

WHAT DOES THE EU NATURE RESTORATION REGULATION MEAN FOR FORESTRY?

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Credit: NaturesCharm

Authors: Jessica Stubenrauch (corresponding author: jessica.stubenrauch@ufz.de), Ioannis Agapakis, Alexandra Aragao, Boris Barov, Charles-Hubert Born, Farah Bouquelle, Elisa Cavallin, Eleonora Ciscato, An Cliquet, John Condon, Kris Decleer, Harm Dotinga, Floor Fleurke, Agustin Garcia-Ureta, Enrico Mezzacapo, Morgan Harris, Laura Hildt, Niels Hoek, Volker Mauerhofer, Matilde Meertens, Ana Mendes, Francesca Leucci, Moritz Reese, Hendrik Schoukens, Niko Soininen, Arie Trouwborst, Nienke van der Burgt, Geert Van Hoorick, Jonathan Verschuuren

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KEY MESSAGES

- 1 Forest ecosystems in Europe are in urgent need of restoration to reverse biodiversity loss and declining carbon sink potential.
- 2 The indicator-based restoration requirements in the NRR mark a shift away from monocultures and clear-cuts towards continuous cover forest management with stands of mixed ages and species.
- 3 The definition of satisfactory levels for each indicator in the Member States has to align with EU's climate, biodiversity and nature protection targets.
- 4 Ensuring support by relevant stakeholders and finding common ground between them is crucial for the long-term success of forest ecosystem restoration.
- 5 Funding gaps for forest ecosystem restoration measures must be closed by e.g., phasing out harmful subsidies at the expense of biodiversity.

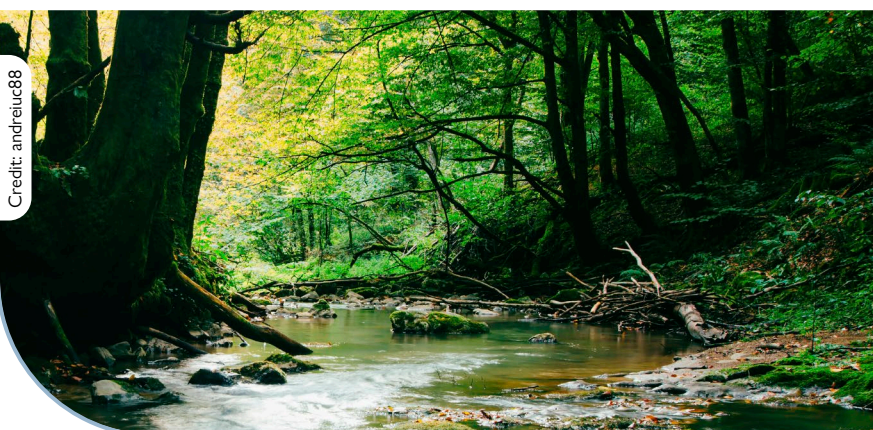
Forests in crisis: time to turn the tide

Forests are vital to combat the interconnected climate and biodiversity crises due to their diverse and valuable ecosystem services.¹ They serve as large resource pools, recreation spaces, cool local temperature, filter, clean and preserve water, and act as natural carbon sinks, by storing around 45% of the world's total terrestrial carbon.² Just as importantly, forests function as biodiversity hotspots. Globally, they are home to around 80% of biodiversity.³ In Europe, where about 40% of the land is covered by forests, forests are also among the most species-rich habitats.⁴

However, forest ecosystems are under continuous stress due to intensive management, increased harvest rates and the effects of climate change.⁵ Forest dieback caused by exceptional dry summers, heatwaves and storms is progressing, moving forests close to an ecological tipping point.⁶ In Central Europe, uniform-aged monocultures of spruce trees tend to be particularly vulnerable to climate change impacts, including beetle infestations or newly introduced pests and diseases.⁷ At the same time however, established oak trees also face increased stress and mortality due to climate change.⁸ Consequently, the carbon sink capacity of European forests is declining rapidly and decreased by about 27% between 2020-2022 compared to 2010-2014.⁹ All this turns forests into an additional source of CO₂ instead of being an reliable sink while habitats deteriorate at the expense of biodiversity.

This trend contrasts sharply with the international climate and biodiversity protection targets set out in the Paris Agreement (PA)¹⁰ and the Convention on Biological Diversity (CBD),¹¹ both of which the EU is legally bound to. The European Climate Law¹² aims to achieve climate neutrality by 2050, meaning that all unavoidable residual emissions must be offset by carbon sinks by then.¹³ The Land Use, Land-Use Change and Forestry (LULUCF) Regulation¹⁴ is important in determining the natural sink capacity required for climate neutrality. The Regulation requires net greenhouse gas removals of 310 mill t of CO₂eq from the LULUCF sector by 2030.¹⁵ This target appears totally out of reach when considering the current trend of declining sink capacities in forests. In spite of this, forests are still considered to have the greatest potential for carbon sequestration in the LULUCF sector. This underpins the importance of adopting restoration measures in the forest sector to reverse the downward trend in carbon sequestration and biodiversity loss at the same time.¹⁶ EU nature protecting legislation does not provide sufficient steering effect to address these urgent issues and is unable to halt biodiversity and carbon sink loss in forest ecosystems.

Against this background, the future of forest conversion and management are subject to intense debates.¹⁷ The targets of the Nature Restoration Regulation (NRR)¹⁸ which also aim to achieve climate and biodiversity goals could be ground-breaking and provide a blueprint for addressing key future forestry issues.¹⁹



Credit: andreic88

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2. Gordon B Bonan, 'Forests and Climate Change: Forcings, Feedbacks, and the Climate Benefits of Forests' (2008) 320 Science 1444.
3. FAO, *The State of the World's Forests 2022: Forest Pathways for Green Recovery and Building Inclusive, Resilient and Sustainable Economies* (FAO Report, 2022); Eckehard G Brockerhoff and others, 'Forest Biodiversity, Ecosystem Functioning and the Provision of Ecosystem Services' (2017) 26 Biodiversity and Conservation 3005.
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5. Henrik Hartmann and others, 'European Forests Are under Increasing Pressure from Global Change-Driven Invasions and Accelerating Epidemics by Insects and Diseases' (2025) 77 Journal für Kulturpflanzen 6.
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8. Aneta Lyubenova and others, 'Prospects for Oak Cultivation in Europe Under Changing Environmental Conditions and Increasing Pressure from Harmful Organisms' (2024) 15 Forests 2164.
9. Migliavacca and others, n4.
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11. Convention on Biological Diversity (adopted 5 June 1992, entered into force 29 December 1993) 1760 UNTS 79 (CBD).
12. Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') [2021] OJ L243.
13. Notably, this might not be early enough to be in line with the 1.5°C target of the Paris Agreement. See Copernicus, 'Copernicus: 2024 virtually certain to be the warmest year and first year above 1.5°C' (Copernicus, 7 November 2024), <<https://climate.copernicus.eu/copernicus-2024-virtually-certain-to-be-warmest-year-and-first-year-above-15degc>> accessed 27 February 2026.
14. Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU [2018] OJ L156.
15. Article 4(2) LULUCF Regulation.
16. European Environment Agency, 'Europe's Land Carbon Sink Declines, but Its Potential Stays High' (EEA, 30 June 2025), <<https://www.eea.europa.eu/en/newsroom/news/europes-land-carbon-sink-declines-but-its-potential-stays-high>> consulted 27 February 2026.
17. David Kreuer and others, 'From Crisis to Transformation: Exploring Pathways for German Forest Policy' (2025) 7 People and Nature 3344.
18. Regulation (EU) 2024/1991 of the European Parliament and of the Council on nature restoration and amending Regulation (EU) 2022/869 [2024] OJ L2024/1991.
19. Article 1 NRR.

The Nature Restoration Regulation as a blueprint for building resilient future forest ecosystems?

Key elements

1 Restoration roadmap

In line with the Kunming-Montreal Biodiversity Framework²⁰ which specifies the CBD, the NRR defines specific nature restoration targets. The overarching EU-wide goal for 2030 is to restore at least 20% of land and at least 20% of marine areas for all ecosystems in need of restoration by 2030, and all ecosystems in need of restoration by 2050.²¹ These restoration targets are concretised by specific ecosystem-related goals, including for forest ecosystems.

In terrestrial ecosystems,²² restoration measures shall, on the one hand, *improve the condition* of the habitat types listed in Annex I of the NRR, including forest habitat types, to good condition – following a staged approach (30% by 2030, 60% by 2040, and 90% by 2050). In doing so, the NRR's requirements also promote the implementation of the EU's Nature Directives²³ by setting specific time and quantity targets for various overlapping habitat types. Until 2030, the focus will be on restoring Natura 2000 areas which cover to almost 50% forest ecosystems.²⁴ On the other hand, restoration measures shall be taken to *re-establish habitat* types to reach favourable reference areas – following a staged approach once again (30% by 2030, 60% by 2040, and 100% by 2050). Restoration measures also cover habitats of all protected forest species according to Article 4(7) NRR.

2 Indicator-based restoration success in forest ecosystems

Article 12(1) NRR requires Member States to take restoration measures to enhance forest ecosystems biodiversity, in addition to the areas that are subject to the restoration measures of Article 4, considering the risk of forest fires.²⁵ Paragraphs 2 and 3 of Article 12 further specify this obligation by establishing indicators for forest ecosystems, including *one mandatory indicator* (the common forest bird index) and *seven additional indicators* from which Member States have to choose six to demonstrate improvement in forest ecosystem biodiversity. Annex VI contains a detailed description of the indicators and determines the methodologies. In that context, the European Commission may further specify methods for monitoring the indicators in an implementing act.²⁶

After the initial measurement period (from 18 August 2024 to 31 December 2030), the indicators must demonstrate an *increasing trend* every six years until satisfactory levels are reached. Notably, Member States have to determine what satisfactory levels mean for the chosen indicators by 2030 *'through an open and effective process and an assessment based on the most recent scientific findings'*.²⁷ Determining satisfactory levels for each indicator will likely be highly challenging, given the polarised interest groups in the forestry sector that often lead to political gridlock,²⁸ the varying ecological conditions between Member States and regions, and the uncertainty surrounding how forest ecosystems may develop under future climate change conditions. Diverse outcomes are to be expected across Member States. Notably, the European Commission has – in contrast to the agricultural sector – not been given the power to establish a 'guiding framework'²⁹ to determine satisfactory indicator levels which aggravates

20. CBD, 'Kunming-Montreal Global Biodiversity Framework', 19 December 2022, UN Doc CBD/COP/DEC/15/4.

21. Article 1(2) NRR.

22. Article 4 NRR.

23. Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (Codified version) [2009] OJ L20 and Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora [1992] OJ L206.

24. Metodii Sotirov (ed.), *Natura 2000 and Forests: Assessing the State of Implementation and Effectiveness* (European Forest Institute What Science Can Tell Us Series No. 7, 2017), <<https://efi.int/publications-bank/natura-2000-and-forests-assessing-state-implementation-and-effectiveness>>, 15 accessed 27 February 2026.

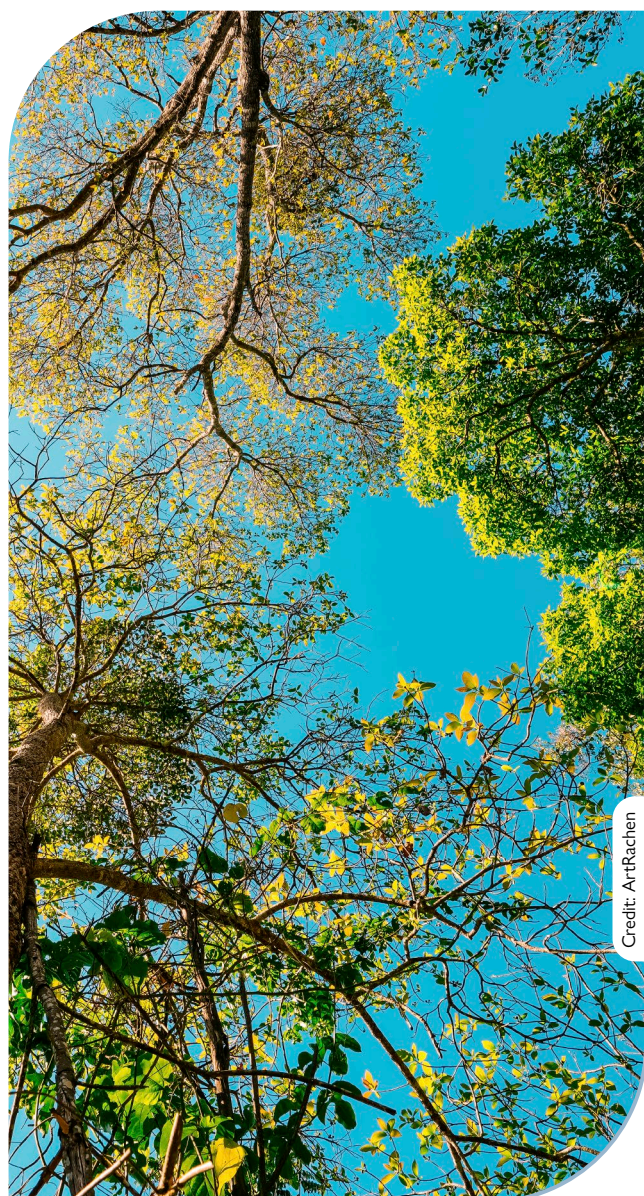
25. Emma Lees and Ole W Pedersen, 'Restoring the Regulated: The EU's Nature Restoration Law' (2025) 37 *Journal of Environmental Law* 75.

26. Article 20(11)(b) NRR.

27. Article 14(5) lit. c NRR.

28. Kreuer and others, n12.

29. Article 20(10) NRR.



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the problem. Non-fulfilment of forest ecosystem restoration obligations can be justified by either large-scale force majeure, including natural disasters such as wildfires, or by unavoidable habitat transformations caused directly by climate change.³⁰ The latter should be viewed as a means of securing the necessary flexibility to respond to the unpredictable nature of forest development in the context of climate change, and should not be used as an excuse in itself for failing to implement restoration measures in forests.

3 Forest ecosystem indicators at a glance

Common forest bird index

Due to their sensitivity, birds are a good indicator of environmental health. The Common Forest Bird Index covers 34 species in the EU³¹ and is based on a specific species list in each Member State. While the EU's common farmland bird index decreased by 42% between 1990 and 2023, the common forest bird index decreased by only 4.5%.³² Nevertheless, it is crucial to reverse this declining trend as an overall factor for ecosystem health.

Standing deadwood and lying deadwood

The amount and diversity of deadwood impacts biodiversity and climate protection as it provides microhabitats for numerous species, influences nutrient cycling and serves as an additional carbon storage pool.³³ However, deadwood is also a potential fire hazard and a valuable source of biomass which has led to its increasing removal in certain European regions.³⁴ As the volume of deadwood varies significantly between Member States,³⁵ satisfactory levels for each habitat may be challenging to negotiate as part of the 'open and effective process' (see above).³⁶

Share of forests with uneven-aged structure

Unevenly-aged forests (only) account for approximately one quarter of the total forest area in Europe.³⁷ However, these forests are potentially rich in biodiversity and less affected by natural disturbances due to high canopy rugosity, variation in rooting depth, improved vitality against insect attacks as well as the presence of smaller trees that are less prone to windthrow and therefore in sum have a good natural regeneration potential.³⁸ Increasing the share of these forests is thus a promising climate adaptation and biodiversity protection measure that can secure long-term economic resilience at the same time.³⁹

Forest connectivity

The NRR defines forest connectivity as the degree of compactness of forest-covered areas. The EU's average forest connectivity was 80.6% in 2021. Compared to 2018, average forest connectivity decreased by 0.8% which is caused by deforestation and forest fires.⁴⁰ To enable the movement and dispersal of plants, it is crucial to address the issue of small, fragmented forests and thereby increase forest connectivity, including those in Natura 2000 sites.⁴¹ Besides that, the indicator can contribute to the commitment to plant at least three billion additional trees in the EU by 2030.⁴²

Stock of organic carbon

Enhancing the stock of organic carbon in litter and mineral soil (0–30 cm) improves the carbon sink capacity of forest ecosystems and contributes to soil biodiversity and multifunctionality.⁴³ Therefore, restoring the soil carbon pool is vital for mitigating and adapting to climate change and to foster biodiverse forests at the same time. Additionally, the increased water retention capacity of carbon-rich soils hinders erosion, prevents extreme



Credit: Dennis Jacobsen

³⁰. Article 12(4) NRR.

³¹. European Environment Agency, 'Common Bird Index in Europe' (EEA, 15 July 2025), <<https://www.eea.europa.eu/en/analysis/indicators/common-bird-index-in-europe>> accessed 27 February 2026.

³². Ibid.

³³. Nicolas Mansuy and others, 'Reconciling the Different Uses and Values of Deadwood in the European Green Deal' (2024) 7 One Earth 1542.

³⁴. Ibid.

³⁵. In 2015 the volume ranged between 2.3 m³/ha in Portugal and 28.3 m³/ha in Slovakia (Forest Europe, *State of Europe's Forests 2020* (Forest Europe Report, 2020), <https://foresteurope.org/wp-content/uploads/2016/08/SoEF_2020.pdf>, 125 accessed 27 February 2026.

³⁶. Müller & Büttler already provide a valuable review of habitat thresholds as a basis for the determination of satisfactory level (Jörg Müller and Rita Büttler, 'A Review of Habitat Thresholds for Dead Wood: A Baseline for Management Recommendations in European Forests' (2010) 129 *European Journal of Forest Research* 981).

³⁷. Forest Europe, n29, 42.

³⁸. Johannes Mohr and others, 'Are Uneven-Aged Forests in Central Europe Less Affected by Natural Disturbances than Even-Aged Forests?' (2024) 559 *Forest Ecology and Management* 121816.

³⁹. Thomas Knoke and others, 'Assessing the Economic Resilience of Different Management Systems to Severe Forest Disturbance' (2023) 84 *Environmental and Resource Economics* 343.

⁴⁰. European Environment Agency, 'Forest Connectivity in Europe' (EEA, 15 October 2024), <<https://www.eea.europa.eu/en/analysis/indicators/forest-connectivity-in-europe>> accessed 27 February 2026>.

⁴¹. Christine Estreguil, Giovanni Caudullo and Daniele de Rigo, 'Connectivity of Natura 2000 Forest Sites in Europe' (2014) 2014 F1000Posters 485.

⁴². Article 13 NRR.

⁴³. Manuel Delgado-Baquerizo et al. 'Multiple elements of soil biodiversity drive ecosystem functions across biomes' (2020) 4 *Nat Ecol Evol* 210.

floods and increases forest drought resilience.⁴⁴ As emphasized in the introduction, the debate will focus on how best to achieve this crucial target.

Share of forests dominated by native tree species

Native species typically support important ecosystem interactions and therefore strengthen the resilience of forests.⁴⁵ This indicator requires that more than 50% of forests and other wooded land consists of native tree species. However, as already the term 'native tree species' is subject to an intense debate, agreeing on a satisfactory level for this indicator seems even more challenging. Having said that, the necessary climate adaptation of forests raises the question as to whether thus far non-native tree species could be recognized as native in the future. The NRR definition includes species occurring within a forest's natural range, past or present, but sets a focus on its dispersal potential, not influenced by human activity.

Tree species diversity

This indicator describes the number of tree species in forest areas. It is proven that increased tree diversity enhances the resilience and climate adaptation of forests by improving ecosystem stability.⁴⁶

Drafting the Nature Restoration Plans and core implementation issues

Nature restoration measures will adhere to Member States specific National Restoration Plans. Each Member State needs to prepare and submit a draft National Restoration Plan by 1 September 2026. The Plan has to cover the period until 2050 and set out intermediate targets for e.g. 2030. The European Commission has provided a uniform format for the Plan's outline.⁴⁷ Member States have to describe existing agricultural and forestry practices that contribute to forest restoration, provide an initial estimation of the overall financial requirements and list adverse subsidies that hinder restoration. Member States have to furthermore carry out preparatory monitoring and research to identify the necessary restoration measures. Regarding forest ecosystems, the national approach to restoring them needs to be described and indicators selected, defining baselines (optionally) and satisfactory levels for each of them. Another challenge is the determination of the total surface area that is planned to be subject to forest restoration measures, supplemented by the specific geospatial information.

To ensure effective implementation, the following points require careful consideration: Firstly, the national approach to meet the forest restoration targets should strengthen potential *synergies* with other regulatory requirements, such as national energy and climate adaptation plans, climate mitigation under the LULUCF Regulation, fostering soil health under the Soil Monitoring Law⁴⁸ or the obligation to enhance habitat connectivity within the Natura 2000 network. Secondly, potential *conflicts* relating to renewable energy targets, such as the use of woody biomass or the expansion of wind power in forests, must be carefully taken into account. This is crucial given that renewable energy targets may be considered 'projects of overriding public interest', particularly outside Natura 2000 areas but at the same time shall not undermine the NRR targets.⁴⁹ Finally, when restoring and particularly re-establishing forest habitats, it is crucial to adopt a *forward-looking perspective* and consider the potential impact of climate change based on the latest scientific evidence. This will help ensure that the chosen habitat types are suitable in the long-term.

⁴⁴. Shan Xu and others, 'Drivers of Soil Organic Carbon Recovery under Forest Restoration: A Global Meta-Analysis' (2024) 3 Carbon Research 80.

⁴⁵. Anastazija Dimitrova and others, 'Risks, Benefits, and Knowledge Gaps of Non-Native Tree Species in Europe' (2022) 10 Frontiers in Ecology and Evolution 1.

⁴⁶. William RL Anderegg and others, 'Hydraulic Diversity of Forests Regulates Ecosystem Resilience during Drought' (2018) 561 Nature 538; M Pardos and others, 'The Greater Resilience of Mixed Forests to Drought Mainly Depends on Their Composition: Analysis along a Climate Gradient across Europe' (2021) 481 Forest Ecology and Management 118687.

⁴⁷. Commission Implementing Regulation (EU) 2025/912 laying down rules for the application of Regulation (EU) 2024/1991 of the European Parliament and of the Council as regards a uniform format for the national restoration plan [2025] OJL, 2025/912.

⁴⁸. Directive (EU) 2025/2360 of the European Parliament and of the Council on soil monitoring and resilience (Soil Monitoring Law) [2025] OJ L2025/2360.

⁴⁹. Article 4(14)(c) NRR.



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Conclusion: major impact on future forestry?

The forest indicators of the NRR demand a shift in forestry practices – moving away from monocultures and clear-cuts to a continuous cover forest management, in line with climate and biodiversity targets. However, the definition of satisfactory levels for the indicators is influenced not only by scientific findings and their discussion within political power structures, but also by existing EU law. Particularly, the requirements of the Habitats Directive, the Birds Directive and the EU Climate Law will have a significant influence on satisfactory indicator levels. Conversely, the use of woody biomass for renewable energy generation, fostered by the Renewable Energy Directive,⁵⁰ could hinder the achievement of increasing indicator trends and thus prevent successful forest restoration. Ultimately, effective – and, so far, missing – legal approaches are needed to balance these competing interests and allow for sustainable forest management in line with restoration targets.⁵¹

In summary, the NRR clearly strengthens the Natura 2000 regime and moves beyond its targets. However, restoring forest ecosystems takes time and must therefore start quickly and should not be postponed in favour of measures in other ecosystems that may encounter less stakeholder resistance. Success will largely depend on positive interactions with these stakeholders, encouraging proactive engagement in forest restoration and generating acceptance of potential changes to forest legislation required to meet the NRR's targets. Another crucial challenge is securing sufficient funding. A considerable budget gap has already been identified for the restoration, preservation or enhancement of Natura 2000 forest ecosystems⁵² and current Multiannual Financial Framework developments point to even more tightened budgets. The extent to which the EU Carbon Farming Regulation⁵³ or nature credits⁵⁴ can help to channel additional finance towards restoration activities is also still an open question. To address this issue comprehensively, harmful subsidies have to be phased out and redirected towards environmentally friendly measures such as (forest) ecosystem restoration. Without this redirection, reaching the ambitious NRR targets seems unrealistic and Member States may simply use '*unavoidable habitat transformations which are directly caused by climate change*' as one potential excuse for inaction.⁵⁵

50. Directive (EU) 2023/2413 of the European Parliament and of the Council amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652 [2023] OJ L2023/2413.

51. Jessica Stubenrauch and Beatrice Garske, 'Forest Protection in the EU's Renewable Energy Directive and Nature Conservation Legislation in Light of the Climate and Biodiversity Crisis – Identifying Legal Shortcomings and Solutions' (2023) 153 Forest Policy and Economics 102996.

52. Sotirov 2017, n15, 123

53. Regulation (EU) 2024/3012 of the European Parliament and of the Council establishing a Union certification framework for permanent carbon removals, carbon farming and carbon storage in products (CRCF) [2024] OJ L2024/3012.

54. European Commission, 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions Roadmap to Nature Credits', 7 July 2025, COM/2025/374 final.

55. Article 14(4) NRR.



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