Policy Brief

Learning to achieve Forest Policy Goals under Climate Change

Policy

The EU as forerunner?
Read more

National policy change?
Read more

National responses to EU policy?
Read more

Policy stability or change: a Polish example
Read more

Coherent EU and national policies?
Read more

Forest owners

Factors driving owners' responses?
Read more

Owners' responses to policy change
Read more

Owners' willingness to improve forest biodiversity
Read more

Collaborative learning

Supporting collaborative learning
Read more

Forest ecosystems

Forest management
Read more

Management responses and Ecosystem services
Read more

Ecosystem services provision
Read more

Policy-relevant conclusions

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Introduction

This Policy Brief summarizes key policy-relevant results from two EU and nationally funded research projects: **LEARNFORCLIMATE** (https://www.ltu.se/en/research/research-subjects/political-science/re-search-projects/research- project-in-political-science/learnforclimate) and BIOCONSENT (https://www.bioconsent.eu/).

LEARNFORCLIMATE supports learning to achieve multiple forest policy and management objectives while adapting to climate disturbances such as droughts, storms, and fires, with case studies in Germany, Poland, Slovenia, and Sweden.

BIOCONSENT provides decision-support to balance forest biodiversity restoration, sustainable timber production, climate adaptation and mitigation, and water protection, with insights from case studies in Bulgaria, Germany, Spain, Sweden, and the EU-27.

The Fact Sheets in this Brief were co-authored by members of the research teams (see list of authors at the end), formatted with the assistance of ChatGPT, and edited by Karin Beland Lindahl, Luleå University of Technology, and Adam Felton, Swedish University of Agricultural Sciences. They are popular summaries of published or forthcoming peer-reviewed scientific publications and reports. References to relevant sources are listed at the end of each Fact Sheet.

An earlier draft version of this Brief was prepared and shared as a background information to participants in the projects' Final Conference *"From Science to Policy and Practice: Forest Biodiversity Restoration and Climate Change-Related Disturbances"* held in Bonn and online on September 23rd, 2025.

The EU as a "Green" Forerunner

Policy Change through the European Green Deal

The European Green Deal (EGD), launched in 2019, marked a turning point for EU forest and environmental policy. The EGD created political momentum to integrate forest, biodiversity, and climate objectives across horizontal policy sectors and vertical governance levels. By combining ecological sustainability with social and economic priorities, the EGD has the potential to strengthen the EU's role in global forest and environmental governance.

Forests in the European Green Deal

Two EU strategies are central to implementing the EGD in this context:

- EU Biodiversity Strategy for 2030 – sets overarching targets, such as protecting 30% of land and sea areas, with 10% strictly protected. It also emphasises the conservation of primary and old-growth forests and the ecological restoration of degraded ecosystems.

- EU Forest Strategy for 2030 – reinforces and expands upon the goals of the EU Biodiversity Strategy by promoting closer-to-nature management, biodiversity-friendly (re-)afforestation, and a forest-based bioeconomy. Clear-cutting and monocultures are discouraged, while uneven-aged, mixed, and climate-resilient forests are promoted.

Both strategies stress that conserving and restoring forests is indispensable for ecological stability, climate mitigation/adaptation, and long-term social and economic resilience. They highlight the accelerating and interlinked biodiversity and climate crises and call for integrated responses. Although formally non-binding, the strategies operate alongside legally binding EGD legislation (e.g., Nature Restoration Regulation, Regulation on Deforestation-free Products), recently updated legislation (LULUCF Regulation, Renewable Energy Directive), and other pre-EGD policies (Birds and Habitats Directives, Water Framework Directive).

Beyond Forests – A Broader Vision

By linking forests, biodiversity, and climate resilience to health, economic growth, and intergenerational equity, the EU not only affects practical aspects of policymaking but also promotes norms and discourses both internally among its member states and externally in (environmental) foreign policy and trade relations.

However, the EU's ambition as a "green" forerunner remains contested. Member states interpret and adopt EU policies and norms differently, often reflecting national or local priorities and stakeholder coalitions. This shows that policy change can occur less through direct compliance and more through processes of diffusion and contestation.

Key Points

➔ The EGD has raised EU ambition for forest and biodiversity policies.

➔ Forests and biodiversity are framed as cross-cutting and interlinked policy issues.

➔ The EGD provides political momentum to align national and EU policies across sectors.

➔ Legitimacy and effectiveness depend on policy coherence and consideration of national/local contexts and practices to close the gap between ambition and implementation.

Sources and further reading: Basilicata, A., Pecurul-Botines, M. & Fleckenstein, S. The EU as a Green Normative Power? Norm Diffusion in Forest Biodiversity Politics (in preparation).

How European Forest Policies Respond to Climate-Induced Disturbances

Policy Responses to Climate-Induced Disturbances

Climate change is reshaping forest governance across Europe. This Fact Sheet summarizes insights from a comparative study of how forest policies in Germany, Poland, Slovenia, and Sweden evolved between 2000 and 2022. All four countries faced storms, droughts, and insect outbreaks, while operating under shared EU and international policy frameworks. The study explored how such challenges influenced the development of national forest policy and why different policy paths have emerged.

Patterns of Change

Overall national policy directions remained broadly consistent in all four countries, but notable adjustments occurred. All countries revised how forest-related challenges are described, and climate change is now framed as a central concern, with new climate-related goals added in most countries. Substantial institutional or management changes were introduced in some countries, while others maintained more incremental approaches.

Institutional and Political Factors

The responses of European countries to climate change and related forest disturbances vary. Differences between countries are likely explained by the frequency and severity of the disturbances they experienced. Major economic and ecological impacts often require new responses. However, national institutions and politics also help to explain these differences. Property rights and governance models shape each country's ambition and ability to act, and existing governance models and policy frameworks influence how new challenges are perceived and addressed. Therefore, established solutions are often re-applied to new problems, limiting transformative change. In addition, dominant domestic actor coalitions can support, or block, policy changes proposed by the EU or international organizations.

Implications for Future Policy

The findings highlight how national forest policy in Europe adapts or remains stable under changing environmental conditions. While there are different views on whether more and faster change is desirable, anticipating how institutional and political factors enable or hinder adaptation can help policy makers and practitioners take appropriate action.

Key Points

➔ Climate change related forest disturbances are now recognized as a central concern in national forest policies in Europe.

➔ Incremental policy adjustments dominate, but more substantial policy changes occur where disturbances have been more severe.

➔ National institutions, property rights and actor coalitions shape change and stability in policy responses.

➔ Understanding past policy changes can help policy makers and practitioners anticipate future developments and factors that may speed up or impede the reforms needed.

Sources and further reading: Sandström, A., Beland-Lindahl, K., Mielewczyk, M., Niedzialkowski, K, Nilsson, J., Pezdevsek Malovrh, Š., Renaud, P., Sotirov, M., & Uhan, Z. 2025. Combating new challenges with old political solutions? Policy responses to climate-related stress and disturbances in European forests, *Forest Policy and Economics,* 178 (2025) 103561.

National Responses to EU Policy: Change or Maintain Status Quo?

Why it matters

The EU Forest and Biodiversity Strategies for 2030 are central to the European Green Deal. However, their realization depends on member states' responses and implementation. National responses differ markedly, reflecting national political and institutional contexts. Understanding these national differences helps anticipate where EU strategies are likely to meet support or resistance.

A Comparative Approach

This Fact Sheet summarizes a study of how actor coalitions and their beliefs shape national responses to EU forest policy. EU and national policy documents, national coalition beliefs, and government statements were analysed in three different contexts: Sweden, Germany, and Spain/Catalonia.

National Responses

Sweden: Forest politics are dominated by a *Production Coalition* prioritizing timber production as part of the bioeconomy and a mean to mitigate climate change. The government endorsed the EU strategies' general aims but gently rejected both, arguing that forest policy remains a national competence and favouring voluntary tools over EU regulation.

Germany: A polycentric subsystem with strong *Multifunctionality, Environmental, and Adaptive Management Coalitions,* all generally supporting multifunctional forest management, albeit with different interpretations of what that entails. The German government was divided and remained neutral to the Forest Strategy, citing subsidiarity concerns, but supported the Biodiversity Strategy, which aligned with its strong environmental beliefs.

Spain/Catalonia: Environmental Coalitions dominate, linking biodiversity and multifunctionality to climate resilience and rural development. Both governments welcomed increased EU-level engagement and supported both EU strategies, stressing synergies between biodiversity conservation, climate adaptation, sustainable use and rural development.

Main Findings

National responses depend not only on institutional fit, but also on the proximity between EU policy beliefs and dominant national coalition beliefs. Where alignment is high (Spain/Catalonia), EU strategies are supported; where conflicts exist (Sweden), they are resisted. In systems with multiple influential coalitions with different beliefs (Germany), responses are more multifaceted.

Key Points

➔ Member state responses to EU policy reflect different alignment between EU goals and dominant coalition beliefs.

➔ Production-oriented coalitions often resist EU strategies that promote biodiversity and forest protection or EU regulation.

➔ Environmental and multifunctionality coalitions are likely to foster support for the EU Forest and Biodiversity strategies.

➔ Understanding national coalition structure and belief proximity helps anticipate national responses to EU-initiated policies and their implementation.

Sources and further reading: Beland Lindahl, K., Nilsson, J., Sandström, A., Basilicata, A., Hajtmarova, S., Sotirov, M. & Pecurul, M. To change course or maintain status quo? How and why EU member states respond differently to new EU forest-related policy, *Environmental Policy and Governance* (submitted).

Stability and Change in National Forest Policy: A Polish Example

Context and Challenges

In recent years, forest policy in Poland has faced new challenges linked to climate change, sparking public debate and conflict among stakeholders. The dominance of state ownership - around 80% of forests are managed by the State Forest Holding - limits opportunities for many actors to influence forest policy and management. At the same time, this strong state-centered model makes the system more susceptible to shifts when the internal or external conditions support change.

Bottom-Up Initiatives and Social Mobilization

Grassroots movements and NGOs increasingly contest Poland's traditional top-down forest governance. Especially in suburban areas, forests are valued through a "well-being discourse" that emphasizes cultural and regulatory functions, rather than timber production. Citizen initiatives expanded during the COVID-19 pandemic, when forest access restrictions, climate impacts, and growing autocratic governance reduced public trust in state forest authorities. These groups represent an emerging coalition of beliefs and values, with a strong determination to influence policy.

Autocratic Rule and EU Pressures

Between 2015 and 2023, Poland's autocratic turn reinforced Eurosceptic attitudes among dominant actors and weakened support for forest policy measures aligned with EU climate goals. The European Green Deal was often framed negatively and was countered by narratives that emphasized national control and down-played climate concerns. Over time, however, the regime's legitimacy eroded, linking the eurosceptic forest policy actors more closely to this ruling political bloc. After the 2023 elections, opposition groups gained influence, public discourse shifted, and prospects for implementing policies aligned with EU environmental goals improved. This created a window of opportunity for the environmental coalitions to push reforms.

Policy Implications

To strengthen forest governance, national decision-makers should foster greater coherence between forestry and environmental policy across governance levels. Policy and management change should be developed through inclusive dialogue, engaging diverse social groups and coalitions. Recognizing the plurality of beliefs and values about forests - and translating them into practical management - can legitimize decisions, improve public understanding, and foster awareness of the challenges of balancing interests in a polarized social and political context.

Key Points

➜ Climate change, the pandemic and autocratic governance have shaped Polish forest policy debates.

➜ Grassroots initiatives and NGOs increasingly contest state-dominated forest governance.

➜ Autocracy (2015–2023) reinforced euroscepticism and hampered implementation of EU climate and forest policy goals.

➜ Political change in 2023 opened new opportunities for EU-aligned change.

➜ Inclusive, participatory processes are essential to strengthening policy legitimacy and resilience.

Sources and further reading: Niedziałkowski, K., Konczal, A. & Mielewczyk, M. 2025. Hands off our forests! The impact of the authoritarian rule on Polish forest policy in the context of the European Green Deal. *Forest Policy and Economics*, 171, 103402.
Niedziałkowski, K. & Chmielewski, P. 2023. Challenging the dominant path of forest policy? Bottom-up, citizen forest management initiatives in a top-down governance context in Poland, *Forest Policy and Economics* 154, 103009.

Coherence Between EU Biodiversity Policy and National Forest Legislation

Policy Maps

Policy mapping across Europe reveals that policy coherence needs to be improved, vertically - between EU and national levels - and horizontally, across forest, biodiversity, climate, energy and other relevant sectors.

Policy Ambition and Coherence at the EU Level

At the EU level, forest restoration targets show strong alignment with biodiversity and climate goals, signalling a high degree of horizontal policy coherence. However, incoherence persists where EU legislation and incentives promote intensive forest use (e.g. in agriculture, rural development, bioenergy, bioeconomy policies) which conflict with biodiversity and climate objectives.

Policy Coherence between EU Biodiversity Policy and National Forest Laws

Substantial mismatches exist between forest-related EU biodiversity and climate resilience policy objectives and national forest legislation. Many national forest laws contain rules that contain significant gaps or counterproductive provisions. National forest laws in many EU countries are often misaligned with the legal rules and norms of the Nature Restoration Regulation, Biodiversity Strategy, and Forest Strategy. For example, countries can have rules regarding clearcutting and legal obligations on short term reforestation favouring monocultures that contradict policy targets on biodiversity rich and climate resilient forests. Countries may also lack quantifiable thresholds for key biodiversity metrics such as deadwood, forest birds, and forest set asides

Moving Forward

To achieve effective implementation of forest-related EU biodiversity restoration and climate resilience policies, EU institutions, national policy makers, and stakeholders, must strengthen both vertical and horizontal policy coherence. Mapping and addressing gaps in forest biodiversity conservation, restoration, and climate policy frameworks is essential. These efforts should be combined with the engagement of key target groups, including private owners, public forest managers, national forest and nature conservation authorities, and environmental NGOs, to ensure legitimacy and uptake.

Key Points

→ Forest-related EU biodiversity restoration and climate resilience policies show high ambition, but conflict with other EU sectoral policies.

→ National forest laws vary widely and often fail to offer coherent coverage and stringency of forest biodiversity restoration and climate resilience indicators that align with EU policy.

→ Coherence gaps persist for key biodiversity restoration related indicators and practices.

→ Improved vertical and horizontal coherence is essential for effective policy implementation.

Sources and further reading: Sotirov, M., Pezdevsek Malovrh, Š. & Jonsson, R. 2024. *Chapter 3. Policy factors.* In Egger, C., Grima, N., Kleine, M. & Radosavljevic, M. (eds.). Europe's wood supply in disruptive times. An evidence-based synthesis report. IUFRO World Series Volume 42.

Fleckenstein, S. & Sotirov, M. (2024). *D5.1: European restoration policies map: Restoration policy and governance framework.* Horizon 2020 Project No. 101036849, European Commission. https://zenodo.org/records/14949521 Sotirov, M., Fleckenstein, S. & Córdova, D. 2025. *Policy Maps of National Forest Biodiversity Conservation and Restoration Related Policy and Implementation in Europe.* BIOCONSENT project report, (D1.2.1).

Driving Factors Affecting Forest Owners' and Managers' Responses

Owners and Managers Responses to Climate-related disturbance

Forest owners and managers are key actors as their management decisions directly influence the achievement of forest policy objectives. The ability of ecosystems and managers to sustain forest ecosystem services is increasingly challenged by the effect of climate change and related disturbances.

Perceptions of Driving Factors

Management decisions are shaped by socio-cultural, technological, environmental, economic, and political (STEEP) factors. Climate change and related disturbances not only alter the environment in which forest management operate, but also reshape the national policy subsystem in which actors interact. Exploring how national-level actors perceive these drivers is therefore crucial.

Cross-Country Insights

A study in Germany, Poland, Slovenia and Sweden revealed both similarities and differences among countries. In Germany, actors gave most STEEP categories equal weight, though Technology was seen as less important. In Poland, Slovenia, and Sweden, stronger contrasts appeared between STEEP categories. These differences reflect national socio-economic, cultural, and institutional contexts that amplify or reduce the influence of particular drivers.

Key Drivers Across Categories

Across countries, some specific factors stood out. Economic incentives and the increased occurrence of disturbances, together with successful adaptive management practices, were consistently emphasized. Socio-cultural aspects such as ownership structure, values, knowledge, skills, and experience were also generally highlighted. Policy coherence, i.e. well-aligned national policy frameworks, was identified as the most important political driver.

Interlinkages

Several driving factors overlapped across categories. Knowledge and skills were linked to economic, environmental, and technological contexts, with ownership patterns and economic incentives also mentioned under multiple headings. These overlaps reveal how cultural and institutional contexts shape the perceptions of drivers and their categorization.

Key Points

→ Forest owners and managers are critical for achieving forest policy objectives under climate-related change and disturbance.

→ Perceptions of driving factors differ across countries, reflecting national contexts.

→ Economic incentives and occurrence of natural disturbances strongly shape responses.

→ Socio-cultural aspects such as ownership patterns, values, and knowledge remain decisive.

→ Policy coherence is the most important political driver.

Sources and further reading: Pezdevšek Malovrh, Š., Lazya Roux, J., Niedzialkowski, K., Nilsson, J., Mielewczyk, M., Renaud, P., Uhan, Z., & Sotirov, M. 2025. What drives practitioners' forest management responses to climate change and induced disturbances? The actors' assessment in four European countries. *Forest Policy and Economics* (under review).

Forest Owner Responses to EU Forest Policy Change

Diverse Responses Among Owners and Managers

EU forest, biodiversity and climate policy objectives require the involvement of a wide range of private forest owners and public managers, with important implications for feasibility on the ground. A survey in Sweden, Germany, Poland, Slovenia, and Spain identified distinct owner types based on management objectives decision making rationalities, and behavioural responses to forest related EU biodiversity and climate resilience policy.

Types of Forest Owners

Multifunctionalists – mainly public managers and some large private owners – support EU goals on biodiversity restoration and climate resilience, though balancing them with timber production and other goals is perceived as a difficult task.

Environmentalists – mostly small owners plus some public and large private managers – support EU conservation goals but are divided on the management needed to maintain and restore biodiversity.

Optimizers – medium and large private owners and some public managers – focus on economic efficiency and often oppose EU environmental rules seen as limiting timber production or adding regulation.

Traditionalists – large and small private owners plus some communal and state managers – consistently resist stricter EU conservation objectives, such as Natura 2000 or required restoration measures after forestry or climate related disturbance.

Passives – small private owners with urban lifestyles, not active in forestry – indirectly support conservation through minimal management and interest in commercial forestry.

Variation Across Countries

These forest owner types appear across Europe, but their prevalence and behaviour differ with national cultural and institutional settings. All owner types except Passives were identified in the survey. Although it is difficult to reach Passives with surveys, the Passive type is well described in the literature.

Policy Implications

Findings highlight the need to tailor EU forest policy, as well as forest-related biodiversity and climate policy, to national contexts and owner types. Support for EU policy goals is strongest among Multifunctionalists and Environmentalists; resistance is greatest among Traditionalists and Optimizers. No single tool works for all, and as such, diverse policy portfolios are required.

Key Points

➔ Forest owners and managers respond differently to EU forest, biodiversity and climate policy.

➔ Different forest owner types exist and are motivated by different factors and rationalities.

➔ Support for EU policy goals is highest among multifunctional and environmental-oriented owner types, whereas resistance is strongest among traditional and profit-oriented owners.

➔ Mixed policy instruments, adapted to national contexts, are essential to support the implementation of EU forest and forest-related biodiversity and climate policy.

Sources and further reading: Sotirov, M., Nilsson, J., Pecurul, M., Beland Lindahl, K., Niedzialkowski, K., Aquilue, N., Nabau, J., Uhan, Z. & Pezdevšek Malovrh, Š. How and why target groups do or don't align with EU policy changes? Forest owner behavioural responses to EU biodiversity and climate policy objectives in Germany, Poland, Slovenia, Spain, and Sweden. *Land Use Policy* (submitted).

Forest Owners' and Managers' Willingness to Improve Forest Biodiversity

Why Forest Owners and Managers Matter

Ambitious policy targets have been set to halt biodiversity loss. However, reaching these targets requires effective implementation and supportive forest management responses from forest owners and managers who must navigate multiple policies and socio-economic influences, and make decisions and trade-offs amid complexity and uncertainty. When developing effective policies to guide forest management, it is important to consider the diverse objectives, preferences, and behaviours of the many types of forest owners and managers.

Forest Structure Shapes Forest Management Decisions

Based on survey results from Germany, Spain, and Sweden, the structure and tree species composition of forests are the most important factors influencing the forest management practices considered by forest owners and managers. Although different types of forest owners and managers can be identified based on management objectives and decision-making rationalities, these types do not directly explain the differences in forest management practices that owners and managers currently implement, or want to consider, to strengthen biodiversity in their forests in the future.

Factors Affecting Forest Management Decisions

Survey results from Germany showed that ecological and economic factors are important for all owner and manager types, along with personal values, goals, knowledge, and experience. The most important policy instrument that forest owners and managers considered for their management decisions was information.

Results from Spain suggest that forest road infrastructure, transportation, personal knowledge and experience, and the silvicultural state of the forest, are the most significant factors for all types of forest owners to support current forest management. Regarding key factors for changing towards a closer to nature management, all types of forest owners point to: subsidies (for both active management and natural development), joint technical management planning, innovations that facilitate forest exploitation, and the availability of labour.

Key Points

➜ Many factors influence the management decisions made by forest owners and managers, and the role of specific policy instruments in relation to these factors is not fully clear.

➜ Many factors shape (or have shaped) forest structure, including the impacts of climate change. Through their combined effect on forest structure, these factors seem to play a crucial role in owners' and managers' current forest management decisions.

Sources and further reading: Maximo, Y. I., Hassegawa, M., Nabau, J., Pecurul, M., Aquilué, N., Kraxner, F., Johnstone, C. P., Shchepashchenko, D., Krasovskiy, A., Kindermann, G., Park, E., Jo, H., Nordström, E-M., Pezdevšek Malovrh, Š. & Verkerk, P.J., 2025. *Report on Improved Forest models with enhanced representation of behavior and behavioral change of forest owners and conservation managers*. BIOCONSENT Project deliverable report 3.1. Zenodo. https://doi.org/10.5281/zenodo.14801478

Forest Management and Conservation Practices in Times of Climate Change

Why Adaptation of Current Practices is Needed

Climate change is affecting forest growth, tree mortality and ecosystem service provisioning, particularly through increased frequency and intensity of extreme climatic events and natural disturbances. At the same time, biodiversity loss is threatening forest ecosystem functions.

Enhancing Forest Resilience is Crucial

Species respond differently to threats like increased drought or pests and diseases. Forest management needs to ensure that current and newly selected tree species are suitable for the changing local climate and site conditions. Increasing (bio)diversity at different levels from stand-level tree species composition (e.g. converting spruce monocultures into mixed stands) to a diversity of management approaches at landscape level (e.g. mixing forest types) is a key strategy to enhancing forest resilience to climate change. Additional silvicultural adaptation options include introducing more drought-tolerant tree species, reducing stand density and shortening rotation times.

Recommended Species Selection in Case Studies

Forest Practitioners from Slovenia advocated for maintaining the natural tree species composition. Adapting species composition was perceived as crucial in Germany and Poland, with local differences regarding which tree species were preferred depending on the regional site conditions. Swedish forest owners affected by past fires reported little intention to change management now but expressed openness to greater species diversity and storm-resistant stands.

Post-disturbance Management Creates Opportunities

Forest restoration following disturbances provides an opportunity to diversify species composition and introduce species or provenances better adapted to the projected climate and site conditions. Natural regeneration is preferred e.g. in Slovenia, but success is threatened by widespread game overpopulation. Pioneer species like birch can be used to quickly restore a forest microclimate, which creates favourable conditions for economically desirable shade tolerant species (e.g. beech or silver fir in Germany).

Pro-active Management Desirable to Mitigate Disturbance Impacts

As disturbances are expected to increase due to ongoing climate change, more preventive measures are needed to increase forest resilience. Conversion of monocultures into mixed stands and the establishment of advanced regeneration through natural regeneration or underplanting is key. This enables faster recovery after disturbances and prevents open exposed soils after disturbances. Shortened rotation cycles are proposed to reduce wind disturbance risks (e.g in Germany).

Key Points

➔ Selecting climate adapted species and increasing species diversity are key measures to enhance forest resilience.

➔ Disturbances are natural processes in forest ecosystems and can be used to increase biodiversity.

➔ Changes to rotation length are controversial: shortened rotations include reduced risks and faster adaptation to climate change, whereas longer rotations are desirable to facilitate older stands and enhance carbon sinks.

➔ Managing game population density is crucial to protect natural forest regeneration and maintain species mixtures.

Sources and further reading: Lindner, M. et al. 2025. *Synthesis report on integrated resilience assessment* https://doi.org/10.5281/zenodo.15252475. Learnforclimate workshop reports from Germany, Poland, Slovenia, Sweden (unpublished).

Forest Ecosystem Services under Forest Owners' and Managers' Management Responses

Management Responses for Climate Change Adaptation

This study, based on survey results from Germany, Poland, Slovenia and Sweden, explores whether and how forest managers and owners plan to change their forest management for climate change adaptation in the future. Few owners and managers indicated that they will change practices to adapt to climate change. This leads to low shares of forest area potentially experiencing a shift in management practices compared to current practices. Managers and owners either (a) already manage their forest for climate change adaptation, hence there is no change in practices compared to current management, (b) are not willing to adopt the management objective of climate change adaptation in their current societal, technological, economic, environmental and policy context, or (c) a combination of both.

Poland shows the lowest share of forest that might experience a change in management, while also rather low shares of forest area might experience a change in management in Slovenia and Germany. The management changes in all countries are mainly related to favouring broadleaved or non-native tree species as well as some alterations to the thinning regimes.

Ecosystem service shifts under management for climate change

The low share of forest that might experience a change in management practices translates into minor shifts in most of the ecosystem services that forests provide, e.g. timber, carbon, habitat and water, when comparing current management with management practices involving climate change adaptation.

The combined effect of all intended climate change adaptation measures leads to slightly lower harvest rates and corresponding higher growing stocks and carbon stocks. In Germany and Poland, we expect a slight increase in habitat quality, whereas indicators for carbon storage and water regulation did not change strongly. In Slovenia, indicators for habitat quality and the carbon sink potential of the forest might increase, whereas no strong changes to water regulation are expected from the management changes.

Key Points

→ Forest management strongly determines forest ecosystem services

→ Significant changes to forest management as part of climate change adaptation, should not be expected in the absence of additional changes to societal, technological, economic or policy conditions

→ Unless more effective policy instruments targeted towards forest owners and managers are implemented, future shifts in forest ecosystem services provisioning may be driven primarily by environmental change and then mediated by how management practices respond to these changes.

Sources and further reading: Nieberg, M., et al. Anpassung der Waldbewirtschaftung an den Klimawandel - Auswirkungen auf Ökosystemleistungen, *AFZ - Der Wald* (in preparation).
Krč, J., et al. Zagotavljenje ekosistemskih storitev v času podnebnih sprememb. *Korenina* (submitted).
Socha, J., et al. (in preparation)
Felton A., et al. (in preparation)

Forest Management and Biodiversity

How Behavioural Change Can Support Forest Biodiversity

To strengthen forest biodiversity, it is important to examine how the behaviour and behavioural change of forest owners and managers can support improvements in biodiversity and, more generally, in sustainable socio-ecological forest systems, including synergies and trade-offs with other forest ecosystem services.

Modelling Behavioural Change across European Forests

Using improved forest simulation models that explicitly incorporate behaviour and behavioural change by forest owners and managers, we evaluated outcomes of alternative policy and management scenarios for biodiversity, carbon, and wood supply indicators. Analyses covered regional case studies in Germany, Spain, and Sweden, as well as an EU-wide case study.

Across all case studies, behavioural changes in forest management can help improve forest biodiversity, though outcomes strongly depended on the type and magnitude of management change. Biodiversity-friendly practices were generally compatible with higher forest carbon storage by 2050 and 2100, particularly where harvest intensity was reduced. At the European level, all scenarios show increasing total carbon stocks over time, and biodiversity-oriented regeneration methods contributed to structural changes such as increased broadleaf cover and deadwood accumulation

Synergies, Trade-offs, and Climate Interactions

Across the four case studies, management effects often had a greater influence than climate effects on biodiversity and other indicators, especially with respect to forest structure, forest carbon, and deadwood. Our results emphasize the importance of the type and intensity of management practices. The German case study showed that biodiversity outcomes are affected by what is specifically harvested (tree species, size, and harvest type) not just by the quantity harvested. This aligns with the findings from the Spanish and Swedish case studies, where close-to-nature or multifunctional approaches can provide balanced outcomes for biodiversity, carbon, and timber supply. In Sweden, biodiversity-first management clearly reduced timber supply and revenues, while multifunctional management minimized these trade-offs. In the Spanish case study, a no-management scenario maximized biodiversity and carbon storage but eliminated timber production, whereas closer-to-nature management served as a compromise that still increased wood supply.

Key Points

→ Behavioural inertia among forest owners and managers limits significant changes in forest structure and composition, as well as biodiversity indicators. Policy-driven incentives can help encourage shifts in forest management, but forest managers and owners often indicated or exhibited limited deviations from current practices in favour of forest biodiversity.

→ Multifunctional, nature-based management can create synergies and reduce trade-offs among biodiversity, carbon, and socio-economic goals.

→ Management intensity and specificity are important: biodiversity improvements are most effective when changes target harvest type, intensity, and regeneration simultaneously, rather than separately. Biodiversity-focused practices may not automatically provide climate benefits unless they are paired with broader changes in harvesting behaviour.

Sources and further reading: Verkerk, P.J., Aquilué, N., Beland-Lindahl, K., Felton, A., Holmtröm, H., Jo, H., Johnstone, C.P., Kindermann, G., Krasovskiy, A., Kraxner, F., Maximo, Y. I., Nilsson, J., Park, E., Pecurul, M., Shchepashchenko, D., 2025. Report on improved and upscaled understanding of how behaviour and behavioural change can support transformation to more sustainable socio-ecological forest systems and better biodiversity status at multiple spatial levels. BIOCONSENT Project deliverable report 3.2/3.3. Zenodo. https://doi.org/10.5281/zenodo.17987566.

Supporting Collaborative Learning on Forest Policy and Climate-Related Disturbances

Why Collaborative Learning Matters

Climate-related disturbances such as fires, storms, droughts, and insect outbreaks put European forests under increasing pressure. The question is how researchers and policy brokers at the EU level and in member states can support collaborative learning among policy and decision makers, forest owners, managers and other stakeholders to prevent and handle risks and damages.

Exploring Learning through Focus Groups

Interaction and new (scientific) information can stimulate learning. To explore the potential of learning in forest policy subsystems, focus group discussions were organized with 42 stakeholders in Germany, Poland, Slovenia, and Sweden. The participants' values and attitudes, i.e. their "policy beliefs", towards forest management and biodiversity conservation under climate change were assessed. Beliefs were surveyed pre- and post-meetings in 2024/2025 and compared with 2023 results to identify the average ratings, the short- and medium-term flexibility of beliefs and the belief divisiveness among participants.

Key Findings

Participants were in consensus on the strong need to prioritize measures to prevent and handle forest damages from climate-related disturbances. Droughts and insect calamities were considered important causes of forest damages across countries. Timber production and biodiversity conservation were both perceived as important goals in a non-divisive manner. High belief divisiveness did occur however, with respect to issues such as old-growth logging, intensive harvesting practices like clearcutting, and the use of potentially damaging machinery.

Strategies that were perceived as rather effective at addressing climate-related disturbances included the development of science-based decision tools, sharing best practices with owners and managers, preparing forest owners and managers for different timber market conditions, and providing financial support for adaptation and damage recovery. Belief divisiveness was, however, relatively high on these instruments except for the provision of science-based decision tools.

Participants identified regular exchanges with experts and stakeholders, input from researchers, and shared forest field observations as key sources of information on climate-related disturbance. Support for collaborative learning can build upon these findings. It requires openness of the participating actors to consider opposing views and needs, and it is most likely to happen for topics where belief flexibility is high and divisiveness low.

Key Points to Support Collaborative Learning

➔ Be aware of the pre-existing beliefs of participating actors and organizations.

➔ Recognize which beliefs are more likely to change in the short- or medium-term and select topics with realistic expectations for learning outcomes.

➔ Build on areas of consensus but also engage with divisive issues openly.

➔ Target specific topics and reflect on your own assumptions and desired outcomes.

➔ Provide new and relevant information and/or facilitate the exchange of information.

➔ Connect collaborative learning activities to ongoing policy and organizational processes and engage key organizations in the forest policy subsystem.

Sources and further reading: Renaud-Bernath, P. et al. Assessing policy-oriented learning as regards belief change and divisiveness: applying the Advocacy Coalition Framework to climate-related forest disturbances in Europe. *Environmental Policy and Governance* (submitted).

Policy Relevant Conclusions

1. Policy Change and Learning

■ The European Green Deal and its 2030 Forest and Biodiversity Strategies create momentum to align EU and national policies. Their legitimacy and effectiveness, however, depend on sensitivity to national and local contexts and to the diverse decision-making logics of private forest owners and public forest managers.

■ EU forest biodiversity policies support climate and nature goals, but they often conflict with objectives and instruments in other EU sectors as well as with national forest policies. Effective implementation depends on stronger vertical and horizontal policy coherence, requiring closer alignment between EU institutions, national ministries, and stakeholders across governance levels and sectors.

■ While change might be called for, national forest policies in EU member states tend to remain stable, with adjustments occurring unevenly and usually gradually. Member states' responses to climate pressures are shaped by the severity of climate impacts, existing institutional arrangements, and the beliefs and influence of national actor coalitions.

■ National actor coalitions can either facilitate or hinder policy learning, policy change, and the implementation of EU policy. When the beliefs of influential coalitions align with EU objectives, reforms are more likely to advance; when they diverge, resistance tends to increase.

■ Learning and change in the EU system require the involvement of all member states and diverse actor coalitions. Broad, multifunctional narratives supported by inclusive, well-represented processes can help bridge divides, reduce political barriers, and strengthen learning, policy legitimacy, and effectiveness.

2. Forest Owners' Responses and Learning

■ Forest management decisions are shaped by long-standing practices and ecological constraints. EU and national biodiversity and climate policies should therefore support necessary changes, learning processes, and adaptive capacity, while recognizing that national context and forest conditions strongly influence how owners and managers adapt.

■ Forest owners and managers differ substantially in their motivations, forest management objectives, and willingness to change practices. Effective implementation requires a targeted policy mix that can incentivise climate adaptation and biodiversity measures across diverse owner and manager types.

■ Policy uptake improves when regulatory, economic, and informational instruments align with the decision-making logics and the key factors shaping the behaviour of forest owners and managers. Coherent policy design is essential for effective implementation.

■ EU and national policies benefit from integrating command-and-control measures and market-based incentives with societal influence channels, including public awareness campaigns, certification schemes, and peer learning. Such combinations can enhance legitimacy, social acceptance, and learning, thereby reinforcing behavioural change.

3. Biodiversity and Ecosystem Services Provision

■ Many factors influence forest owner's and managers' management decisions. Forest structure is one key factor, shaped by past and present influences such as policies, previous management and climate change. Through their combined effects on forest structure, these factors seem to play a crucial role in current forest management decisions.

■ Management decisions - especially whether and how to harvest - strongly affect forest biodiversity and ecosystem service provisioning at the stand level. At regional to EU scales, however, the effects of potential management change are usually less drastic, as forests change slowly and are shaped by strong path-dependencies linked to the long lifespan of trees.

■ Behavioural inertia among forest owners and managers limits significant changes in forest structure and composition, as well as biodiversity and ecosystem service indicators. Current management responses to climate change and biodiversity restoration remain limited and insufficient to substantially halt or affect biodiversity decline and climate change. Additional incentives may be required to meet EU biodiversity and climate change targets.

- Management changes under alternative policy scenarios affect some ecosystem service indicators more than others. Whereas water regulation and soil carbon uptake were hardly affected by the explored management changes, other service indicators differed quite strongly. Under the biodiversity scenario, harvest removals decreased, leading to increasing growing stock and carbon pools.

- Spatial implementation of policy targets and effective conservation strategies are crucial for managing trade-offs between forest functions, particularly between wood production and biodiversity conservation and carbon sinks. Land sharing and TRIAD approaches are perceived as viable landscape-level strategies for high ecosystems services provisioning, with regional differences reflecting contrasting management traditions and disturbance risks.

4. Collaborative Learning across Science, Policy and Practice

- Collaborative learning among stakeholders can support climate adaptation and biodiversity objectives where there is convergence on problem framing, such as shared perceptions of climate-induced disturbances and the need for prevention and restoration. Its effectiveness is more limited where beliefs are deeply polarized, particularly around intensive harvesting practices.

- As beliefs vary in flexibility, EU and national policies should prioritise collaborative learning on topics with higher belief malleability and lower levels of conflict, where dialogue can realistically contribute to behavioural change and policy acceptance.

- Collaborative learning is strengthened by complementary measures, including science-based decision-support tools, exchange of field-based best practices, preparation for evolving timber market conditions, and financial support for climate adaptation and forest damage recovery.

- Participatory scenario building and strategic foresight methodologies offer EU and national decision-makers tools to reduce uncertainty, foster shared understanding, and stimulate social learning. These approaches enhance stakeholders' capacity to anticipate trade-offs and synergies, thereby improving strategic preparedness for long-term climate and biodiversity challenges.

- Without explicit attention to power relations, collaborative processes risk reinforcing existing management paradigms that benefit dominant actor coalitions. Effective policy design should therefore include safeguards to ensure balanced participation, transparency, and inclusiveness in learning-oriented governance arrangements.

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