugal. Photo: João Carvalho

NATURAL REGENERATION

Allowing for natural regeneration reinforces species diversity and other natural processes, helping to restore forests to a state that is closer to nature.[33] It has ecological and economic advantages. As well as being far cheaper than planting, natural regeneration has been shown to increase genetic diversity and promote the adaptation of tree populations to changing site conditions.[34] Some of these benefits from natural regeneration are linked to the avoidance of intensive site preparation techniques, the use of herbicides and fertilisers.[35]

Natural regeneration can also be part of transitioning to a close-to-nature approach. It is appropriate in cases where there are already site-adapted native trees, and where stands (groups of trees) are genetically diverse. However, in some situations, such as when converting plantations or previously deforested land to close-to-nature forests, a lack of seeds may mean that natural regeneration needs to be accompanied by some planting as part of the transition process.[36]

33 Krumm et al. 2020; Larsen et al. 2022

34 Tahvonen et al. 2010

35 Larsen et al. 2022, 18

36 Williams and Dumroese 2013

Natural regeneration of beech trees. Photo: Azahara MarcosDeLeon/Adobe Stock

Pine tree plantation. Photo: Olandsfokus/Adobe Stock

DEADWOOD

An ecosystems-based approach to forest management is not just about living trees, but requires care to maintain healthy soil, fungi and fauna. The wood from dead and dying trees plays a key role in how ecosystems function, with an estimated 20 to 40 percent of forest plants, animals (especially insects) and fungi depending on dead or dying wood during some part of their life cycle.[37] In addition to its habitat function, deadwood also plays an important role in the carbon, nutrient and hydrological cycles, and is critical to reducing erosion.

Appropriate levels of deadwood vary according to forest type. In one estimate, boreal coniferous forests should maintain a minimum of 20 cubic metres per hectare (m^3 ha^{-1}), while a minimum of 30 m^3 ha^{-1} deadwood should be maintained in lowland oak-beechforests.[38]

It is also important to retain a range of "ecosystem legacies" (e.g. seed trees, dead wood, stand remnants) after disturbance to increase the structural diversity of stands.[39] Preserving old trees, rare species, trees rich in micro-habitats, large dead trees, and unusual biotopes is of particular importance for protecting biodiversity, ranging from nesting birds to symbiotic fungi.[40]

37 Bauhus et al. 2019; Larsen et al. 2022

38 Müller and Bütler 2010

39 Seidl et al. 2011

40 Larsen et al. 2022; Krumm et al. 2020

Deadwood in Germany,
Photo: Romtomtom/Flickr (CC BY 2.0)

Deadwood. Photo: Bambizoe/Flickr (CC0 1.0)

New life sprouting from deadwood. Photo: WWF/Timur Chiș

FOREST EDGES

Maintaining and shaping forest edges helps to protect bird species and pollinators and, in the case of water edges, preserves water quality. The use of heavy machinery should not be allowed in these buffer zones to protect valuable habitats. Deadwood offers important protection for many fish species to survive and breed. Clear-cuts, on the contrary, create forest edges that are susceptible to wind throws, and wind throws open the door to bark beetles.[41]

41 Hroššo et al. 2020; Arold 2021

Structured forest edge. Photo: Manfred and Barbara Aulbach/Flickr (CC BY-NC-ND 2.0)

Sharp edge of a monoculture plantation. Photo: X.J.frames/Adobe Stock

CONTROL OF DEER POPULATIONS

High populations of deer (and other grazing animals) can make natural regeneration of forest areas difficult or impossible.[42] In Hungary, according to an expert interviewed, the population of red deer has been found to be 10 times higher than the capacity of the landscape to sustain it, while the use of fencing to protected regenerated forest areas brings additional problems.

Further landscape mapping is needed, in order to provide a science-based assessment of the capacity of forest areas and forest edges to sustain deer, boar and other grazing animals. Close-to-nature forestry can help to reduce deer populations over time by reducing large forest gaps created by clear-cutting. Forest gaps lead to concentration of herbivorous mammals and their effects, due to increased forage supply.[43] Changes in hunting rules can also support forest preservation and the needs of close-to-nature forest management. [44]

42 Motta 1996; Larsen et al. 2022

43 Kuijper 2011

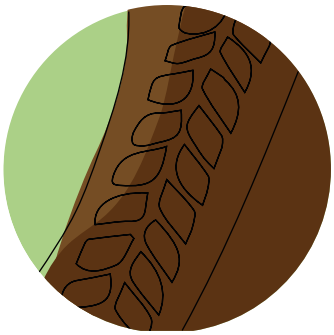
44 Börnecke 2020b

Ungulates in the forest. Photo: Karel/Adobe Stock

Damage from browsing by ungulates. Photo: Hajotthu / Wikipedia

Control fence to assess the impact of browsing by ungulates. Photo: Dama764 / Wikipedia

AVOIDANCE OF INTENSIVE MANAGEMENT



Close-to-nature forest management excludes the use of pesticides or fertilisers, with the only exemptions related to soil restoration interventions in badly degraded areas as part of a transition plan.[45] It avoids the use of heavy machinery for harvesting, since it can compact and erode the soil, damaging forest ecosystems, as well as drainage.[46] Genetically modified trees, usually engineered to increase productivity or modify wood composition to benefit the pulp and paper production, are not used.[47]

45 Pro Silva 2012

46 Pro Silva 2012

47 Steinbrecher and Lorch 2008; CBAN 2022

Drainage in Croatia. Photo: Thomas Waitz

Use of heavy machinery in Croatia. Photo: Thomas Waitz

Use of horses in timber harvest. Photo: bambe1964/Flickr (CC BY-ND 2.0)

3

PRINCIPLES INTO PRACTICE

The underlying principles of close-to-nature forest management, as set out above, are similar in all regions. These all involve learning from natural processes, encouraging more complex and varied forest structures, respecting natural disturbance patterns, protecting the broader forest ecosystem (including soil and fungi) and taking steps to reduce the impact of timber harvesting.

How close-to-nature principles are put into practice will vary according to the natural processes characteristic of different ecosystems across the EU as well as the starting point of the transition. In some cases, close-to-nature forestry will require a transition from monoculture plantations to multifunctional forests. In other cases, the starting point will be a forest destroyed by fires, windthrow or insect outbreaks, an unmanaged (abandoned) forest or low-production agricultural land.

Projecto Bosques in Portugal. Photo: João Carvalho

UPTAKE OF CLOSE-TO-NATURE FORESTRY IN EUROPE

Ecosystem-based approaches are practised on an estimated 22 to 30 percent of the EU's forested area, although this varies considerably between countries and regions.

Ecosystem-based forestry approaches have a long tradition in Europe. Different forms have developed in different parts of the continent.[48] Today, such approaches are practised on an estimated 22 to 30 percent of the EU's forested area, although this varies considerably between countries and regions.[49] Continuous cover forestry is the predominant model in Slovenia and some German federal states, as well as the basis for the management of all public forests in Denmark, but there are only limited cases in Portugal, Ireland, Finland and Sweden.[50]

However, even in countries where rotational forestry remains dominant, there are increasingly examples of how a transition can be achieved. The European Integrate Network, for example, has catalogued 158 demonstration sites where nature conservation is being integrated into forest management, which encompass 22 countries in the EU.[51]

Overall, the share of EU forested land subject to ecosystem-based management is increasing, albeit slowly.[52] In some EU countries, regulations have been introduced that mandate ecological forestry practices in public forests (e.g. Denmark and Wallonia, Belgium) or that ban clear-cutting (e.g. Slovenia, Italy) (see Figure 2).

48 Larsen et al. 2022

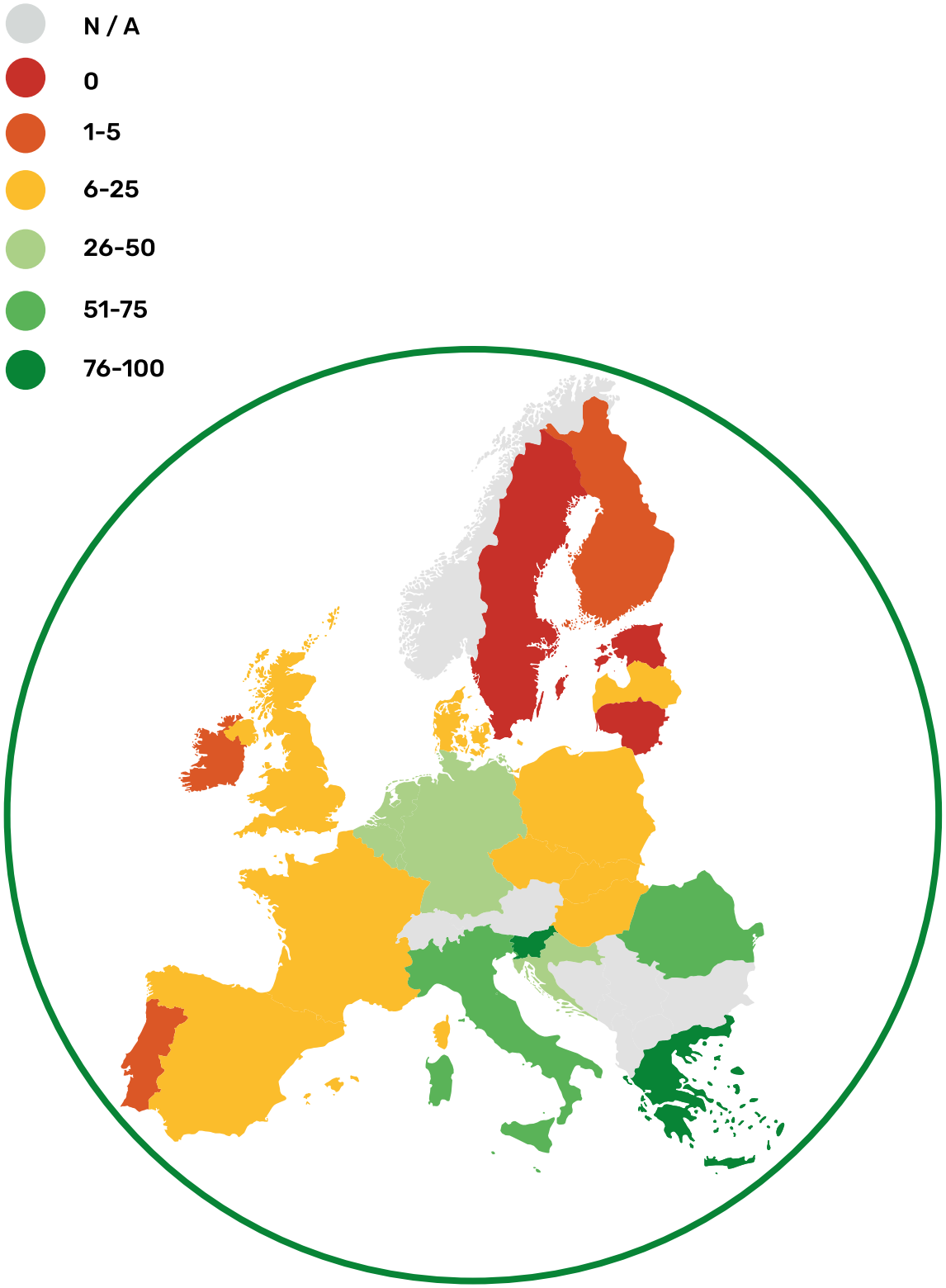
49 Mason et al. 2021

50 Mason et al. 2021; Hengeveld et al. 2012; Larsen 2012

51 EFI 2022

52 Mason et al. 2021; Larsen et al. 2022

FIGURE 2. PERCENTAGE OF FOREST AREA MANAGED BY CONTINUOUS COVER FORESTRY ESTIMATED PER COUNTRY. SOURCE: MASON ET AL. 2021.



Map. Photo: Mcbudi/Adobe Stock

Forest in Austria. Photo: Hannes Flo/(CC BY 2.0)

Slovenia. Close-to-nature forest management is practised across most of the country's forested area, and clear-cutting was prohibited in 1947 (Slovenia Forest Service 2008).

Germany. Close-to-nature approaches are already predominant in a number of federal states. The new German government coalition agreement states that "in the medium term, forests owned by the federal government should at least be managed according to FSC or Naturland standards" (SPD et al. 2021).

Belgium. The Wallonia region of Belgium, which hosts 80 percent of the country's forests, has required the application of continuous cover forestry in all public forests since 2013. Public forests account for half of Wallonia's forest area of 530,000 ha.

France. Continuous cover forestry now accounts for 20 to 25 percent of the forest area in France, including private as well as public forests. In the Bourgogne-Franche-Comté region, three quarters of forests have close-to-nature forest management plans.

Map. Photo: Mcbudi/Adobe Stock

Denmark. Since 2005, close-to-nature approaches have been the basis for the management of all public forests in Denmark.

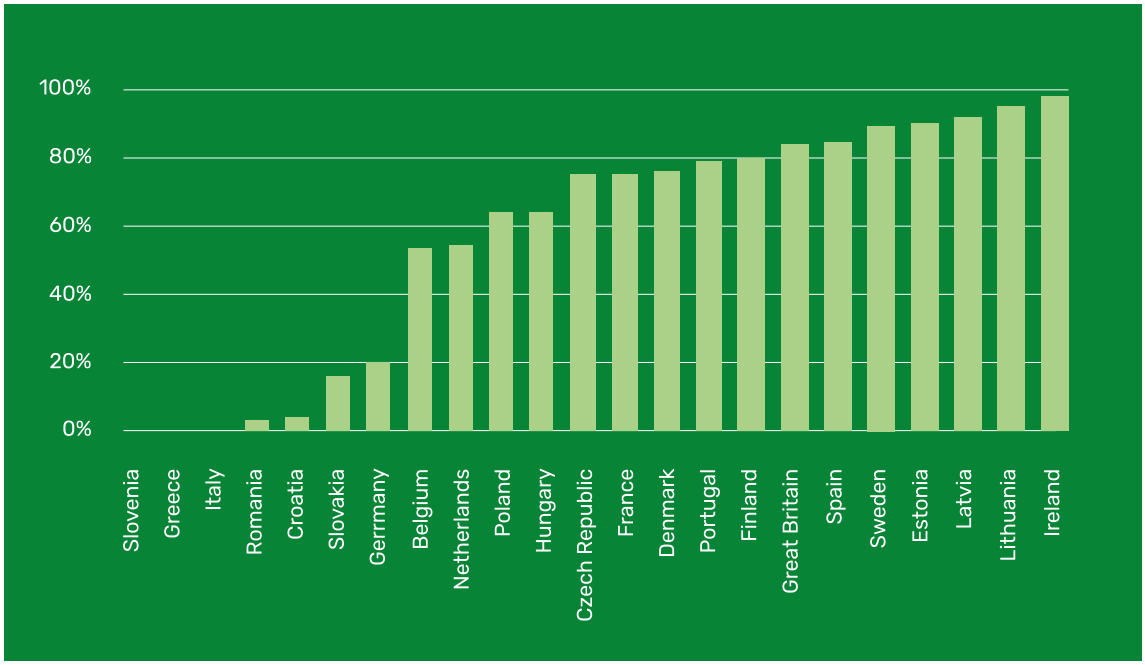
Sweden. Rotational forestry remains dominant, with perhaps as little as 3 percent of productive forest land managed without clear-cutting. But municipalities are increasingly adopting close-to-nature forestry, encouraged by the experience of the City of Gothenburg, which manages its 4,000 ha according to this model.

Finland. There has been a rapid increase in continuous cover forestry since the introduction of the 2014 Forest Law. Seventeen percent of private landowners use only continuous cover forestry. The forestry service, Metsähallitus, has several experimental areas where it applies this approach.

Slovakia. In 2020, the government set a policy objective to make close-to-nature forestry the dominant approach in the country, although at present it accounts for just 2 percent of the forest area (Saniga 2020). Implementation of the new approach remains slow.

Despite the increasing adoption of ecosystem-based forestry, its uptake in forests managed for wood production is still slow.[53] As Figure 3 shows, the share of forest area subject to clear-cutting remains high in many European countries.

FIGURE 3. PERCENTAGE OF FOREST AREA SUBJECT TO CLEAR-CUTTING ESTIMATED PER COUNTRY. SOURCE: MASON ET AL. 2021



53 Larsen et al. 2022

Clearcut after bark beetle infestation. Photo: Edojob/Adobe Stock

PROMISING EXPERIENCES ACROSS THE EU

In this section we outline some concrete examples where the principles of close-to-nature forestry have been applied.

ROLD SKOV, DENMARK

Rold Skov is Denmark's largest forest, with the Danish Nature Agency managing 2,300 ha of its total 8,000 ha area.[54]

A new management plan was made for the forest in 2005 which, in common with all state forests in Denmark, set out to apply close-to-nature forest management principles.[55] This was seen as part of a long-term strategy to achieve more resilient forest development, in particular offering greater protection against the impact of severe storms. New targets were defined based on local growth conditions and soil mapping, with spruce areas (especially those that were damaged by storms) replanted with beech and other broadleaved species, to supplement natural regeneration. Coppices and forests with grazing were also included in the new management plan. Veteran trees were maintained, as were those with woodpecker holes or nests made by birds of prey, and rarer tree species (e.g. willow, aspen), to increase variation and secure microhabitats for species living on these trees.

As of 2015, the coverage of domestic broadleaved tree species had increased by 25 percent, while the area of conifers as the main tree species had decreased by 18 percent, and there was an increase in mixed stands. Open areas, including inner forest edges, had increased from 300 ha to 470 ha, and domestic animals (cattle, horses) were introduced to prevent these open habitats transitioning into forest.

54 This case study is derived from Andersen and Krog 2020.

55 Larsen 2012

Alongside the transition to close-to-nature principles on multiuse forest areas, the protected area was increased from 107 ha (in 1995) to 380 ha, offering additional protection for old beech forest, rare species of fungi and orchids.

Although the transition to close-to-nature forest management takes decades, the forest area is already more diverse. Tourism and leisure uses have also been encouraged, with 70km of marked hiking/running routes and a comprehensive network of mountain biking routes.

Rold forest. Photo: Danish Nature Agency - Naturstyrelsen

SOLOGNE, FRANCE

A 300 ha area of private forest in Sologne, France has been transitioning to a close-to-nature approach for over 30 years.[56] Prior to this, the forest area was heavily exploitedand degraded, so the first steps in the transition were to reduce cutting to increase stem density and volume, as well as removing poor quality medium-sized trees to increase the concentration of larger, higher quality trees. Large trees now account for over half of the forested area, compared to one-third of the area in 1988.

Under the model of "irregular" forest management (futaie irrégulière), the aim has been to diversify the species mix and encourage uneven aged stands. Oak trees remain predominant, but their proportion has gradually been reduced (from 75 to 69 percent of the standing volume in 30 years) to the advantage of other hardwoods that are suitable to the soil and climate conditions.

The results have been favourable economically. At the outset, most of the wood harvested was for fuelwood, but now an increasing share of the harvested wood is timber. Forest management expenditure and fixed costs have also fallen. As a result, the economic balance (income minus expenditure) of the forest is now positive, increasing by an average of €42 per hectare per year.

56 Pro Silva 2018

Sologne forest. Photo: Association Futaie Irrégulière

LÜBECK, GERMANY

The municipal forest of Lübeck, northern Germany, has practised close-to-nature forestry on an area of 5,000 ha since 1994, following eight years of preparatory work including soil surveys, forest inventories and biotope analyses.

The guiding principle for the management of the Lübeck forest is the protection of natural forest dynamics.[57] This involves the designation of reference areas, covering 11 percent (471 ha) of the overall area, where the forest is left untouched to serve as an example for the production forest. Every 7 to 10 years, all forests are examined for a set of indicators (e.g. standing volume, deadwood, indicator species) in order to capture the dynamics in both managed and unmanaged forests. The management of the production forest strives to achieve 80 percent of the values measured in the unmanaged areas. Knut Sturm, longstanding chief forester at the Lübeck municipal forest, says the resulting forest represents, just like a natural forest, a "multivariable mosaic of different succession stages" that is heavily "influenced by chance" (i.e. the occurrence of natural disturbances).

To protect the forest's natural dynamics, trees are felled individually or in groups of two or three, avoiding work during ecologically sensitive seasons (spring and summer). Trees of exotic species (e.g spruce, douglas fir) are harvested earlier, those of naturally occurring species (e.g. beech) later, based on minimal target diameters. No more than 50 percent of the annual increment in naturally occurring species is harvested.

After almost 30 years, the biodiversity data are "very promising", with a notable increase in standing volumes of natural broadleaved tree species, a reduction in exotic species, and the return of sensitive and rare species such as bats, black storks, and various woodpecker species.[58]

57 Sturm 1993

58 McAfee and de Camino 2010

The economics of Lübeck's nature-oriented forestry are encouraging too. Instead of seeking to maximise forest yield, the focus is on minimising inputs, achieving older growth and providing higher quality wood. In 2021, the forest held 470 cubic metres of timber per hectare (m3/ha), compared to 300 m3/ha in 1992.

Stadtwald Lübeck also ensures that the forest is accessible for leisure activities, sports and school visits – with 250 km of hiking, equestrian and cycling trails. A 2017 survey found that two-thirds of Lübeck residents preferred its forest to more conventionally managed forests.[59]

The Lübeck Concept has served as a model for the first German "Naturland"-certification scheme, and many municipal forests have implemented practices developed in Lübeck.[60]

Lübeck municipal forest. Photo: Knut Sturm

59 Dauncey 2019

60 McAfee and de Camino 2010

IN LÜBECK, THE PRODUCTION FOREST (ABOVE) SHOULD CLOSELY RESEMBLE THE UNMANAGED FOREST AREA (BELOW).

Managed forest, Lübeck. Photo: Knut Sturm

Unmanaged forest, Lübeck. Photo: Knut Sturm

FEITAL, PORTUGAL

The Projecto Bosques in Feital, Portugal is promoting and restoring native forests and local biodiversity in an area that was at risk of becoming a desert.[61] Overseen by Luzlinar-ARS Association, in partnership with UTAD (University of Trás-os-Montes and Alto Douro), the project encompasses two areas, with 7 and 60 hectares. Initially, field trials were conducted in different parts of the area as part of a research project on landscape planning to prevent fire (Scapefire). Native oaks and broadleaf species were promoted because of their resistance and resilience to forest fires. The restored ecosystem has also seen improvements in water and soil quality, and greater biodiversity.[62]

Although the project involves a relatively small demonstration area, the intention is to provide a replicable model of how forest owners can profit from the production of high-quality oak timber, alongside non-wood products (mushrooms and acorns) and ecotourism. Taken together, these activities are more profitable than the eucalyptus and pine plantations that predominate in Portugal.[63] It also provides relevant ecosystem services, which offers even more value to the environment and society.

Projecto Bosques in Portugal. Photo: João Carvalho

61 Fern 2019

62 Projecto Bosques n.d.

63 Fern 2019

POHORJE, SLOVENIA

The Pahernik family forest covers 570 hectares in Pohorje, northern Slovenia. It has been managed according to close-to-nature principles since early in the 20th century, when it was restored on land that had seen Norway spruce plantations, as well as degraded pastures and meadows.[64] Most stands are now mixed and uneven aged. Increasing the quantity and quality of deadwood (currently 11.6 m^3 ha^{-1}) remains a challenge, however, since this had historically been removed by forest management, or collected by local people for firewood. Logging is done manually by chainsaw while timber is moved by cable to forest roads to protect the soil.

Through a combination of high-quality timber and low management costs (including 98 percent natural regeneration), the economic returns from the forest have increased. Regular harvesting rather than clear-cutting large areas has also meant a more steady revenue stream.

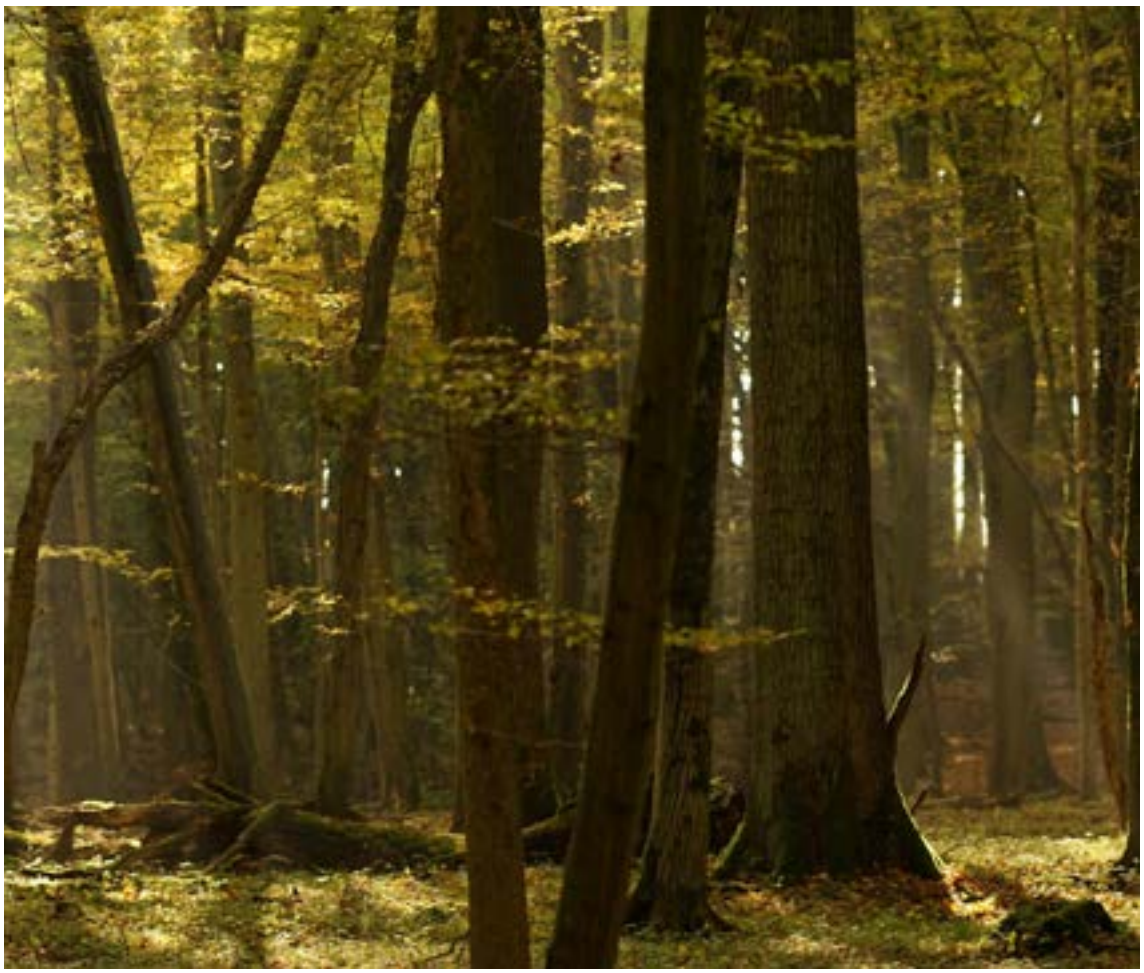
Pohorje forest. Photo: Jurij Diaci

64 Sever et al. 2020

4

THE ECONOMICS OF ECOSYSTEM-BASED FOREST MANAGEMENT

One of the most frequently heard objections to the expansion of close-to-nature forest management is that it comes at too high an economic cost. While it is difficult to make a conclusive assessment, existing studies and models do not support this assertion.



Lübeck municipal forest. Photo: Knut Sturm

A DIFFERENT ECONOMIC MODEL

The economic model supported by close-to-nature forestry is different to the one that underpins the predominant model of rotational forest management (see Table 2 below). The rotational model prioritises intensive production, characterised by repeated cycles of clear-cutting and re-planting. Close-to-nature forestry, by contrast, concentrates production principally and progressively on larger and higher value trees.[65]

Comparative studies and modelling comparing rotation and close-to-nature forestry have mixed results, depending on whether forests are considered at initial/transition stages or on their optimal state, and on the assumptions made.[66] But when conditions allow for natural regeneration (which is not always possible in the early transition phases) the economic outcomes of close-to-nature forestry are better than or at least the same as those of rotational forestry.[67]

When conditions allow for natural regeneration the economic outcomes of close-to-nature forestry are better than or at least the same as those of rotational forestry.

An increasingly important element in the equation is the lower economic risk displayed by forests managed in accordance with ecological principles. It is due to the fact that well-managed, healthy forests have the ability to withstand and recover from natural disturbances, and to adapt to changing climate conditions. They are more resilient than the even-aged, same species stands typical of rotational forestry.[68]

"We need to look at the risk perspective of continuing with business-as-usual" says Ulf Lovén, an ecologist and project manager at Ekoskog, a Swedish non-profit organisation that is developing a new certification system. "There are big risks of doing the rotation as today, so we need to adapt and try to mimic natural processes wherever possible to build resilience and long-term productivity."

Ecological forest management also improves economic resilience in that there are always different timber assortments in the forest that can be sold depending on the market situation. In addition, close-to-nature forests have been shown to recover their economic value more quickly than rotational forests.[69] Experts tell us that forest insurance products are starting to reflect these differences, although progress is hampered by a lack of adequate data.

65 Bruciamacchie 2012; Knoke 2012

66 Knoke 2012, Tahvonen and Janne Rämö 2016

67 Knoke 2012

68 Malo et al. 2021

69 Knoke et al. 2021

Oak forest blossoming in Portugal. Photo: João Carvalho

TABLE 2. COMPARISON OF ECONOMIC CHARACTERISTICS OF ROTATION AND CLOSE-TO-NATURE FORESTRY[70]

ROTATIONAL FORESTRY	CLOSE-TO-NATURE FORESTRY
High cultivation and thinning costs	Low cultivation costs, including no costs for planting, no costs for inputs such as herbicides and fertiliser
Low final felling costs	High harvesting costs, although harvesting cost per cubic metre decreases with increasing tree size
High financial payoffs from large-scale wood harvests at long intervals	Steady income in smaller increments from small-scale harvests
Income mainly from wood production	Income diversification
High risk of economic loss due to natural hazards linked to climate change	Low risk of economic loss due to natural disturbances
Financial support for site cultivation and replanting after clear-cutting	Lack of financial support for desirable outcomes

Further advantages of close-to-nature forestry should be considered alongside any direct comparison of the financial costs and benefits of rotational and close-to-nature forestry.

70 Elements of this table draw on Arold 2021, Sotirov et al. 2022

CREATING VALUE BEYOND WOOD PRODUCTS

One of the key objectives of close-to-nature forestry is to foster multiple-use forests, whose value extends far beyond the value of the wood that can be harvested from them. Close-to-nature forests combine ecosystem resilience, biodiversity, carbon sequestration and socio-cultural benefits, which are not necessarily reflected in studies concerning economic benefits.[71]

Valuing non-timber forest products (e.g. forest fruits, mushrooms) has also been shown to increase the overall profitability of forests, with close-to-nature forests consistently outperforming rotational forestry when these broader metrics are taken into account.[72] Growing demand for non-timber forest products is likely to accentuate this trend. As this results in economic diversification, it reduces risks and increases income stability, which is of considerable benefit to forest owners.[73]

Mushrooms. Photo: Ankh/Adobe Stock

71 Pukkala 2021; Price and Price 2008; Wolfslehner et al. 2019

72 Kurttila et al. 2018; Pukkala 2021

73 Arold 2021

RURAL DEVELOPMENT

The intensive production model underpinning rotational forestry has failed to deliver benefits for employment and rural development. Employment in European forestry dropped by a third between 2000 and 2015, mainly as a result of increased mechanisation.[74] While large scale harvesting tends to involve sub-contractors and migrant workers who travel across large distances and suffer poor working conditions, an ecosystem-based approach supports greater local employment.

Close-to-nature forestry provides more employment centred on ecosystem management rather than simply timber production and harvesting. Multi-use forests create additional jobs and development opportunities in the leisure and tourism sectors. Further developing the value chain of non-wood forest products (e.g. forest fruits, mushrooms, cork, pine nuts, acorns, medicinal herbs, essential oils, chestnuts) can also be beneficial to rural economies.[75]

Based on a more complete picture, experts agree that ecosystem-based management approaches are economically similar or superior to intensive forestry, without the ecological trade-offs.[76]

74 Forest Europe 2020

75 Wolfslehner et al. 2019

76 Arold 2021, Larssen et al 2022

Tourist attraction Hallerbos in Belgium.
Photo: Tupungato/Adobe Stock

5

THE TRANSITION TO ECOLOGICAL FORESTRY

Although the economic performance of established multifunctional forests is generally equivalent to or better than rotational forests, the shift to this model takes time and can be difficult to achieve. The transition is often hampered by current forestry regimes, as close-to-nature forestry challenges the established sectoral culture and the even-aged forestry research paradigms.[77] Forestry is typically an activity that requires longer perspectives, therefore long-term and consistent support is needed to motivate public and private forest owners to make the shift.

Forest in Germany (Black Forest). Photo: Toms (CC BY-NC-ND 2.0)

77 Hertog et al 2022

PUBLIC FORESTS - THE DANISH EXAMPLE

The transition to close-to-nature forest management requires good knowledge of the forest ecosystem (or forest development types) endemic to a particular region, including natural disturbance regimes (e.g. fire, wind, pests), and the potential impact of climate change.[78] In Denmark's public forests it has been helpful to develop management plans together with foresters, from forest workers to management. This typically involved a site survey to assemble data on the existing state of the forest area, or area to be reforested, including tree species, age distribution, geology and soil types, nutrient and water supply, the presence of any special habitats, the presence and density of browsing animals, site-specific factors (e.g. compacting, drainage) and economic/social factors (e.g. the recreational or cultural value of the landscape).[79]

In Denmark, conversion to close-to-nature forestry was pursued through passive or active strategies, depending on current conditions

Conversion to close-to-nature forest management was then pursued through passive or active strategies, depending on current conditions. Passive strategies are primarily based on existing vegetation, using natural regeneration and continuing over several tree generations. An active strategy is used where stability does not allow for a slow conversion, economic factors favour a faster conversion, and/or there are ecological, aesthetic or recreational reasons to aim for greater intervention.[80] Active strategies can include additional "thinning", to promote stability and structural variation, through to the clear cutting of unstable spruce stands (former plantations) to allow for regeneration based on locally-appropriate species. In some active strategies, natural regeneration is supplemented by planting.[81]

78 Larsen and Nielsen 2007

79 Larsen 2012; Larsen et al. 2022

80 Larsen 2012, 203

81 Larsen 2012

PRIVATE FORESTS

With around 60 percent of EU forests in private hands, it is important that not only public but also private forest owners adopt close-to-nature principles. Private owners have been slower to embrace ecosystem-based approaches, sometimes even lobbying against any new environmental regulation of forests. Their reservations often have to do with a lack of awareness of close-to-nature approaches, together with inadequate knowledge transfer and a cultural resistance to new practices.

The reluctance of forest owners to embrace ecological practices is exacerbated by subsidy schemes and tax regimes that favour rotational forest management. For example, financial support is often provided for site cultivation and replanting after clear-cutting but not for management practices associated with natural regeneration. In some countries, this has been overcome by not paying forest owners and managers for specific practices (e.g. the planting of oak) but for desired outcomes (e.g. the share of oak). [82]

Financial support for forest owners is often provided for practices linked toclear-cutting, not for ecological forestry practices

Another obstacle identified is the lack of sawmills that can process the high-value, large dimension timber produced under ecological forestry approaches. Parts of the sawmilling industry have specialised in the processing of mid-sized coniferous trees and cannot handle larger logs. This can mean that no price premium is paid for such logs.[83]

A number of Finnish and Swedish experts interviewed for this study also highlighted the role of forest owners associations in maintaining the status quo, since they act as both advisors and sellers of business services (forestry planning, clear-cutting and planting) to the hundreds of thousands of individuals who own most of the forest in these countries. However, according to these experts, where close-to-nature practices have been shown to be effective, private owners are increasingly open to such practices.

82 Mason et al. 2021

83 Mason et al. 2021

Saw logs. Photo: Steidi/Adobe Stock

TRAINING AND EDUCATION

As noted by several of our interviewees, there is a lack of adequate training in close-to-nature forest management techniques in many parts of the EU, and this is further hindered by the conservatism of "traditional" forestry schools. There are a number of initiatives to bridge this gap. For example, The Teagasc Forestry Development Unit in Ireland has worked with Pro Silva to develop a new training course on managing broadleaf woodlands under continuous cover forestry (CCF). Pro Silva have also organised and run, in conjunction with the Forest Service, a course for foresters on the Forest Service CCF Scheme. "We're overloaded with demand" says Padraig O'Tuama, a private forest consultant and Board member of Pro Silva. "The courses are fully subscribed, and that's filling a new skill set in the profession, since in Ireland foresters were only practising clearfelling over the last decades."

There is a lack of adequate training in close-to-nature forest management techniques in many parts of the EU

In the Wallonia region of Belgium, after the Department for Nature and Forests imposed close-to-nature forestry practices in publicly owned forests, it mandated the non-profit association Forêt Nature to train and advise the responsible forest managers. "Forest managers are often willing to implement the necessary changes but don't know where to start," according to Christine Sanchez who is in charge of the programme.

EU support for education and training in ecosystem-based forest management could help to accelerate this and similar processes.

REFORM OF TAXES AND SUBSIDIES

An urgent priority is to redirect tax breaks and subsidies in favour of close-to-nature forest management, including both production and demand-side measures.[84] Forestry subsidies in many EU member states continue to reward rotational, even-aged forest management. Until now there have been few ecological conditions on the distribution of rural development funding under the Common Agricultural Policy (CAP). The European Court of Auditors has found that rural development measures have "little impact" on ensuring EU forests help protect biodiversity and address climate change.[85]

There have been few ecological conditions on the distribution of EU rural development funding

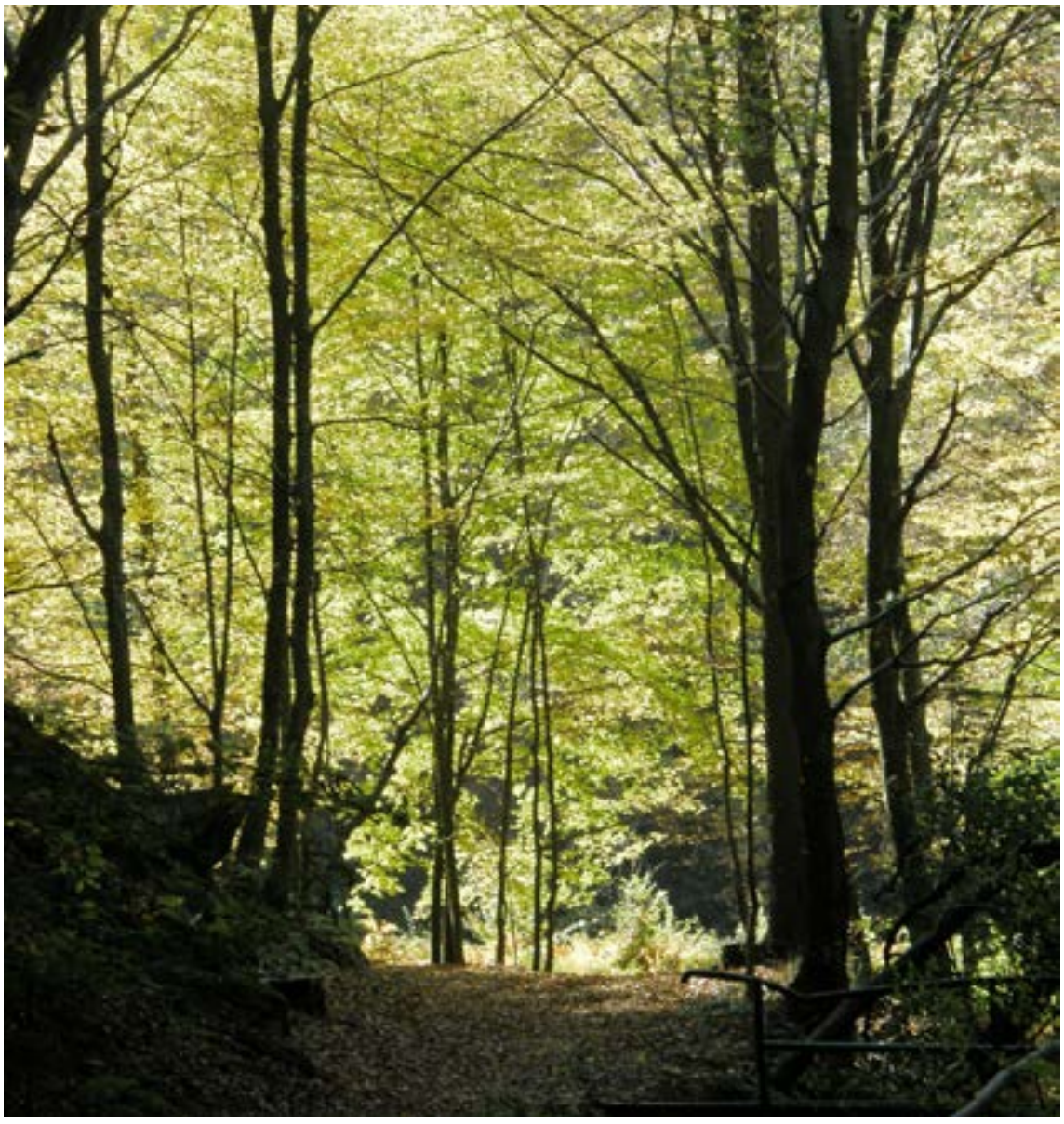
In France, for example, 87 per cent of the €200 million provided for post-Covid recovery of the forestry sector went to plantations that practice clear-cutting.[86] In Portugal, it is an association of paper and pulp production companies, CELPA, that channels millions of euros into supporting intrusive production methods in non-native, fast-growing eucalypt plantations, including deep ploughing and use of herbicides.[87]

On the demand side, biomass subsidies in the EU, which amounted to over €5 billion in 2017, incentivize larger-scale and more frequent felling rather than supporting diverse, multi-use forestry.[88]

84 Larsen et al. 2022
85 ECA 2021
86 Canopée 2022
87 Arold 2021
88 Trinomics 2021

TRANSITION FUNDS

The transition process involves various costs, including the investment needed to develop new forest management plans, re-training, and the purchase of new machinery if needed. A fund could be established to help meet these costs, with eligibility criteria that prioritise smaller-scale forest owners and contractors, to ensure that the new system does not disproportionately reward large companies that have benefitted from ecologically harmful practices. Such a fund should be primarily grant based, although there may be a role for concessional loan financing to cover the transition costs of close-to-nature forests that have not yet reached maturity.



Forest in Slovenia. Photo: Danilo Tic/Flickr (CC BY-SA 2.0)

A NEW VALUE FOR FORESTRY PRODUCTS

It should be stressed that the success or otherwise of an ecosystem-based model of forest management depends on a new perspective on the value of forests. To be effective, close-to-nature forestry should be accompanied by measures to reduce unnecessary demand on wood and wood residues, and an economic model that values the broader benefits of multifunctional forests (including for non-timber products, leisure and tourism, etc). The focus on the large-scale production of cheap wood and wood products, primarily for the pulp and paper industry, and for wood-based bioenergy, is unsustainable.

In the EU, wood harvesting rates have increased significantly in recent years.[89] The biggest driver has been biomass subsidies at national level, which are driving the intensified use of wood and wood residues from forests.[90] According to scientists, this has placed increased pressure on forests and could "significantly impede the recent progress for more biodiversity-friendly, sustainable forestry systems if no accompanying measures are taken for the preservation of biodiversity as basis for forest goods and services".[91]

The focus on the large-scale production of cheap wood and wood products, primarily for the pulp and paper industry, and for wood-based bioenergy, is unsustainable.

Wood demand should be reduced, while retaining value for forest owners and rural livelihoods

To restore forest ecosystems, harvesting rates must be limited to about 50 percent of the annual timber growth, according to Greenpeace.[92] This will only be possible if wood demand is reduced, while retaining value for forest owners and rural livelihoods. As such, the promotion of close-to-nature forest management should form part of a package of measures to ensure a more efficient use of timber as well as re-use and recycling of timber products.[93] This could entail a phase-out of harvesting of wood for electricity generation, a ban on disposable wood and paper products made from fresh wood fibre, and higher recycling rates for paper and other short-lived wood products, for example.[94]

89 Greenpeace 2020; Welle et al. 2020

90 Bollmann et al 2020; Trinomics 2021

91 Bollmann et al 2020, 29; Bauhus et al. 2017

92 Greenpeace 2020

93 Greenpeace 2020; Welle et al. 2020

94 Greenpeace 2020

PROTECTED AND STRICTLY PROTECTED FORESTS

A reduction in harvesting rates will not only facilitate the transition to close-to-nature forestry practices. It will also allow countries to place greater forest areas under nature protection, and to set aside forest areas where no logging takes place. Both approaches, ecosystem-based forestry and taking forests out of production, complement each other. Well-managed forests will only flourish if they are expanded alongside protected areas, which provide habitat for rare and protected species.[95] Protected forests also provide an important reference for the management of production forests (see the Lübeck example above).

The multifunctional forests created by close-to-nature forestry can help to increase resilience and biodiversity compared to the uniform production forests and plantations of today. However, they should not be conceived of as an alternative to protected areas. At present, only 3 percent of EU forests are protected from logging.[96] This figure should be raised to at least 10 percent, and EU member states should be encouraged to develop national level targets, which may be higher than the EU-wide figure.

95 Larsen et al. 2022

96 Greenpeace 2020

Forest in Germany (Black Forest). Photo: Herbie/ Adobe Stock

6

EU POLICIES TO SUPPORT ECOLOGICAL FORESTRY

The EU can play an important role in supporting the expansion of ecological forest management. The European Green Deal, EU Biodiversity Strategy to 2030 and the EU Forest Strategy have made progress in recognising the need to protect and restore EU forests.

The EU Forest Strategy proposes several measures such as guidelines for "closer-to-nature forestry" that "seeks multifunctional forests by combining biodiversity (even in planted forests), carbon stock preservation and timber-related revenues." The Commission's closer-to-nature guidelines would then form the basis of a voluntary certification scheme "so that the most biodiversity friendly management practices could benefit from an EU quality label".[97]

Measures proposed under the EU Forest Strategy also include better definition of "sustainable forest management", and new legal framework for monitoring EU forests. EU member states are recommended to set up payment schemes so that forest owners and managers will be rewarded for ecosystem services provided by their forests.

In this section, we refer to five specific EU policies that are currently under discussion. We do not attempt to provide a comprehensive list of policies and recommendations.

97 European Commission 2021, 14

GUIDELINES FOR "CLOSER-TO-NATURE FORESTRY"

The Commission's upcoming guidelines for "closer-to-nature forestry" are specifically targeted at forest owners and managers aiming to achieve a transition from forestry approaches that are "far from nature" to those that are "closer to nature". These guidelines should clearly indicate the direction of travel and set out milestones for what "closer to nature" means in practice. They should reflect progress towards the full application of the principles set out in this report:

- Continuous cover through the avoidance of clear-cutting. EU closer-to-nature guidelines should clearly distinguish between "restorative forest management" that cuts groups of trees in an attempt to mimic natural processes and "clear cutting".
- Structural diversity. Guidelines should encourage the creation of uneven-aged, mixed stands to enhance forest resilience. The creation of new monoculture plantations should be ruled out, with guidelines put in place to diversify existing forest areas and plantations. Progressively higher minimum thresholds for species mixture should be set locally, and benchmarked against local reference areas (i.e. unmanaged forests).
- Site-and climate-appropriate endemic species. The planting of appropriate endemic species should be encouraged, with reference to locally specific data. The use of genetically engineered trees should be specifically ruled out.
- Natural regeneration. This should be the norm, except in cases where converting plantations or previously deforested land requires planting as part of a clearly defined, time-bound transition plan.
- Deadwood thresholds. There should be science-based thresholds for an increasing proportion of deadwood left in close-to-nature forests.
- Buffer zones and forest edges. Science-based criteria for the minimum size and maintenance of buffer zones should be established. The protection of forest edges may require economic support, for example using farm subsidies designated for protected areas.
- Control of deer populations (and other grazing animals). Landscape mapping is needed to provide a science-based assessment of the capacity of forest areas and forest edges to sustain deer, boar and other grazing animals.
- Avoidance of intensive management. Pesticides and fertilisers should not be used, except as part of specific soil restoration initiatives as part of a transition to ecosystem-based forestry. New guidance is also needed to promote the use of machinery that minimises soil damage.

NATURE RESTORATION LAW

The proposed nature restoration law supports the expansion of close-to-nature forestry by defining it as an activity that helps to restore the health of EU forests.[98] Other examples of restoration measures include an increase in large, old and dying trees (habitat trees) and deadwood, a diversification of forest structure (in terms of vegetation and age), natural regeneration and succession of tree species and the development of old-growth native forests and mature stands (e.g. by abandonment of harvesting). The proposed law also sets out indicators and thresholds that assist the monitoring of improvements. The law should include specific targets for the restoration of forests.

CERTIFICATION OF CARBON REMOVALS

The upcoming carbon removal certification law will define various activities to increase the uptake of carbon in lands.[99] This law should reward carbon storage as much as removals. That would promote forests with older trees, increased amount of deadwood and overall greater carbon storage, rather than young, fast-growing monocultures. As such, close-to-nature forestry should be an important activity promoted under the new law.

FOREST MONITORING LAW

The upcoming law on EU Forest Monitoring and Strategic Plans will provide access to better data on the condition and management of EU forests, and on the products and ecosystem services that forests provide.[100] This law should improve the quality, compatibility and consistency of forest information and allow us to track the impact of forest management on both the climate and the ecosystem.

98 European Commission 2022

99 European Commission 2022a

100 European Commission, 2022b

TAXONOMY FOR NON-CLIMATE OBJECTIVES

The upcoming delegated act on the four non-climate objectives of the EU taxonomy will provide criteria for what constitutes good practice regarding the use of water and marine resources, transition to a circular economy, pollution prevention and control and the protection and restoration of biodiversity and ecosystems. It should include science-based criteria for forestry and bioenergy. The EU's taxonomy law is aimed at channelling investment toward greening the EU.

In addition to these ongoing and planned initiatives, the EU should

- **Provide funding for educational services and training** on close-to-nature forest management. The EU could also provide support for the creation of demonstration/reference areas that advance close-to-nature forest management to new areas, as well as for data gathering to fill knowledge gaps.

- **Set up a new fund to help forest owners meet the costs of the transition** to ecological forest management. Eligible funding could include the cost of developing new forest management plans, training courses and capacity building, and the purchase of new machinery where needed. Such a fund/funds should be primarily grant based, although there may be a role for concessional loan financing to cover the transition costs of close-to-nature forests that have not yet reached maturity.

- **Encourage an urgent review of national subsidies and tax regimes** affecting private forestry, including the role of biomass subsidies, and government-backed support for site cultivation and replanting, and the tending and thinning of young plantations. Instead of supporting intrusive management practices, public funding could be geared towards outcomes such as species mixtures or deadwood left after damage.

Forest in France. Photo: Julien Carnot/Flickr (CC BY-SA 2.0)

CONCLUSION

It is undisputed that we need healthy forests to preserve and bring back nature and confront the climate crisis. Existing practices and studies show that ecological forestry approaches, alongside protected areas, help to protect and restore forest biodiversity and increase forests' capacity to absorb and store carbon.

These approaches follow a different economic logic than dominant rotational forestry but are at least as successful, particularly in the face of large-scale natural disturbances that are expected to increase as the planet is heating up. Once the transition has been achieved, multi-functional and structurally diverse forests can secure a more regular revenue stream for forest owners and bring greater benefits to rural economies, through a greater focus on high-quality timber, a diversification into non-wood forest products and leisure uses of forest spaces, and reduced costs through the adoption of natural regeneration.

Once the transition has been achieved, multi-functional and structurally diverse forests can secure a more regular revenue stream for forest owners and bring greater benefits to rural economies.

The transition to close-to-nature forestry faces numerous obstacles, both culturally and in terms of training and financial support. It also requires a shift in our perception of forest resources, whose mass production using intensive management approaches has led to a large-scale degradation of EU forests. It is no longer tenable that we waste these precious resources by burning wood for energy production, and by allowing the proliferation of short-lived products like cardboard and paper with low recycling rates.

The EU can play an important role in driving the necessary changes. It should introduce new policies (e.g. nature restoration targets, monitoring instruments) and adapt existing ones (e.g. the Renewable Energy Directive) in order to facilitate, rather than blocking, the much needed transition towards ecological forestry.

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ANNEX

LIST OF EXPERT INTERVIEWEES

The following experts were interviewed for this report. However, the views expressed in this report are those of the authors. They do not purport to reflect the views of these interviewees.

Professor Joao Fidalgo Carvalho,
University Tras-os Montes Alto Douro, Portugal
Professor Jurij Diaci, University of Ljubljana, Slovenia
Bruno Doucet, Canopée, France
Hans von der Goltz, ANW Deutschland, Germany
Gesche Jürgens, Greenpeace Germany, Germany
Zoltan Kun, Wildland Research Institute, Hungary
Professor Emeritus Jørgen Bo Larsen, Denmark
Ulf Loven, Ekoskog, Sweden
Marcello Miozzo, D.R.E.A.M. Italia, Italy
Padraig O'Tuama, Pro Silva Ireland, Ireland
Kelsey Perlman, Fern, Belgium
Professor Emeritus Timo Pukkala, Finland
Viktor Säfve, Protect the Forest, Sweden
Christine Sanchez, Forêt Nature, Belgium
Knut Sturm, Lübeck City Forest, Germany
Julien Tomasini, Association Futaie Irrégulière, France
Sauli Valkonen, Natural Resources Institute, Finland

Forest in Germany (Kellerwald). Photo: Marianne Spenner Häusling

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