Forest restoration paradigms and conflicts in Europe

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HIGHLIGHTS

- Diverse understandings of forest restoration exist among stakeholders interviewed in this study.
- These understandings may be shaped by the context and the collective values and beliefs of actor groups.
- Forest restoration conflicts may occur when the values and beliefs of different actor groups clash in a specific context.
- The forest restoration conflicts identified in this study mirror wider patterns of forest conflicts in Europe and the world.
- Effective forest restoration in Europe will need to take these diverging perspectives and conflicts into account in future decision-making processes.

SUMMARY

Forest restoration is gaining importance in Europe. This study aims to investigate how forest restoration is understood in a European context, identify potential forest restoration conflicts, and explore the relationship between both understandings and conflicts. To achieve this, 46 semi-structured interviews were conducted with stakeholders in 12 forest restoration case studies in 12 European countries. The results show three distinct ways in which forest restoration is understood by the stakeholders, i.e., 'forest restoration paradigms', which may arise from how different actor groups problematise forests and their management. Looking deeper, our results suggest that these 'forest problematisations' may be determined by the ecological and socio-ecological context and the collective values and beliefs of actor groups. In addition, when these underlying values and beliefs clash in a certain context, forest restoration conflicts may occur. For effective forest restoration implementation in Europe, it is important to investigate how stakeholders understand forest restoration and the contexts in which different understandings emerge.

Keywords: restoration, forest, Europe, conflicts, perceptions

Paradigme de la restauration forestière et des conflits européens

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La restauration forestière gagne en importance en Europe. Cette étude s'efforce d'examiner la manière dont la restauration forestière est comprise dans le contexte européen, à identifier les conflits potentiels menaçant la restauration forestière, et à explorer la relation entre ces compréhensions et les conflits. Pour parvenir a cela, 46 interviews ont été conduites auprès des parties prenantes dans 12 études-cas de restauration forestière dans 12 pays européens. Les résultats observent trois points de vue différents dans la perception de la restauration forestière par les parties prenantes, c.a.d. Les 'paradigmes de restauration forestière' pouvant potentiellement résulter de la manière dont les différents groupes d'acteurs problématisent les forêts et leur gestion. A la suite d'un examen approfondi, nos résultats suggèrent que ces 'problématisations forestières' peuvent être déterminées par le contexte écologique et socio-écologique et par les valeurs et les croyances communes des groupes d'acteurs. De surcroît, des conflits dans la restauration forestière peuvent apparaître quand ces valeurs et ces croyances sous-jacentes se heurtent dans des contextes particuliers. Pour atteindre une mise en marche efficace de la restauration forestière en Europe, il est important de mener une investigation dans la manière dont les parties-prenantes perçoivent la restauration forestière et les contextes dans lesquels ces divergences de compréhension émergent.

Paradigmas y conflictos de la restauración forestal en Europa

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La restauración forestal está cobrando auge en Europa. El objetivo de este estudio es investigar cómo se entiende la restauración forestal en el contexto europeo, identificar posibles conflictos en torno a la restauración forestal y explorar la relación entre las formas de entenderla y los conflictos. Para ello, se realizaron 46 entrevistas semiestructuradas a partes interesadas en 12 estudios de caso de restauración forestal en 12 países europeos. Los resultados muestran tres formas distintas de entender la restauración forestal por parte de los interesados, es decir, los 'paradigmas de la restauración forestal', que pueden surgir de cómo los distintos grupos de interesados problematizan los bosques y su gestión. En un análisis más profundo, los resultados sugieren que estas 'problematizaciones forestales' pueden estar determinadas por el contexto ecológico y socioecológico y los valores y creencias colectivos de los grupos de interesados. Además, cuando estos valores y creencias subyacentes chocan en un contexto determinado, pueden producirse conflictos de restauración forestal. Para una aplicación eficaz de la restauración forestal en Europa, es importante investigar cómo entienden la restauración forestal las partes interesadas y los contextos en los que surgen las distintas formas de entenderla.

INTRODUCTION

In the last few decades, forest restoration has gained importance on the wider international agenda. Restoration is connected to expectations such as combating climate change and biodiversity loss, increasing the provision of multiple ecosystem services, and improving human well-being (Brancalion and Chazdon 2017). The global area of restored forests has significantly increased in the second half of the twenty-first century and will likely continue given several international conventions that prioritise forest restoration as a means to achieve diverse targets, including the United Nations (UN) Framework Convention on Climate Change, the Kumning-Montreal Global Biodiversity Framework, and the UN Convention to Combat Desertification (de Jong *et al.* 2020). At the same time, forest loss continues globally and surpasses global forest gain (Estoque *et al.* 2022, FAO 2020). These two patterns – restoration vis a vis deforestation – represent two alternative 'forest frontiers': on the one hand, a growing 'restoration frontier', and on the other hand, a 'traditional forest frontier' represented by deforestation and degradation (Winkel *et al.* 2021).

The term forest restoration is used to describe a myriad of different approaches and practices ranging from passive to active, and which differ depending on the social and ecological context (Mansourian 2005, Stanturf 2004). This has led to a diversity of related terms associated with forest restoration including, for example, afforestation, reforestation, and rewilding (Mansourian 2018). These different approaches and related terms also encompass different objectives (Mansourian 2018, Stanturf *et al.* 2014). Different typologies of objectives have been developed that vary depending on the discipline from which they are examined. For example, from the field of forest and restoration ecology, Stanturf *et al.* (2014) describe four overarching forest restoration approaches with unique objectives: (1) Revegetation, which aims to increase forest cover, e.g., to improve soil erosion, but with little regard for other ecosystem services; (2) Ecological restoration, defined as the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed (SERI 2004); (3) Forest landscape restoration, defined as "a planned process that aims to regain ecological integrity and enhance human well-being in a deforested or degraded forest landscape (WWF and IUCN 2000); and (4) Functional restoration, which aims to restore natural processes, but without necessarily trying to restore ecosystem structure according to a certain baseline. Meanwhile, Kleinschmit *et al.* (2024) look at restoration from a more social science perspective. They describe three main restoration objectives: (1) Restoration for bioeconomy (e.g., timber plantations); (2) Restoration for environment (e.g., natural or more species diverse forests); and (3) Restoration for communities (e.g., agroforestry or mosaic landscapes).

Research from the field of forest landscape restoration (FLR), a specific community centred approach to forest restoration, has shown that stakeholders interpret the meaning of restoration and its objectives in a way that best serves the values of their sector (Mansourian 2018). Differing perceptions and the values and beliefs that shape them can increase the potential for stakeholder conflict, especially when they clash with one another (Emborg *et al.* 2012, Mansourian 2018, Mansourian 2021). Understanding the link between stakeholder understandings of forest restoration, values and beliefs, and conflicts is therefore important to prevent conflict escalation, develop conflict resolutions strategies, and increase social acceptability and participation in restoration (Castillo *et al.* 2021, Emborg *et al.* 2012, Höhl *et al.* 2020, King *et al.* 2015, Stanturf *et al.* 2019). However, research exploring this link is generally limited and mainly comes from the body of FLR literature, which is largely derived from studies in tropical countries (César *et al.* 2020), and therefore may not always be applicable to other contexts. Nonetheless, there are several notable studies that investigate restoration perceptions. Castillo *et al.* (2021) look into different perceptions of native forest regeneration and acknowledge that conflicts could arise from them, but do not aim to investigate them further. Similarly, Mansourian (2018) assigns different objectives of FLR to the disciplines of either forestry, ecology, or rural development, but does not delve deeper into the conflicts arising from different interpretations. Earlier work by Mansourian (2016 2017) explores the intersection between FLR and governance, but also does not aim to examine links to conflict.

In Europe, forest restoration is gaining importance given the emergence of several key policies and frameworks calling for large-scale forest restoration in Europe (Ockendon *et al.* 2018), including the EU Biodiversity Strategy for 2030 (European Commission 2020), the EU Forest Strategy for 2030 (European Commission 2021), and the Regulation (EU) 2024/1991 on Nature Restoration (European Parliament and Council 2024). At the same time, Europe has a long history of forest conflicts (Hellström and Reunala 1995, Niemlä *et al.* 2005, Nousiainen and Mola-Yudego 2022) and different values and beliefs are known to underline forest (policy) conflicts in Europe (Winkel and Sotirov 2014). Specifically, EU forest policy-making is thought to be associated with two major worldviews that strongly contrast with each other: (1) Global environmental sustainability and climate protection which supports stronger environmental regulation at EU level, versus (2) A preference for the (forest) bioeconomy with a strong forest industry and member state competencies (Sotirov *et al.* 2021).

Given the current political movement for forest restoration in Europe (European Commission 2019) and the lack of research on perceptions of forest restoration despite its relevance for conflict (Castillo *et al.* 2021), there is a need for research that investigates forest restoration conflicts in Europe. Specifically, information is needed on how forest restoration is interpreted by different stakeholders and how these different understandings can be linked to conflicts between stakeholders. Drawing on 12 forest restoration case studies across Europe, this study attempts to help fill this gap by pursuing three main objectives. First, to explore what forest restoration means to stakeholders in a European context. Second, using a typology of conflicts developed by Emborg *et al.* (2012), to identify forest restoration conflicts in different European forest restoration case studies. Third, to explore the link between stakeholder understandings of forest restoration and the identified conflicts.

CONCEPTUAL FRAMEWORK

Forest restoration paradigms

We use the concept of paradigms to inform our analysis of stakeholder understandings of forest restoration and the values and beliefs that shape them. A paradigm is "the values, metaphysical beliefs, institutions, habits, etc. that collectively provide social lenses through which individuals and groups interpret their social world" (Milbrath 1984: 7). In his seminal work on policy paradigms, Hall (1993: 279) further observes that paradigms encompass ideas and standards that specify the goals of a policy and the problems that it means to address.

We find the use of paradigms in the field of natural resource management to be the most applicable to inform our application to forest restoration. Natural resource management paradigms are "the set of common values, beliefs, and shared wisdom that collectively provide the lens through which individuals in a resource management professions such as forestry interpret and act upon their world" (Brown and Harris 1992: 232, Brown and Harris 2000: 1). These paradigms also "may include values and beliefs regarding the resource management decision process (participatory vs. expert determination), economic ideology (efficiency through benefit maximization vs. equity through benefit distribution), and social valuation of forest lands (production of commodities vs. provision of amenities)" (Brown and Harris 1992: 232).

Following Winkel (2014) (and similarly Hall (1993) in his foundational work on policy paradigms), we focus on two core aspects of how paradigms become visible in debates on natural resource management: problematisations and solutions. Problematisations relate to the perception of problems – hence to those patterns or trends that are seen as a problem to be addressed. Solutions then refer to the interventions foreseen to fix the perceived problems. In this study, restoration paradigms are hence the different "lenses" through which forest restoration is interpreted, which are connected to "the common values, beliefs, and shared wisdom" (Brown and Harris 1992: 232) of individuals with a stake in forest restoration. These values and beliefs then become visible in how actors construct restoration 'logics', which connect problems to (restoration) solutions.

Forest conflicts

Forest conflicts can be placed within the broader category of environmental and natural resource related conflicts (Nousiainen and Mola-Yudego 2022). Natural resource conflicts are often described using Glasl's (1999) description: "disputes and disagreements constitute being a conflict when one group is impairing the activities of another" (see Nousiainen and Mola-Yudego 2022, Mola-Yudego and Gritten 2010, Mola-Yudego *et al.* 2012, and Yasmi *et al.* 2006). There are different types of forest conflicts, but they usually share a common root in differing stakeholder interests, values, perceptions, and objectives (Gritten *et al.* 2009, Hellström 2001, Walker and Daniels 1997).

Global forest conflicts can be categorised according to four main topics (1) Land-use conflicts; (2) Conservation/preservation conflicts; (3) Raw material conflicts (e.g., bioenergy); and (4) Modern conflicts (e.g., urban forestry) (Mola-Yudego and Gritten 2010, Mola-Yudego *et al.* 2012). These different types of conflict can be linked to different geographical regions around the world, as well as to different socio-economic (e.g., democracy and political rights) and environmental factors (e.g., forest growing stock) (Gritten and Mola-Yudego 2011, Gritten *et al.* 2013).

In Europe, forests have been described as a "battlefield for a variety of interests" (Niemelä *et al.* 2005: 878), and therefore are prone to conflict. Conflicts are often related to changes in the demands on European forests (Hellström and Reunala 1995), which have notably shifted in recent decades from timber production to cultural and environmental services such as recreation and biodiversity conservation (Winkel *et al.* 2009, Winkel *et al.* 2022). Specifically, forest conflicts in Europe often arise due to intensification of forest management and timber production, increasing recreational demand in forests, and increasing concern over forest biodiversity loss and adaptation to climate change (Hellström and Reunala

1995, Niemelä *et al.* 2005, Nousiainen and Mola-Yudego 2022). Several factors are associated with forest conflicts including the type of forest, forest-use, and wider land-use (Niemelä *et al.* 2005). They may also have increased frequency in certain areas, such as urban areas (Nousiainen and Mola-Yudego 2022) and Natura 2000 and other protected areas (de Koning *et al.* 2014, Gallo *et al.* 2018, Nousiainen and Mola-Yudego 2022, Winkel *et al.* 2015).

While research on forest conflicts is steadily increasing (Eckerberg and Sändstrom 2013, Winkel *et al.* 2021), research specifically examining conflicts related to forest restoration is limited. Most research has specifically focused on conflicts present in FLR, a well-researched approach to forest restoration. For example, previous studies have focused on conflict mitigation and negotiation strategies for conflicts in FLR such as focus groups, surveys, and consensus building workshops (Jones and Dudley 2005). Emborg *et al.* (2012) expand on this, introducing discourse-based approaches, e.g., processes where stakeholders engage in dialogue and decision-making together as a means to resolve conflict in FLR. In addition, to the best of our knowledge, conflicts specifically related to forest restoration in Europe have not yet been investigated in-depth. There are, however, case studies available that relate to conflicts on restoration in a broader sense, e.g. on the perceptions of natural forest regrowth or the establishment of new plantations (e.g., Asselin 2022, Barnaud *et al.* 2021, Frei *et al.* 2020, Frei *et al.* 2022).

Given that a typology of forest restoration conflicts in Europe has yet to be developed, we utilise a typology of FLR conflicts developed by Emborg *et al.* (2012) that was developed to guide decision-making processes and conflict management. The typology describes five types of FLR conflict: (1) Interest-based conflict: when restoration negatively impacts an individual's personally held goals, which are often economic in nature; (2) Value-based conflict: disputes and disagreements over what comprises a 'good' landscape or forest; (3) Authority/Jurisdictional conflict: when there are unresolved questions about which agency, level of government, or civic sphere has the appropriate authority to make the decisions; (4) Legitimacy conflict: when the public disagrees with the governance approach of the government; and (5) Cultural/Historical conflict: disputes and disagreements that are rooted in cultural/historical differences between different groups and actors.

In order to explore how different understandings of forest restoration can influence conflicts between stakeholders (Emborg *et al.* 2012, Mansourian 2018, Mansourian 2021), we first identify forest restoration paradigms in European forest restoration case studies using the concept of natural resource paradigms developed by Brown and Harris (1992 2001). Second, using an FLR conflict typology developed by Emborg *et al.* (2012), we identify specific forest restoration conflicts in the case studies. Finally, we explore the link between forest restoration paradigms, their underlying values and beliefs, and forest restoration conflicts.

METHODS

Case studies

This research was conducted as part of the European project SUPERB, which aims to both demonstrate and create an enabling environment for large-scale forest restoration across Europe. The research was conducted in the project's 12 restoration case studies in 12 European countries. These case studies were selected to cover typical examples of forest degradation in Europe, a fair variety of forest biogeographical regions, land-ownership types, ecological diversity and biodiversity, and socio-economic contexts (Table 1).

At the time of this study, all case studies had begun to implement their detailed restoration plans following an initial assessment, which included selecting exact locations to be restored, planning of biodiversity restoration goals, stakeholder mapping and planning of communication processes, selecting tree species and provenances, and planning of maintenance and monitoring.

Selection of stakeholders, data collection, and analysis

We conducted two rounds of interviews between June 2022 and March 2023. All interviews followed a semi-structured interview guide. In the first round of interviews with case study leads, the guide was designed to gain an overview of the restoration case study and the overall governance situation. For the second round of interviews with key restoration

TABLE 1 *Overview of the 12 European forest restoration case studies*

Case study	Forest degradation, ecological, and socio-economic characteristics	Ecosystem services at centre of the restoration approach
Italy, Po Valley	Densley populated region; intense agricultural land-use; historical mixed bottomland forest types nearly completely replaced due to agricultural expansion and urbanisation; remaining forests fragmented and poorly connected; forests are publicly owned	Heat island mitigation, water retention, pollution absorption, recreation
Netherlands, Limburg province	Densely populated region; intense agricultural land-use; former agricultural lands converted into Scotch pine and European oak plantations with acidic soils and low biodiversity; use of agricultural fertilisers has caused biodiversity loss; forests owned by the national forest service, the municipality, and private forest owners	Carbon storage, wood production, biodiversity conservation, water retention, water provision, recreation

TABLE 1 *Continued*

Case study	Forest degradation, ecological, and socio-economic characteristics	Ecosystem services at centre of the restoration approach
Czech Republic, Vysocina and North Moravia	Agricultural and recreational region; historical forests dominated by European beech, silver fir, and Norway spruce converted into monocultures of spruce that are heavily impacted by bark beetle outbreaks and drought with negative impacts for biodiversity; forests owned by the state, private forest owners, and the military	Wood production, carbon storage, biodiversity conservation, soil protection, recreation, water provision
Germany, North Rhine Westphalia	Densely populated region; former coal and iron mining area; historical broadleaf forests replanted as monocultures of Norway spruce and Scots pine with low biodiversity; spruce monocultures heavily impacted by bark beetle outbreaks, drought, and windstorms with negative impacts for biodiversity; forests owned by the state, municipality, private forest owners, and the church	Wood production, carbon storage, biodiversity conservation, recreation, tourism, water provision, air purification
Sweden, Vindelälven-Juhttátahkka Biosphere Reserve	Remote area with rural depopulation; forests historically used by indigenous Sami people for reindeer husbandry; high proportion of intensively managed monocultures with low biodiversity; some intact high conservation-value forests remain; forests owned by the state, private forest owners, municipalities, the church, national authorities, and others	Wood production, carbon storage, cultural services, spiritual values, recreation and aesthetic values
Scotland, Queen Elizabeth Forest Park	Area with high recreational importance characterised by rural depopulation; area prone to flooding; diverse land types and land-uses including lakes, commercial and non-commercial forests, agricultural land, and sporting estates; large proportion of Sitka spruce monocultures with low biodiversity and resilience to climate change; forest owned by the state	Recreation, tourism, wood production, water retention, slope stabilisation, carbon storage, biodiversity conservation
Serbia and Croatia, Biosphere Reserve Bačko Podunavlje	Cross-border case study; rural area characterised by rural depopulation; intensive agricultural land-use; historical riparian forests cleared for agriculture and urban development and later converted into poplar monocultures with negative effects for biodiversity; forests owned by the state and private forest owners	Carbon storage, water retention, biodiversity conservation, cultural services, recreation
Romania, Făgăraș Mountains	Remote mountainous area; historical European beech and mixed forests transformed into monocultures of Norway spruce with low biodiversity; some fragmented, poorly connected patches of primary and old-growth forests with high biodiversity value remain; forests owned by a non-governmental environmental organisation	Carbon storage, biodiversity conservation, soil protection
Denmark, Thy	Densely populated coastal area with high recreational importance; temperate forests with large areas of conifer forest plantations established to protect urban areas from sand-drift but have low biodiversity; high proportion of managed forests and little remaining old forests; forests owned by the state	Water retention, carbon storage, water provision, recreation, aesthetic value, biodiversity conservation
Spain, Castilla y Leon	Rural area characterised by rural depopulation; area of high agricultural importance and previously important for mining; abandonment of agricultural systems, causing increased shrublands, forest regeneration, and risk of forest fires; forests important for the endangered Cantabrian brown bear; forests owned by the local administration	Carbon storage, water retention, water provision, soil protection, biodiversity conservation
France, Aquitaine	Area located in wildland-urban interface; former agricultural region now afforested with monocultures of maritime pine that are intensively managed and have low biodiversity and low resilience to climate change; forests impacted by forest fires, windstorms, and bark beetles; some relics of poorly connected broadleaved hedgerows around plantations owned by the state, institutions, and private forest owners	Wood production, carbon storage, forest climate change adaptation, cultural services, recreation, aesthetic values, soil protection
Serbia, Kraljevo	Semi-rural area characterised by rural depopulation; historic coppice forests important for biodiversity, but are neglected and suffer from poor structure and composition, low biodiversity, and low resilience to climate change; forests owned by monasteries and private forest owners	Carbon storage, wood production, recreation, soil protection, biodiversity conservation, cultural services, aesthetic value

stakeholders in each case study, the guide was simplified to focus on stakeholders' interpretations of forest restoration and identification of restoration conflicts (see Appendix 1 for overview of interview questions in both rounds).

Stakeholders were identified by the case study leads (as required by the project for data protection purposes) using selection criteria that ensured the inclusion of diverging perspectives (see Appendix 1 for full selection criteria). The 36 interviewed stakeholders included representatives from (a) public forest and environmental administrations; (b) state forests; (c) private forests; (d) non-governmental environmental organisations; (d) financial institutions; (e) recreational and hunting associations; and (f) other (see Appendix 2 for an overview of interviewed stakeholders). We do not claim to have covered all relevant stakeholder groups in all case studies, however, at a certain point during the process of conducting interviews, we observed that no new understandings of forest restoration emerged, and therefore we assume that we did not miss any additional understandings among stakeholders.

Both rounds of interviews (with case study leads and key stakeholders) were conducted online due to the high geographical distribution of case studies. Interviews were conducted in English, unless the interviewee preferred to have the interview in their native language. In that case, the interview was conducted and transcribed in the original language and subsequently translated into English (see Appendix 1 for an overview of interview language). The interviews lasted approximately one hour.

All interviews were fully transcribed in English and subsequently coded independently in MAXQDA, a software for qualitative text analysis. The coding process for the interviews with the case study leads followed a deductive approach, in which coding categories were based on the interview guide (Kuckartz and Rädiker 2019). In a second round of coding, sub-categories were developed inductively based on the content of the interview. In this way, the coding took place as an iterative process in which two researchers went back and forth coding the part of the text independently, until a final coding categorisation was reached (Creswell and Creswell 2017). The two researchers then discussed the two independent code structures until a final one could be agreed upon. The final one was subsequently tested by both researchers and finally applied to all of the case study lead interviews.

The coding process for the interviews with key stakeholders followed a similar approach which first followed a deductive approach and was guided by the themes of both the interview guide and theoretical lens. After the round of deductive coding, inductive coding was carried out and the development of categories was informed following as similar approach to Frei *et al.* (2020). Paradigms and the narratives inherent in them were then developed by grouping codes together to construct forest restoration paradigms that contained problem definitions, causes, and solutions (cf. Frei *et al.* 2020). This resulted in a table of stakeholders and their associated meaning of forest restoration which was then compared with what restoration conflicts they saw.

RESULTS

Forest restoration paradigms

The analysis revealed three paradigms of stakeholder understandings of forest restoration with multiple sub-paradigms: (1) Ecological restoration, with sub-paradigms natural forests and ecosystem functionality; (2) Restoration for forest cover; and (3) Socio-economic restoration with sub-paradigms multifunctional forestry, active forest management, and economic profitability (Table 2).

The three paradigms and corresponding sub-paradigms appear to fall on a spectrum from more biodiversity and nature conservation oriented to more aligned with the development of a strong bioeconomy in Europe. Following a similar pattern, these three paradigms also appear to be associated with distinct stakeholder groups. The ecosystem restoration paradigm was associated mostly with public environmental administrations and organisations, while the socio-economic restoration paradigm was associated mostly with public forest administrations and organisations, and private forest owners, associations and workers.

Forest restoration conflicts

The analysis revealed four types of forest restoration conflicts following the Emborg *et al.* (2012) typology: (1) Public administration conflict; (2) Policies and legislation conflict; (3) Stakeholder conflict; and (4) Decision-making conflict (Table 3).

When compared to the other three Emborg *et al.* (2012) conflict types, interest-based and value-based conflicts were far more numerous and ubiquitous across all case studies and were the only type of conflict that could explicitly be connected to restoration paradigms. Therefore, we focus on interest and value-based conflicts for the remainder of this paper and describe the four interest and value-based conflicts we identified in detail below. This is followed by an analysis of their relationship to forest restoration paradigms (Table 4).

(1) Biodiversity conservation vs. timber production and harvesting: This conflict was rooted in all three paradigms. In the natural forests sub-paradigm, public environmental stakeholders favouring biodiversity conservation saw conflicting interests and values with public and private forest stakeholders, as well as rural communities, who they perceived to favour economic and subsistence use of forests and consequently fear economic losses from reduced timber production or restrictions on subsistence harvesting. In the restoration for economic profitability sub-paradigm, public and private forest stakeholders perceived the opposite, i.e., that their economic interest in forests conflicted with public environmental stakeholders who they perceived to value naturalness and biodiversity of forest ecosystems over their economic profitability. Stakeholders subscribing to the natural forests sub-paradigm reported that this conflict often manifests in disagreements over tree species selection. Public environmental stakeholders were in favour of the use of diverse native

TABLE 2 *Paradigms in stakeholder understandings of forest restoration*

Forest restoration paradigm	Sub-paradigms (if any)	Problematisations	Solution (restoration meaning)	Case study countries where paradigm was found	Main stakeholder groups voicing paradigm
Ecological restoration	Natural forests	Human intervention has degraded forests. Most natural forests have disappeared and now monocultures of non-native species are widespread. Forests that have persisted have been considerably altered in their species compositions, structures, and natural processes. These degraded forests have low forest biodiversity and ecosystem services and poor ecosystem functioning.	Restoration aims to return forests to a more natural state, i.e., the state before they were degraded by humans. This includes returning to the original tree species compositions and forest structures, as well as the return of natural processes. This also increases the provisioning of ecosystem services, including increased forest biodiversity, habitat connectivity, carbon sequestration, and cultural value.	Denmark, Romania, Scotland, Sweden, Serbia	Public environmental administrations & organisations
	Ecosystem functionality	Climate change and the continuous management of forests for centuries has irreversibly altered forests. It is no longer possible or desired to restore forests to how they were prior to human intervention. Forests are susceptible to climate change and need to be adapted to withstand future disturbances.	Restoration aims to restore ecosystem functionality without considering a particular baseline. It considers future climate change and the cultural value of the existing forest through careful species selection and introduction of traditional management practices.	Denmark, France, Scotland	Diverse
Restoration for forest cover	N/A	Agricultural expansion has decreased forest cover. In some areas, agricultural lands are now abandoned and have low biodiversity and cultural value. Remaining forests in the agricultural landscape are fragmented and poorly connected.	Restoration aims to transform former agricultural lands into forests (again), and as a result, create green spaces for society, address climate change, improve habitat connectivity, soil conditions, and biodiversity.	Italy, Serbia	Diverse
Socio-economic restoration	Multifunctional forestry	Forest management has historically prioritised timber production over other ecosystem services. This has decreased forest resilience to climate change and disturbances and negatively impacted biodiversity and ecosystem services, especially cultural services.	Restoration aims to transition to more sustainable forest management for multiple ecosystem services, including timber production, carbon sequestration, recreation, and forest biodiversity. Timber production is still a central objective of forest management but is no longer prioritised over other ecosystem services.	Croatia, Czech Republic, Germany, Netherlands, Scotland, Sweden	Public forest administrations; private forest owners, associations, & workers
	Active forest management	Due to rural depopulation and changing socio-economic factors, former agricultural lands were abandoned, resulting in natural forest regrowth. Without proper management, these new forests, as well as abandoned old forests, are vulnerable to forest fires and have little economic value.	Restoration aims to return forests to active management and therefore reduce risk of forest degradation by wildfires, as well as increase the economic and environmental value of the rural area.	Spain	Diverse
	Economic profitability	Climate change and disturbances such as bark beetle outbreaks have degraded forests which has decreased their economic profitability and negatively impacted forest owners.	Restoration aims to increase forest resilience to climate change, decrease the risk of degradation by future disturbances, and increase the profitability of the forest again by increasing the potential for long-term timber production. This has some secondary benefits to the primary goal of timber production, including increased forest biodiversity and hunting opportunities.	Germany, Czech Republic	Public forest administrations; private forest owners associations, & workers

TABLE 3 *Common governance conflicts associated with forest restoration*

Forest restoration conflict type	Description	Alignment with Emborg *et al.* (2012) conflict type(s)
1. Public administration conflict	Ambiguous and conflicting administrative competencies impairs coordination between administrations	Authority/jurisdictional conflict
	Top-down decision-making is misaligned with local interest	Authority/jurisdictional conflict
2. Policies and legislation conflict	Horizontal and vertical incoherences in forest policy	Authority/jurisdictional conflict
3. Stakeholder conflict	Conflicts between stakeholder groups rooted in differences in interests and values	Interest-based conflict; value based conflict
	Historical power imbalances between stakeholders	Cultural/historical conflict
4. Decision-making conflict	N/A; Case study specific	Authority/jurisdictional conflict

TABLE 4 *Relationship between forest restoration paradigms and interest/value-based conflicts between stakeholder groups*

Main stakeholder group & associated forest restoration paradigm		Perceived conflict with	Interest/value-based conflict
Public environmental administrations & organisations	**Ecological restoration**	Public forest administrations & organisations; forest industry; private forest owners, enterprises & workers; rural communities	Biodiversity conservation vs. timber production & harvesting
		Traditional hunting associations & hunters	Forest restoration vs. hunting culture & traditions
		Recreationists	Forest restoration vs. recreation & forest cultural value
Diverse	**Restoration for forest cover**	Farmers and agricultural sector; development sector	Forest restoration vs. other land-use types
		Recreationists	Forest restoration vs. recreation & forest cultural value
		Public forest administrations & organisations; forest industry; private forest owners, enterprises & workers; rural communities	Biodiversity conservation vs. timber production & harvesting
Public forest administrations, private forest owners, associations & workers	**Socioecological restoration**	Public environmental administrations & organisations	Biodiversity conservation vs. timber production & harvesting
		Recreationists	Forest restoration vs. recreation & forest cultural value
		Traditional hunting associations & hunters	Forest restoration vs. hunting culture & traditions

tree species, which they see as a conflicting with public and private forest stakeholders that prefer non-native species for economically profitable timber production. Finally, in the restoration for forest cover paradigm, this conflict manifested in disagreements between active vs. passive forest management and was found only in the Spanish case study. Here, stakeholders from diverse groups who favoured active management of forests to increase the economic and environmental value of rural areas and reduce wildfire risk, perceived conflicting interests and values with local environmentalist groups that are thought to favour passive management of forests for conservation purposes.

(2) *Forest restoration vs. hunting culture and traditions*: This conflict was reported by stakeholders sharing the ecological restoration and socio-economic restoration paradigms. In the two paradigms, stakeholders, regardless of which stakeholder group they belonged to, perceived that an overpopulation of deer and other browsing ungulates is impeding forest restoration efforts. However, they believed that this (perceived) overpopulation is denied by traditional hunting associations and hunters in order to maintain a hunting culture that is focused on traditional hunting values rather than on ecosystem-based population control. This conflict was mainly thought to be a problem in Central, Eastern, and Northern

European countries. In the German and Scottish case studies, hunters were thought by some stakeholders to be supported by a strong hunting lobby and/or powerful elites that prevent the changing of hunting policies, legislation, and leaseholder systems that are perceived to support the traditional hunting culture.

(3) *Forest restoration vs. recreation and forest cultural value*: This conflict was associated with stakeholders in all three paradigms. In each of the three paradigms, stakeholders perceived that forest restoration induced changes to forest accessibility, recreation, safety, and aesthetics create conflict with local communities, recreationists and hunters, especially when forest restoration blocks access to certain recreational paths or hunting areas either through fencing or flooding resulting from changes in the forest water regime. In the natural forests sub-paradigm, public environmental administrations were in conflict with recreationists specifically over strict protection measures, as the approach is seen to increase the number of aging trees which are perceived as a safety threat to recreationists. Changes to forest aesthetics by altering tree species, water regimes, and forest structure were most conflict prone in all three paradigms, because they were thought to damage local communities' emotional connection to the forest and negatively impact forest cultural value.

(4) *Forest restoration vs. other land-use types*: This conflict was unique to stakeholders in the restoration for forest cover paradigm. Stakeholders from diverse groups perceived conflicts with the agricultural and development sectors which are perceived to value agricultural expansion and infrastructure development over the environment and forest protection. According to stakeholders, this competition for land-use is especially prominent in urban areas. In most cases, stakeholders thought this conflict posed a challenge for expanding forest restoration because there is currently a lack of available incentives to convince farmers or private land owners in the surrounding areas to engage in forest restoration.

DISCUSSION

Our exploratory study suggests the presence of three forest restoration paradigms among our stakeholders: (1) ecological restoration, with sub-paradigms natural forests and ecosystem functionality; (2) restoration for forest cover; and (3) socio-economic restoration, with sub-paradigms multifunctional forestry, active forest management, and economic profitability. The three paradigms and corresponding sub-paradigms appear to fall on a spectrum from more biodiversity and nature conservation oriented to more aligned with the development of the bioeconomy in Europe. This spectrum is closely in line with the spectrum of forest management regimes across Europe ranging from more biodiversity and nature conservation focused in Western and Southern Europe to more timber production and bioeconomy oriented in Northern and Central Europe (Winkel *et al.* 2009, Winkel and Sotirov 2014).

The results of our study suggest that, in their understanding of forest restoration (i.e., forest restoration paradigm), stakeholders problematise certain aspects of forests and their management. Looking deeper, these 'forest problematisations' appear to be linked to (1) the ecological and socio-ecological context in which restoration takes place and (2) the larger values and beliefs of the actor group, which shape the lens in which they interpret forests and their management (Brown and Harris 1992). In this way, on the one hand, the forest restoration paradigms identified in our interviews may respond to forest management aspects and challenges that have been present in the landscape before and which are embedded in the regional context. On the other hand, through forest restoration paradigms, the stakeholders in this study appear to interpret what is a problem for forests through the lenses of different worldviews, which are often found across the continent and beyond (e.g., nature conservation vis a vis economic forest use dichotomy, see Winkel and Sotirov 2014, Winkel *et al.* 2021).

On the most pro-biodiversity side of our identified spectrum, our results suggest that stakeholders aligning with the natural forests sub-paradigm (mainly environmental administrations and NGOs) problematise intensive forest management and related forest structures (e.g., monocultures). Some of the case study countries where this paradigm was found represent some of the places where forest management intensity in Europe is typically highest, such as in Northern and Central Eastern countries (Levers *et al.* 2014, Winkel *et al.* 2022). This paradigm mirrors scientific debates concerning the impact of intensive forest management on biodiversity, which have for example been prominent in Fennoscandian countries (Eggers *et al.* 2022, Kuuluvainen *et al.* 2012, Nilsson *et al.* 2006). The paradigm is additionally related to scientific discussions on the role of intense timber focused management in the disappearance of old-growth and other high conservation-values forests, for example in Sweden (Ahlström *et al.* 2022). Our results indicate that stakeholders respond to this problematisation by emphasising the need to focus on nature and biodiversity, including natural processes, species composition, and forest structure. In general, the natural forest sub-paradigm found in this study seems to reflect one of the dominant perspectives on forests in EU – mainly held by environmental administrations and NGOs – which views forests as an ecosystem vital for biodiversity and natural processes and which are threatened by intensive forest management (Winkel *et al.* 2009, Winkel and Sotirov 2014).

Meanwhile, stakeholders aligning with the ecosystem functionality sub-paradigm appear to problematise the idea that forests can be returned to a target state that lies in the past, arguing that forests have been irreversibly impacted by climate change and will continue to be in the future, creating great uncertainty. This sub-paradigm is in line with discussions within scientific communities on the need for dynamic restoration approaches that are focused on restoration of ecosystem processes as opposed to historic baselines (Higgs *et al.* 2018, Perino *et al.* 2019). The emphasis on the need to consider forest cultural value in restoration made by some stakeholders is reflected in literature that investigates conflicts related to the loss of cultural landscapes in Europe (Frei *et al.* 2020, Tieskens *et al.* 2017).

Falling in the middle of our identified biodiversity/bioeconomy spectrum, stakeholders aligning with the restoration for forest cover paradigm appear to problematise both historical deforestation and the intensification of agriculture in Europe that have decreased forest cover. Potential negative impacts of these land-use changes on ecosystem services such as biodiversity, carbon sequestration, soil, water, and recreation have been discussed within certain scientific circles (e.g., Kaplan *et al.* 2009, Stoate *et al.* 2009). Our results indicate that stakeholders subscribing to this paradigm consider forest restoration as a means to counteract these negative impacts and consider the phenomenon of large areas of agricultural land abandoned in recent decades (Ustaoglu and Collier 2018), as a potential for restoration. This opportunity has also been discussed in the literature, especially in the context of natural revegetation (e.g., Pereira and Navarro 2015). Notably, increasing forest cover through afforestation and reforestation is also a central goal of the EU Forest Strategy and the 3 Billion Tree Planting Pledge For 2030 (European Commission 2021).

Moving to the socio-economic paradigm and bioeconomy side of our identified spectrum, stakeholders aligning with the multifunctional forestry sub-paradigm also appear to problematise intensive forest management, but for alternative reasons compared to the stakeholders subscribing to the natural forests sub-paradigm, including for negative impacts to forest resilience and on the provisioning of ecosystem services important to society such as cultural and regulating services. These concerns align with the perspectives of some scientists that multi-species forests are more beneficial for biodiversity and climate resilience than monospecific forests (e.g., Messier *et al.* 2022). Our results show that stakeholders subscribing to the sub-paradigm consider forest restoration as a means to transition away from intensive forest management to management focused on multiple ecosystem services (i.e., multifunctional management). This paradigm was often found in Central European case study countries where multifunctional management is already the dominant management regime (Borrass *et al.* 2017, Winkel *et al.* 2009, Winkel and Sotirov 2014). The interviewed stakeholders also highlighted restoration as a means to respond to changing societal demands of forests, which has been described in the literature as a shift from timber production to amenity related services like recreation and biodiversity, and decreasing demands for timber production (Winkel *et al.* 2009, Winkel *et al.* 2022).

In the centre of the pro-bioeconomy side of our identified spectrum, stakeholders aligning with the restoration for active forest management sub-paradigm appear to draw on the context of agricultural land abandonment in Southern Europe, which has occurred due to a range of political, socio-economic, and ecological factors (Frei *et al.* 2024, Rey Benayas *et al.* 2007, Ustaoglu and Collier *et al.* 2018). Stakeholders also linked land abandonment to spontaneous forest regrowth on abandoned agricultural land, which has been shown by other research to be problematised differently by different stakeholders (Frei *et al.* 2020, Frei *et al.* 2022). Stakeholders subscribing to this sub-paradigm, which was exclusive to the Spanish case study, seemed to problematise land and forest abandonment for increasing the risk of wildfires and contributing to the low economic value of rural land. This is closely aligned with a "pro-forest management" narrative found in Southwestern Europe that argues that forests must be managed in order to reduce risk and create opportunities for the local wood market (Frei *et al.* 2020). Notably, the active forest management sub-paradigm and restoration for forest cover paradigm appear to overlap in that they both respond to land abandonment. The stronger focus on economic prospects of forestry by stakeholders subscribing to the active forest management sub-paradigm vs. biodiversity and cultural ecosystem services in the restoration for forest cover paradigm may arise partially from the rural vs. urban case studies where the sub-paradigm and paradigm were respectively found, a divide that has been identified in relation to spontaneous forest regrowth (Frei *et al.* 2020).

Finally, at the end of the bioeconomy side of our identified spectrum, stakeholders subscribing to the economic profitability sub-paradigm appear to problematise climate change and forest disturbances. The impact of climate change and related increased frequency and intensity of forest disturbances on European forests is well researched (Patacca *et al.* 2023, Seidl *et al.* 2017, Senf *et al.* 2020), including in relation to Norway spruce (*Picea abies*) plantations across Central Europe (Marini *et al.* 2017, Vitali *et al.* 2017). The paradigm further mirrors scientific debates about the economic impacts of disturbances on European forests, including the concerns over the loss of income to forest owners and reduced long-term timber supply to the timber industry (Hanewinkel *et al.* 2013, Hlásny *et al.* 2019). Stakeholders subscribing to this sub-paradigm consequently respond to this problematisation by calling for increased economic resilience of forests through two main means: (1) diversifying of tree species with climate-adapted, non-native species mainly from North America (e.g., Douglas fir and Sitka spruce) that can meet the demand for biomass for the forest industry, and (2) shortening rotation periods to reduce disturbance risk. In general, the sub-paradigm seems to reflect the other dominant perspective on forests in the EU – held mainly by forest administrations, related interest groups, and the forest industry – that views forests as a commodity for wood production and perceives threats by external factors such as natural disturbances and insect outbreaks (Winkel *et al.* 2009, Winkel and Sotirov 2014).

When compared to some of the restoration paradigms present in the global debate, the three paradigms identified in our interviews have strong overlaps but also notable differences. For example, compared to the three types of restoration objectives described by Kleinschmit *et al.* (2024) (restoration for bioeconomy, restoration for environment, and restoration for communities), the socio-economic restoration paradigm we identified overlaps with the objective to restore for the bioeconomy, while the ecological restoration paradigm overlaps with the objective to restore for the environment. The restoration for communities objective is notably missing within the three paradigms we identified, while some elements (e.g., creation of green spaces in the restoration for forest cover paradigm) are present.

Our results indicate that by responding to distinct specific problematisations, forest restoration may act as a boundary object (Leigh Star 2010) to which actors attach their vision of a preferred, alternative forest management regime. From our interviews with stakeholders, it appears that when the underlying values and beliefs that shape both the problematisations and solution strategies inherent in forest restoration paradigms clash with one another, these can cause interest and value-based conflicts.

The interest and value-based conflicts found in this paper ((1) Biodiversity conservation vs. timber production and harvesting; (2) Forest restoration vs. recreation and forest cultural value; (3) Forest restoration vs. hunting culture and traditions; and (4) Forest restoration vs. other land-use types) are reflected in the wider patterns of forest conflicts in Europe and the world (Hellström 2001, Gritten *et al.* 2013, Nousiainen and Mola-Yudego 2022). A prominent interest/value-based conflict in the case studies was between biodiversity conservation and timber production and harvesting that was associated with all three paradigms. Given that forest restoration involves diverse sectors, including forestry and nature conservation (Mansourian 2021), and the prevalence of this conflict in general in European forests (Niemelä *et al.* 2005, Young *et al.* 2005) and EU forest policy (Edwards and Kleinschmit 2013, Sotirov and Arts 2018, Sotirov and Storch 2018), it is not entirely unexpected that this conflict also manifests in relation to forest restoration in Europe.

The conflict found between forest restoration and hunting cultures does not appear to fit neatly into the box of recreational conflicts that are primarily concerned with clashing recreational uses of forests (Bakhtiari *et al.* 2014, Nousiainen and Mola-Yudego 2022). However, conflicts related to hunting and forestry have been found in Central European countries, for example in Germany (Ammer *et al.* 2010). The perception of this conflict with traditional hunting associations and hunters is notably shared by various stakeholders subscribing to different paradigms, which aligns with findings that both economically and environmentally motivated stakeholders perceive that hunters hinder the achievement of their respective management goals in forests by neglecting (perceived) overly high ungulate populations (Ammer *et al.* 2010).

In comparison to forest restoration paradigms, conflicts also appear to be rooted in the context where the restoration takes place. This further highlights the need to understand the interplay of the values and beliefs of different actors and the socio-ecological contexts where restoration takes place, as this may influence both restoration paradigms and conflicts related to restoration.

Overall, the results of this study highlight the importance of investigating potential meanings of forest restoration according to stakeholders before implementing forest restoration in a certain case, and that these diverse perspectives are openly discussed in decision-making processes, especially in conflict resolution processes, as earlier discussed by (Castillo *et al.* 2021, Emborg *et al.* 2012, Mansourian 2018, Mansourian 2021). The results also suggest that it is important to clarify what is meant by forest restoration in policy-making, as the forest restoration paradigm a particular policy holds may best suited for the policy sector in question, rather than commonly held perspectives or objectives of forest restoration, as found earlier by Mansourian (2018).

Finally, it is important to acknowledge the methodological limitations of this study. The objective of this study was to explore, namely, (1) how forest restoration is understood in a European context by different stakeholders, (2) potential forest restoration conflicts, and (3) the relationship between both understandings and conflicts. Therefore, as an exploration, we do not aim to draw too far-reaching conclusions from the results of this study. The results should rather be carefully interpreted, especially considering the limitation of the data gathering, i.e., this research used selected case studies and the number and diversity of stakeholders per case study was limited. For these reasons, this study does not aim to make generalisations or draw conclusions across stakeholder groups or across geographical regions, nor does it claim that the identified forest restoration paradigms or conflicts are the only ones present in Europe. However, given the total number of interviews conducted across a high diversity of different cases, we find that the results are able to speak to trends of forest restoration paradigms and conflicts in different geographical regions and stakeholder groups in Europe.

CONCLUDING REMARKS

Forest restoration is high on the political agenda in Europe and is developing increasing importance with the new EU regulation on nature restoration. While this implies positive impacts for biodiversity, ecosystem services and society, this paper shows that forest restoration in Europe is not understood in the same way by different stakeholders. Instead, in our interviews, we found different forest restoration paradigms that problematise the state of forests and landscapes differently, and envisaged different solution strategies related to these problematisations under the name of forest restoration. Consequently, restoration conflicts arise when the underlying values and beliefs that shape these forest restoration paradigms and their inherent problematisations clash with one another. These results point to the importance of investigating different understandings in advance in order to aid restoration policy design and implementation and resolve conflicts. Future research is needed to determine if the forest restoration paradigms found in this study are representative for the stakeholder groups and case study countries, and if further paradigms can be found. Finally, the increasing impact of climate change on forests may further alter the debate on forest restoration.

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APPENDIX 1: Overview of interviews conducted between June 2022 and March 2023

Round	Target group	Case study country	Number	Interview language	Selection criteria	Focus of interview questions
1	Project leads of the 12 restoration case studies	All 12 case study countries	12	English	Project leads of the case studies	1) description of the case study area; (2) status of the restoration activities; (3) the decision-making processes related to restoration in the case study; (4) relevant policies that affect restoration in the case study; and (5) challenges and opportunities that impact restoration implementation in the case study
2	Key restoration stakeholders in each case study area	Croatia/ Serbia	4	Croatian, English	Four main criteria: (1) (a) Knowledgeable of the project restoration case study (preferred) OR (b) knowledgeable about restoration in the local area/region; (2) Belongs to one of the following groups: (a) Public forest or environmental administration (at local, regional, or national level) (b) Private forest owners, workers, and associations (c); (d) Non-governmental environmental organisations; (e) State forest enterprises, agencies, and associations; (f) Recreational or hunting associations; or (g) Financial institutions; (3) (a) Knowledgeable about governance challenges and/ or conflicting interests and values of stakeholders that effect restoration implementation in the case study, OR (b) represent a typical view of a typical conflict between stakeholders in the case study; (4) Gender balance.	1) the meaning of forest restoration to the stakeholder; (2) the stakeholder's interest and engagement in the restoration in the case study/local area and predicted future outcomes of the restoration; (3) stakeholder's perceptions of conflicts related to restoration; (4) other challenges and opportunities for restoration in the case study/local area; (5) predicted future outcomes of the restoration in case study/local area.
		Czechia	2	English		
		Denmark	2	English		
		France		French, English		
		Germany	4	German		
		Italy	2	Italian		
		Netherlands	3	Dutch		
		Romania	3	Romanian		
		Serbia	3	English		
		United Kingdom (Scotland)	4	English		
		Spain	2	Spanish		
		Sweden	3	English		
Total			46			

APPENDIX 2: Overview of interviews with case study leads and stakeholders in the 12 case studies

Case study country	Reference code (S=stakeholder, CL=case study lead)	Gender	Knowledge of case study (YES/NO)	Stakeholder's affiliation	Meets all stakeholder criteria?	Notes
Croatia/Serbia	CL-RS-HR-1	F	YES	Research/academia representative	N/A	Case study leads interviewed together
	CL-RS-HR-2	M	YES	Research/academia representative	N/A	
	S-RS-HR-1	M	YES	Public environmental administration representative	YES	From Serbian side of case study
	S-RS-HR-2	M	YES	State forest representative	YES	From Serbian side of case study
	S-RS-HR-3	M	YES	State forest representative	YES	From Croatian side of case study
	S-RS-HR-4	M	YES	Hunting association representative	YES	From Croatian side of case study
Czechia	CL-CZ-1	M	YES	Research/academia representative	N/A	Case study leads interviewed together
	CL-CZ-2	M	YES	Research/academia representative	N/A	
	S-CZ-1	M	YES	Hunting association representative	YES	
	S-CZ-2	M	NO	Public forest administration representative	YES	
Denmark	CL-DK-1	F	YES	Public environmental administration representative	YES	
	S-DK-1	F	NO	Non-governmental environmental representative	YES	
	S-DK-2	F	YES	Public environmental administration representative	YES	
France	CL-FR-1	M	YES	Research/academia representative	N/A	Case study leads interviewed together
	CL-FR-2	M	YES	Research/academia representative	N/A	
	S-FR-1	F	NO	Public forest administration representative	YES	
	S-FR-2	M	YES	Research/academia representative	NO	Does not belong to one of the targeted stakeholder groups

Case study country	Reference code (S=stakeholder, CL=case study lead)	Gender	Knowledge of case study (YES/NO)	Stakeholder's affiliation	Meets all stakeholder criteria?	Notes
Germany	CL-DE-1	M	YES	Research/academia representative	N/A	Case study leads interviewed together
	CL-DE-2	F	YES	State forest representative	N/A	
	S-DE-1	M	NO	Hunting association representative	YES	
	S-DE-2	M	YES	Private forest representative	YES	
	S-DE-3	M	YES	Public environmental administration representative	YES	
	S-DE-4	M	NO	Church/religious representative	NO	Does not belong to one of the targeted stakeholder groups
Italy	CL-IT-1	M	YES	Research/academia representative	N/A	
	S-IT-1	M	YES	Financial institution representative	YES	
	S-IT-2	F	YES	Financial institution representative	YES	
Netherlands	CL-NL-1	M	YES	Forest cooperative representative	N/A	
	S-NL-1	M	YES	Public forest administration representative	YES	
	S-NL-2	M	NO	Recreational association representative	YES	
	S-NL-3	M	YES	Private forest representative	YES	
Romania	CL-RO-1	M	YES	Non-governmental environmental representative	N/A	
	S-RO-1	M	YES	State forest representative	YES	
	S-RO-2	M	NO	Private forest representative	YES	
	S-RO-3	M	YES	Private forest representative	YES	
Serbia	CL-RS-1	M	YES	Research/academia representative	N/A	
	S-RS-1	M	YES	Public environmental administration representative	YES	
	S-RS-2	F	YES	Educational representative	NO	Does not belong to one of the targeted stakeholder groups
	S-RS-3	M	YES	Hunting association representative	YES	

Case study country	Reference code (S=stakeholder, CL=case study lead)	Gender	Knowledge of case study (YES/NO)	Stakeholder's affiliation	Meets all stakeholder criteria?	Notes
Spain	CL-ES-1	F	YES	Forest advisory representative	YES	
	S-ES-1	M	NO	Agricultural association representative	NO	Does not belong to one of the targeted stakeholder groups
	S-ES-2	M	NO	Public environmental administration representative	YES	
Sweden	CL-SE-1	M	YES	Research/academia representative	N/A	
	S-SE-1	F	YES	State forest representative	YES	
	S-SE-2	M	NO	Private forest representative	YES	
	S-SE-3	F	YES	Public environmental administration representative	YES	
United Kingdom (Scotland)	CL-GB-1	M	YES	Research/academia representative	N/A	
	S-GB-1	M	YES	Public forest administration representative	YES	
	S-GB-2	M	NO	Recreational association representative	YES	
	S-GB-3	F	YES	Public environmental administration representative	YES	
	S-GB-4	M	YES	Public environmental administration representative	YES	
Gender balance (stakeholders) 26% F/ 74% M			Total stakeholders representing public environmental administrations: **8** Total stakeholders representing public forest administrations: **4** Total stakeholders representing state forests: **4** Total stakeholders representing non-governmental environmental organisations: **1** Total stakeholders representing private forests: **5** Total stakeholders representing recreational or hunting associations: **6** Total stakeholders representing financial institutions: **2** Other: **4**			**Stakeholders that meet criteria: 75%**