Small4Good

Sustainable Multifunctional Management by Small Forest Owners
in Support of Bioeconomy, Biodiversity, and Climate

Grant Number: 101135517

Deliverable D2.1

Motivations and Barriers of Small Forest Owners for Multifunctional Management

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Abbreviations

AC	Autonomous Community
BES	Biodiversity and Ecosystem Services
D	Deliverable
EU	European Union
FOA	Forest Owner Association
IAD	Institutional Analysis and Development
LCA	Latent Class Analysis
LL	Living Lab
PES	Payment for Ecosystem Services
SFO	Small Forest Owner
S4G	Small4Good
WP	Work Package
NIPF	Non-industrial private forest owner
NWFP	Non-wood forest products

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Executive Summary

The following report investigates the macro, meso and micro levels of small-scale forestry across Europe. Based on literature, interviews, and the results of an online survey the intrinsic and external motivations as well as barriers of small forest owners (SFOs) to manage their forests for multifunctionality are examined. The report focuses on the five project countries of the Small4Good project, namely Norway, Germany, Switzerland, Romania, and Spain. The results reveal differences between the countries in the degree of centralisation of governance, legal restrictions in forest management, the establishment of forest owner associations, and the ownership structure. This comparative analysis forms the basis for understanding how the institutional context may shape forest management decisions and identify leverage points for transformative change. This includes supporting business model development in Work Package 3 (WP3) of this project. 1292 SFOs from these countries participated in a survey to investigate their relation to their forests, their communication networks and their forest management practices. In terms of intrinsic motivations, results indicate that the relationship between SFOs and their forests is an influencing factor of their forest management and offers valuable insights for further research. Furthermore, they can inform supportive policy design and targeted communication strategies and knowledge transfer. Based on three clusters describing the relationship - namely the *conflicted*, the *enthusiastic* and the *flexible relation* towards their forests - targeted policy recommendations that are potentially more effective, could be developed. In a next step, we focused on the networks the SFOs are embedded in regarding their forests. Here, four clusters could be identified: *Isolated* forest owners, forest owners with predominantly *informal* connections, those linked mainly to forest owner associations (*association first*) and forest owners that operate in more *formal* institutional settings. As both, the owner/forest relationship and the communication patterns, can be shown to be linked to the institutional contexts, we can see a complex interplay across scales when it comes to SFOs and their forests. We provide first conclusions on potential regulative, operational, financial, participatory, and informational policy instruments, which will be further refined in the up-coming deliverables.

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1. Introduction

Europe's forests fulfil multiple functions for society and the environment. They play a crucial role in mitigating climate change, yet they face increasing challenges due to climate-induced disturbances (Patacca et al., 2023). To simultaneously strengthen resilience, enhance mitigation potential, and meet growing societal demands for wood products and ecosystem services more generally, many scholars advocate for a stronger integration of multifunctionality into forest management approaches.

About 60% of Europe's forest area is privately owned, with much of it fragmented into small properties (Hirsch & Schmithüsen, 2010). Collectively, these owners and their forest management play a substantial role for ensuring forest multifunctionality, namely the provision of a broad range of ecosystem services, including biodiversity and carbon sequestration. Understanding how forest owners manage their forests, the structural conditions they navigate, and the motivations driving their decisions is essential for developing effective measures that enhance carbon sequestration, forest biodiversity and resilience, which comprise key components of the EU forest strategy for 2030 (European Commission, 2021).

Forest owners are recognised as a heterogenous group (e.g. Krause, 2011). The diversity in lifestyles, objectives as well as skills and knowledge related to forests and forest management among forest owners poses challenges for effective governance (Weiss et al., 2019). Numerous scientific studies have been dedicated to increase the understanding of forest owners by categorising them with respect to their demographics, forest management objectives or values (Ficko et al., 2019). Recently, by integrating the actual management behaviours rather than stated objectives in typology creation it was hoped to explain lacking policy implementation (Tiebel et al., 2023; Westin et al., 2023). Additionally, aspects like 'psychological ownership' have been explored to understand forest management behaviour (Andabaka et al., 2021; Matilainen et al., 2017).

While previous research has provided important insights into the motivations of forest owners for integrating forest multifunctionality into their management, this deliverable aims at expanding the knowledge of drivers and barriers for multifunctional management in two ways. First, our aim is to develop a more comprehensive understanding of forest owners' motivations for forest management by shifting from an instrumental focus on objectives to a relational perspective, thereby broadening insights into why forests matter to their owners. This follows a recent call of Himes & Dues (2024) for a 'relational turn' in forestry by acknowledging "*forest as complexes of dynamic and constitutive relationships*" (p. 6). Accordingly, forest owners are thought to have several relations to their forests simultaneously. Therefore, forest policies need to account for various relationships that exist between the forest owner and the forest holding, rather than focusing only on instrumental aspects of forest management.

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The second aim responds to increased awareness to the limits of forest owner's agency, pointing to the relevance of the structures forest owners are embedded in. Forest owner's decision-making is mostly studied as the forest owner's choice between several alternatives, leaving aside the effects of diverse institutional arrangements and the relevance of their networks (Matilainen et al., 2023). In the work presented here, we follow an understanding of structure and agency as mutually constitutive (cf. Giddens, 1984), both necessarily shaping forest management in private forest holdings. We therefore intend to emphasise these structural factors by exploring the role of communication networks of forest owners, legal and institutional framework conditions for multifunctional forest management and the acceptance of payment for ecosystem service (PES) schemes.

More specifically the research aims can be stated as:

1. Examine the institutional contexts small forest owners are embedded in and how these contexts enable or constrain their management practices.
2. Investigate the owner/forest relationship and its implications for forest management practices.
3. Examine how small forest owner's communication networks are linked to forest management objectives and practices.

In the following work, we will delve into these research aims in greater detail. To achieve our research goals, four Living Labs were developed as multiple case studies (Stake, 2013) in north, south, east and central Europe. We choose a mixed methods approach (Greene, 2007), combining qualitative and quantitative methods, that underpins this research, which includes a literature review, explorative interviews, and qualitative data analysis as well as a quantitative survey and statistical analysis, as discussed in Chapter 2. Following this, Chapter 3 presents selected aspects of the institutional context for small forest owners in the five project countries. In Chapter 4, we explore the intrinsic motivations of these forest owners by investigating their relationships with their forests. Next, Chapter 5 highlights the communication patterns and networks among small forest owners. We conclude our findings with a brief overview on factors influencing the acceptance of PES schemes that incentivise forest management in Chapter 6. Finally, Chapter 7 addresses the limitations of our research design and summarises key insights along with policy recommendations.

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2. Methods

The results presented in this deliverable are based on a mixed-method approach (Greene, 2007). It makes use of a qualitative interview campaign, literature reviews, as well as a quantitative survey to identify motivations and barriers to various ways of forest management of small-scale private forest owners. After a brief depiction of the geographical scope of this research, the following chapters elaborate on the applied methods for data collection and analysis.

2.1 Geographical Scope

Within the project Small4Good, five European countries were selected according to a maximum variation sampling of case studies: Norway, Romania, Spain, Switzerland, and Germany (see Figure 1). While this subset of European countries cannot represent the challenges all small forest owners across Europe are facing, it still ensures a variety of contexts, covering high susceptibility to disturbances, high share of non-wood forest products (NWFP) and high versus low institutional regulation. In order to keep the local level in focus throughout the project, four Living Labs (LLs) were chosen as focal points and investigation space throughout the project. These LLs are regions situated in the five participating countries and are meant to cover different contexts and thus allow for an in-depth investigation of the small forest owner's relationship to their forests. One of these LLs is a cross-boundary LL. It connects similar forest regions in Germany and Switzerland with different institutional contexts. For more detailed information on the establishment, characteristics and scope of the LLs, please refer to Deliverable 1.1 of the Small4Good project.

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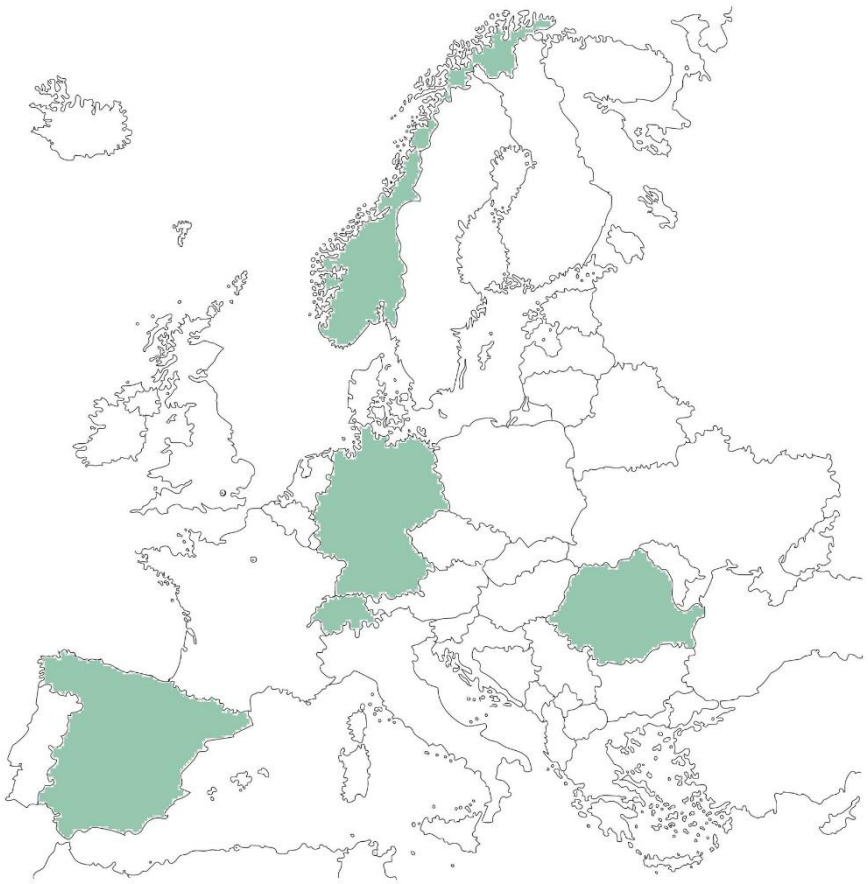

Figure 1: Five countries are chosen within the Small4Good project to investigate European small forest owners: Norway, Germany, Switzerland, Romania, and Spain.

2.2 Interviews

The interviews provide insights into the institutional contexts of small-forest owners in Europe (*Research Aim 1*, see page 9) and are triangulated with existing literature to give a comprehensive overview over the legal frameworks in each LL Country. The results are presented in Chapter 3.

In cooperation between Work Package 2 (WP2) and Work Package 3 (WP3) partners, three interview guides were developed. The first targets forest owner associations, forest administrations, private forest managers and public forest rangers who operate at the local level (hereafter referred to as local forest rangers). The second interview guide was adapted for individual forest owners and the third was developed for EU-level owner associations. The first and the second both included sections on motivations, drivers, and barriers to multifunctional forest management in private forest holdings, plus the decision-making context of small-scale private forest holders as well as cooperation and visions for the future. Additionally, the forest owners were asked about their relations to their forest and representatives of forest administrations and forest owner associations, as well as forest rangers and managers were asked to elaborate on the meaning of

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multifunctional forests in the local context. The EU-level owner associations answered questions about the perceived main challenges for small-scale forest owners, the relevance of small-scale forest owners in their work, and EU-level politics. The complete interview guides can be found in the appendix (A-C). The interview guides were translated into the different main languages of the LL regions of the Small4Good project by the LL coordinators. Several feedback loops and test interviews were carried out before the interviews were conducted.

Five to six actors were interviewed in each LL, except in LL Central. Since the LL Central is spread over two countries (Germany and Switzerland), it was decided to conduct five interviews in each country, to additionally cover the different institutional contexts. The composition of actors interviewed per LL varied slightly between the LLs, depending on the relevance of the actor in the respective country. The interviewees were selected in consultation with the LL coordinators, as local experts for the advisory and support services for forest owners in the area. However, the sample covered actors of local and regional scales as well as the public and private (where relevant) sectors and forest owner associations. Table 1 gives an overview over the interviewed actors per LL. All interviewees signed a GDPR agreement, assuring inter alia their anonymity before the interview started.

Table 1: To gain information on the institutional context of the different project countries, 24 interviews were conducted across all participating countries.

LL-North	Forest Owner Administration - regional and local Public Forest Managers (2) Forest Owner Association - including Forest Managers (2) Forest Owner (1)
LL-South	Forest Owner Association (1) Environmental Agent (formerly Forest Ranger) (1) Forest Owner (3)
LL-East	Forest Owner Administration (2) Fores Owner Association (1) Forest Researcher (1) Forest Owner (1)
LL-Central (Switzerland)	Forest Owner Administration (1) Forest Owner Association (1) Local Forest Ranger (2) Forest Owner (1)
LL-Central (Germany)	Forest Owner Association (2) Local Forest Ranger (1) Forest Owner (1)

The interviews in the LLs lasted between 45 and 90 minutes and were conducted between the 1st of May and the 5th of July 2024. Interviews with EU-level associations followed in the second half of July. The participants in LL Central were interviewed onsite by scientific employees of University of Freiburg, while in LL South and North, the

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interviews were conducted by the LL coordinators or their respective team members. This strategy was chosen to ensure the interviewees' comfort in being interviewed in their native language and additionally offered a possibility for the LL coordinators to strengthen collaboration for the remaining project. In LL East, it was, however, requested that researchers from University of Freiburg, as the leaders of the interview campaign, conduct the interviews to enhance trust and motivation to participate. Therefore, these interviews were held online using a translator to facilitate the conversation. Interviews in LL South were conducted by a research team with scientifically trained personnel while the LL coordinator in LL North received instructions to ensure a quality standard. The interviews with EU-level forest owner associations were conducted online. All interviews were recorded, transcribed, translated into English, and analysed to aid the development of the survey and examine the institutional context small forest owners (SFOs) are embedded in. This qualitative approach is especially valuable, since it captures local realities and thereby enables a survey design which is tailored to its target audience. Further analysis of the data for scientific publications is envisioned.

2.2.1 Legal Frameworks

To give a comprehensive overview on the legal framework, the interview results were triangulated with existing literature to understand how forest policies are shaped and implemented, how forest owners engage with governance structures, and how issues like inheritance and collective action influence forest management. The information in subchapter 3.1 is widely derived from the EU FACESMAP[1] Country Reports, complemented and updated with relevant literature. Key dimensions that were elaborated include: the degree of centralisation in policy-making, the regulatory nature of forest management (voluntary or restrictive), the strength and function of forest owners' associations (FOAs), and the role of inheritance in shaping property structures.

2.3 Forest Owner Survey

2.3.1 Survey Development and Distribution

Based on the interviews and a semi-structured literature review, a quantitative survey was developed throughout the summer 2024. In a two-day synthesis meeting in the second half of June 2024, project partners of WP1, 2 and 3 identified key sections to be covered in the survey building on the preliminary results of the interview campaign. The sections identified were: (I) small-scale forest owner's intrinsic motivations for decision-making; (II) the socio-demographic and socio-economic characteristics of the owner and respectively biophysical characteristics of the owner and/or the forest holding; (III) and institutional arrangements relevant to the forest owner.

The first section covered questions about the relation between forest owners and their forests. To investigate this aspect, an extensive list of statements was included in the

[1] https://facesmap.boku.ac.at/index.php/activities-and-outputs/country-reports

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survey. For the development of these statements, the outcomes of the qualitative interviews were enriched with existing literature on small-scale private forest owners to ensure high coverage of the possible meaning of the forest to their owner. As presented in Table 5, each statement was then assigned to a specific relationship following Himes & Dues' (2024) proposal on relational forestry (an elaboration on purpose and theoretical background is presented in Chapter 4). Additionally, the section on intrinsic motivations comprised management objectives and operations. The third section covered cooperation, support, and advice systems. The complete questionnaire can be found in the appendix (D).

Between September and December 2024, the survey went through several internal and external revisions and was then translated into the four first languages of the LLs: Romanian, Norwegian, Spanish and German. The translation was based on the TRAPD method (Walde & Völlm, 2023) and followed recommendations by Behr (2023). Since the languages required for translations could be covered by the project partners, we refrained from hiring external translators, ensuring an efficient use of project resources. The survey was translated in two steps. As a first step, the survey was translated using AI-supported translation software[2] and reviewed by native speakers. As a second step, an additional revision was conducted by another group of native speakers. The translators were aided with a translation brief to ensure correct translations of meanings, cultural adequacy, and consistency. Following the translation process the survey was transferred into an online-survey using the *SoSci Survey* Software (Leiner, 2024). Before the survey was launched the online survey was tested by project partners as well as selected forest owners in the LLs to guarantee that the questions are suitable for the target group.

The survey was distributed at national and Living-Lab-level in Germany, Norway, Romania, Spain and Switzerland. The distribution at national level was facilitated by the project partners CEPF and ELO by contacting their forest owner associations in the respective countries. Since CEPF and ELO, however, do not have members in Switzerland and Romania, the national distribution in these two countries was aided by WaldSchweiz and Romsilva. At LL-level, the coordinators were responsible for the distribution. As it was key to also represent forest owners, who are not enrolled in a forest owner association, the LL areas served as a focal point to increase efforts for survey distribution. Prior to the survey launch different distribution possibilities were developed to enhance participation within the LLs. An implementation procedure was developed in several steps to ensure consistency in sampling and distribution between countries. The survey was distributed via mailing lists of local forest administrations, via webpages and social media presence of municipalities situated in the LLs, via local newspapers and events of forest owner associations. Comparability of the distribution efforts was ensured via a distribution documentation sheet filled out by the LL coordinators. Additionally, a question on the source of the survey facilitates traceability: According to the final data,

[2] https://www.deepl.com

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44.7% of respondents were informed of the survey via mailing lists of forest owner associations, 39.8% via forest administrations, 6.8% via online advertisement of municipalities located in the LLs, 6.1% via friends and family and 1.4% via local newspapers. The countries only differed in the aspect that Romanian forest owners were more informed by the forest administrations instead of the forest owner associations. The survey was launched on 12th of December 2024 and closed on the 2nd of March 2025. The link to the survey was accessed 2135 times. In total 1292 forest owners completed the full survey (n=1292).

2.3.2 Survey Analysis

The data collected in the survey was used to, on the one hand, analyse the intrinsic motivations of forest owners for multifunctional management (*Research Aim 2*, see page 9) by creating a forest owner typology, and on the other hand, to identify their communication networks (*Research Aim 3*). The results are presented in Chapter 4 and Chapter 5, respectively. Additionally, a subchapter was dedicated to pay closer attention to differences between forest owners who claimed to actively manage their forests and those who did not. This contributed further to *Research Aim 1*.
The data was derived from *SoSci Survey* (Leiner, 2024) and was processed and analysed in *R* (R Core Team, 2024). Data is stored and was shared according to the Small4Good data management plan. The final data set included all observations of respondents who finished the survey. It was shared with WP partners involved in the process of analysis. Descriptive statistics were used to gain an overview of the survey participants.

LCA – Relationality-Based Typology

A small forest owner typology, as presented below, was developed using a Latent Class Analysis (LCA) for clustering. Table 2 summarises the sequential steps of our analysis. Variables used to inform the clustering were selected based on Himes & Dues' (2024) presentation of relational values. The LCA itself is a model-based approach, in which each variable observation is assigned a probability for class membership. In a subsequent step a class membership can be assigned to each respondent based on the highest posterior probability. The LCA was conducted using the *poLCA* package (Linzer et al., 2011) in *R*. The model selection was based on theoretical assumptions as well as an in-depth assessment of the different models' fit metrics (cf Weller et al. 2020). As suggested in Nylund-Gibson & Choi (2018), we calculated AIC, BIC, sample-size adjusted BIC, Consistent AIC, Approximate Weight of Evidence, Vuong-Lo-Mendell-Rubin Test, Bayes factor, and class size. Even though some fit metrics suggest a model including four or more clusters, we decided to use the three-cluster model to ensure the model's conceptual sense (Weller et al. 2020). The classes were compared with sociodemographic variables to ensure that the clustering has explanatory power beyond the socio-demographic background. Subsequently, the classes were tested for differences also in terms of management operations conducted and institutional arrangements. Statistically,

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the differences were tested with the ChiSquare tests (for factors) and the Kruskal Wallis test (for numeric integers).

Table 2: Step-wise approach of the LCA following Weller et al. (2020).

LCA STEPS
1. Selecting indicator Variables (theory based) 2. Structuring Dataset 3. Conducting LCA 4. Selecting a class solution (number of classes) by using fit metrics and theory 5. Ensure clusters are not explained by socio-demographic variables 6. Interpretation and Implications for Practice 7. Validating the LCA Model 8. Reporting Results

No Management and Multifunctional Management

In addition to the relational typology, the survey respondents were deductively split into two groups to specifically investigate the (institutional) differences between forest owners who perceive their forests as actively managed and those who do not (Chapter 4.3). To test the significance of the differences ChiSquare and Kuskal Wallis tests were used.

Binary Logistics Regression using IAD Framework

Furthermore, a binary logistic regression model focusing on multifunctional or ecosystem services-related management was developed to gain a more nuanced understanding of management behaviours (Chapter 4.3.1). This analysis contributed to *Research Aim 1* (see page 9). Multifunctional management served as the dependent variable and is defined based on practices that contribute to ecosystem service provision, following the categories outlined by Brockerhoff et al. (2017). These include activities such as promoting native species, supporting natural regeneration, protecting habitat trees and deadwood, managing browsing pressure, enhancing species and structural diversity, and removing invasive or non-native species. The corresponding variables were already provided in the online survey, specifically in the section '*What management operations have been applied in your forest by you or third parties in the last ten years?*' (see appendix, section D).

The independent variables were selected based on Ostrom's Institutional Analysis and Development (IAD) framework (Ostrom, 2009, as displayed in Figure 2), following the precedent set by prior studies that have used institutional variables to explore how structural conditions influence individual behaviour and decision-making in natural resource management (e.g. Bouriaud et al., 2015; Coleman, 2009; Coleman and Steed, 2009).

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Ostrom's (2009) framework is organized into three main components:

- External Factors (Biophysical Conditions, Community Attributes, and Rules-in-Use)
- Action Situation
- Outcomes

In this analysis, we focused on the external factors as elaborated in the IAD framework to better understand the drivers of multifunctional management behavior.

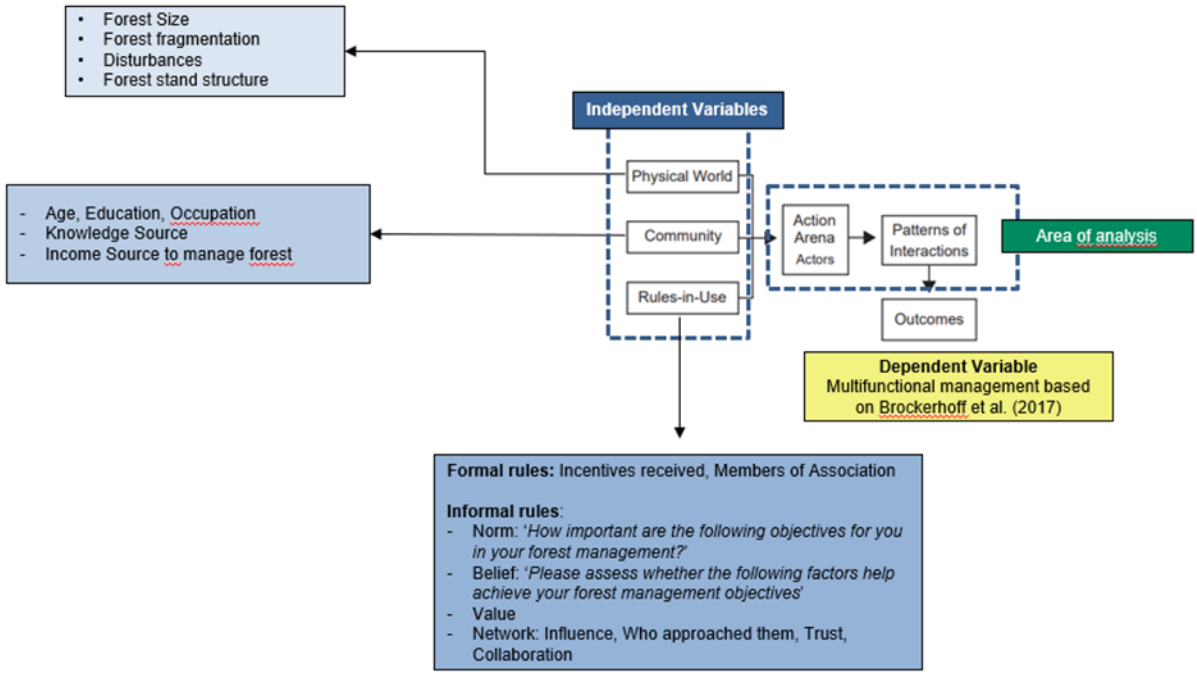

Figure 2: Integration of survey variables into Ostrom's (2009) framework.

The variables from the survey are then categorized as following:

- Biophysical Aspects: Forest Size, Forest Fragmentation, Forest disturbance, forest age structure
- Community Attributes: Age, Education, Knowledge Source, Income Source, Occupation, Independence Perceived in Decision Making
- Rules-in-Use: Formal and Informal Rules
  - Formal Rules: Incentives, Member of Association
  - Informal Rules: Norms (perceived important forest management objectives), Belief (factors believed to help achieve forest management goals), Value, Time Consideration in Decision Making, and Network.

Social Networks

Forest owners are embedded in social networks which describe how well connected the individuals are. Depending on the connections individual SFOs have, their access to information and resources changes, and with it the opportunities available and decision

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outcomes (Loch & Kleinschmit, 2025). The survey answers on communication frequencies were used to evaluate patterns between forest owners and forestry actors networks. First, a **bipartite network** was constructed with stated communication patterns between SFOs and various forestry actors.

In a bipartite network, nodes are divided into two distinct sets of actors (nodes). Connections (edges) can only exist between these sets, not within them (Borgatti & Everett, 1997). This structure was appropriate as the survey focused solely on whether SFOs communicated with specific forestry actors; it did not assess communication among SFOs themselves or among the forestry actors. Consequently, each set of nodes remained *isolate*d from the other. The resulting bipartite network facilitated an assessment of the centrality of forestry actors, measured by their direct ties to the SFOs. A tie was defined as any instance in which an SFO reached out to, or was approached by a forestry actor at least once in the past five years. This relatively inclusive threshold was adopted because communication relating to forest management can have significant long-term implications, and even infrequent exchanges may influence management decisions.

To capture the extent of each forestry actor's influence, **degree centrality** was used as a measure of their reach within the network (Liu et al., 2017). Specifically, degree centrality was calculated by counting the number of edges associated with each forestry actor. For cross-national comparisons, this count was standardised by expressing it as a proportion of all possible connections. Interpreting this ratio allowed for a straightforward comparison of how large a share of the entire network each forestry actor reached.

To advance the analysis, the reach out and approach networks defined earlier were combined into a single network. Ties were established only if communication occurred at least once in five years on average; if the frequency fell below this threshold, no tie was created. Next, the bipartite network was converted into a **one-mode network** by collapsing the two-sided node structure. Specifically, forestry actor nodes were replaced by direct connections among SFOs who shared a tie with the same forestry actor. For instance, if SFO 1 and SFO 2 both communicated with forestry actor A, then A was removed from the network, and a direct tie was formed between SFO 1 and SFO 2. In the resulting one-mode network, SFOs reporting an average communication frequency of less than once every five years became *isolates*, which were subsequently removed and labelled as a distinct subset of forest owners who did not report communication within that period.

With the established one-mode SFO network, a **Louvain cluster** analysis (Blondel et al., 2008) was performed to identify cohesive subgroups. The Louvain method groups nodes such that modularity—a measure of how densely nodes are connected within clusters compared to connections between clusters—is maximised. In this context, the Louvain approach allowed for the identification of distinct groups of SFOs based on their shared communication patterns. This analysis was conducted using the *igraph* package in R (Csardi G & Nepusz T, 2006), and the *cluster_louvain()* function.

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2.4 Systematic Literature Review on PES

A stocktake of key properties which affect the acceptance and take up of voluntary PES and carbon farming schemes amongst private forest owners in Europe was explored in a systematic literature review and synthesised by use of meta-analysis methods (Chapter 6). This analysis contributed to *Research Aim 1* (see page 9).

2.4.1. Literature Review

The literature was collected in July 2024 through a systematic online literature search of the Scopus, EconLit and Web of Science databases and was pre-registered on OSF[3] (currently under review). The search focused on the participation of non-industrial private forest owners (NIPFs) in voluntary forest management programmes. The work built on and extended the data collection and analysis conducted by Mitani and Lindhjem (2022).

Results were filtered to cover literature from the last three decades (1994–2024), which were considered the most relevant to today's private forest owner decision process to enter into a voluntary PES agreement. Furthermore, only peer-reviewed papers, conference papers and book chapters written in English were considered, to ensure accessibility and a high quality of the reported information. The system boundary was defined as the European continent.

2.4.2 Meta-Analysis

The literature was synthesised using a meta-regression approach (Harrer et al., 2021), with the dependent variable being the participation rate in voluntary forest management contracts (including PES schemes). These participation rates, sourced from various publications, originated from dichotomous choice and choice experiment surveys, census data, and other methodologies. Where participation rates where not directly stated, they were estimated either as the proportion of respondents intending to enrol or via a binary logit model (Mitani & Lindhjeim, 2022). The use of standard errors allowed for weighting each survey's impact in the regression, ultimately revealing preferences and patterns in voluntary management program participation.

[3] https://osf.io/5hku4/

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3. Institutional Context of Small-Forest Owners Across Europe

The Small4Good project focuses on small forest owners, a heterogeneous group, both, in terms of material contexts and worldviews (Krause, 2011). They are embedded in diverse biophysical and institutional contexts, which highly impact the forest owners' possibilities to manage their forests for multifunctionality. The following chapter provides insights into the different informal and formal institutional contexts of the LLs. This information forms the basis of further research in the Small4Good project and builds on interdisciplinary collaboration and data collection among the consortium. The first part is based on in-depth interviews with local forest stakeholders (n=24) and focusing primarily on the informal aspects of forest management in the project countries. The second part is based on existing literature and investigating the formal institutions, i.e. legal frameworks of the respective LL countries.

3.1 Informal Institutional Settings Across LLs

To begin with, the perception of 'forest size' varies across but also within countries. In Romania, for example, a forest holding below 100 ha is considered small, while the average forest property is with 2 ha much smaller in size. In Norway, on the other hand 'small' is an attribute used for forest holdings below 25 ha. Our results indicate that there is a large number of forest properties that are not sufficient in size to sustain a substantial income for their owners. This observation implies that for many forest owners their forest is a secondary activity, leaving a wide range for engagement, interest, capacities for and connection to the forest. Designing policies primarily based on financial incentives might therefore fall short in meeting the needs of small-forest owners.

Furthermore, the concept of multifunctionality is used and perceived differently across the LLs. While in all LLs a variety of forest functions (nature, biodiversity, recreation, timber, firewood, emotional connection, protection from natural disasters, etc.) was appreciated, the concept of 'forest multifunctionality' was only used by German and Swiss forest owners. Protection from natural disasters as a forest function was especially pronounced in Spain and Switzerland, referring to forest fires, landslides or avalanches. Moreover, opinions on the role of small forest owners to provide forest multifunctionality were highly diverse, ranging from the unmanaged small forest property as biodiversity hub (Switzerland) to no additional multifunctionality from small forest holdings, as they are reportedly managed the same as larger ones (Norway).

Part of the institutional contexts of forest owners are the modes of decision-making and how they are impacted by the legal framework as well as more informal customs, which vary widely between countries. A detailed overview of the legal conditions in each project country can be found in Chapter 3.2. During the interviews, it became evident through

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statements of key stakeholders, that even in countries with less restrictive legal frameworks the management decisions of small forest owners are often substantially influenced by the available advisory services. In each LL key actors could be identified that either actively approach forest owners or are approached by forest owners regarding forest management. In Germany this role is usually taken by a publicly employed forest ranger or by forest owner cooperatives. In Switzerland the procedure is similar but differs in the importance of forest owner cooperatives and the fact that the forest ranger must approve the management actions taken by forest owners. In Spain the so-called environmental agents (formerly forest rangers) need to authorise specific management activities such as harvesting or logging. In Norway, forest owner cooperatives play a key role. These employ a forest manager, also referred to as the 'timber buyer', who is in contact with forest owners regarding forest management operations and coordinates logging in neighbouring parcels. However, it is important to note that there is no obligation to manage forests in Germany, Norway, Spain, and Switzerland and therefore also no obligation to use the most common advisory services.

3.2 Formal Institutional Settings Across LLs

The following section presents a comparison of the project countries' legal frameworks to provide an overview over the institutional context of each of the LL areas. Table 3 presents a summary of these findings.

Table 3: The project countries differ in terms of governance, management, the role of the forest owner associations and ownership structures. The following table summarises key aspects for each of the participating countries.

Country	***Governance Type***	***Management Nature***	***FOA Role and Strength***	***Inheritance and Ownership Impact***
Norway	Centralised policy, decentralised practice	Voluntary, owner-led	Politically active FOAs	Family-based inheritance preserves ownership, challenged by urbanisation
Romania	Highly centralised, top-down	Restrictive, state-led	Legally driven FOAs, relatively young	Post-socialist restitution led to fragmented, contested ownership
Spain	Regionally decentralised	Voluntary, owner-led	FOAs in wood-producing regions, offer	Diverse civil laws contribute to fragmentation,

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			support to access grants	especially in traditional regions
Germany	Federal, decentralised implementation	Voluntary. owner-led	FOAs establishment is encouraged by national law	Combination of inheritance-driven fragmentation (West) + restitution complexity (East)
Switzerland	Federal, strong cantonal autonomy	Mandatory, Cantonal decision	Communal management is common	Inheritance causes fragmentation, but communal institutions buffer impacts

Forest governance in **Norway** is characterised by centralised policy-making combined with decentralised implementation. The Ministry of Agriculture and Food holds primary responsibility for developing national policies related to agriculture and forestry (Norwegian Ministry of Agriculture and Food, 2020). At the regional level, the County Governor (Statsforvalteren) serves as the government's representative, ensuring that national forestry policies are implemented across counties. The County Governor also provides guidance to municipalities on forestry issues, administers subsidy schemes, and contributes to the achievement of national sustainability goals (Statsforvalteren, retrieved 2025).

The legal foundation for forest management is provided by the Forestry Act of 2005, which promotes sustainable use of forest resources to support both economic development and environmental conservation (Norwegian Forest Act, 2005). Forest management at the property level, however, remains largely voluntary (Follo et al., 2015). Private forest owners are not legally required to comply with recommendations from public authorities, allowing for significant autonomy in decision-making (Follo et al., 2015; Norwegian Forest Act, 2005). While this flexibility encourages innovation and self-governance, it also means that state goals for sustainable management rely heavily on owner initiative. Nevertheless, forest owners are legally obligated to notify municipal authorities before initiating forestry activities that may affect areas classified as selected habitat types, as mandated by the Nature Diversity Act (Miljøverndepartementet, 2009).

Private ownership is a dominant feature of the Norwegian forestry sector, with the majority of forested land held by families and individual owners (Follo et al., 2015). Regarding forest associations, the active private forest owners are often members of either Norskog or the Norwegian Forest Owners' Federation. While Norskog operates countrywide, the Forest Owners' Federation is organised into eight regional cooperatives

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(Follo et al., 2015). Approximately 30,000 family forest owners are represented by the Norwegian Forest Owners' Federation, which supports sustainable forestry practices and engages in policy advocacy (Norges Skogeierforbund, 2023).

In contrast, **Romania** presents a centralised and restrictive forest governance system, shaped by its communist legacy. Today, forest governance is primarily overseen by the Ministry of Environment, Water, and Forests, which holds the main authority for drafting policies and legislation related to forests. Operating under the Ministry's jurisdiction, the National Forest Administration—Romsilva—is tasked with managing approximately 50% of publicly owned forests. In addition to its public management role, Romsilva may also provide services under contract to private forest owners (Forest Policy, 2024). The core legal framework guiding forest governance is the Forest Code (Law No. 46/2008), which outlines regulations concerning the national forest fund, licensing and permitting procedures, sustainable forest management practices, mechanisms for control and compliance, and provisions for legal liability and penalties.

Under state socialism, private forest ownership was entirely abolished and only reinstated after 1989 through a complex and often contentious restitution process (Bouriaud, 2005; Nichiforel et al., 2015), which is elaborated in the Land Resources Law (Law No. 18 of 1991). The consequences of this disruption continue to influence current governance structures: private forest owners must adhere to strict, state-imposed technical norms, leaving limited space for local adaptation or individual discretion (Lawrence, 2009; Weiland, 2010). Key forest management decisions—ranging from harvesting to reforestation—are typically carried out by certified forest professionals operating under state authority rather than by the owners themselves (Vilkriste & Zālīte, 2015). Romanian law further obligates forest owners to implement measures aimed at maintaining specific environmental standards (Bouriaud, 2005). For forest holdings below 100 ha, a detailed forest management plan has to be issued by the state administration Romsilva or by authorised private forest administrations. This management plan assigns functional zone(s) to the forest land and defines the silvicultural management allowed on the property (Nichiforel et al. 2021).

Forest Owner Associations (FOAs) do exist but are often established out of regulatory necessity, such as meeting the 100 ha threshold required for collective forest management plans (Weiss et al., 2012). However, most FOAs remain underdeveloped, concentrating primarily on legal compliance rather than on active forest operations (Bouriaud et al., 2013). The fragmentation that emerged from the restitution process, compounded by persistent disputes over land titles, continues to pose significant challenges to effective forest governance (Nichiforel et al., 2015).

More broadly across Central and Eastern European (CEE) countries, forest restitution generally restored ownership rights with respect to wood production, but in most cases did not return other traditional rights, such as hunting. Consequently, many private forest owners cannot fully capitalise on the economic potential of their forests and lack

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decision-making power over essential aspects like setting hunting quotas, determining timber harvest volumes, or selecting harvest timing (Bouriaud, 2005).

Spain presents a notable case of regional decentralisation in forest governance. Responsibility for designing and implementing forest policies rests with each Autonomous Community (AC), while the national government plays a coordinating role with European Union institutions and represents Spain in international forestry matters. In Castille y Leon, the AC where the Small4Good LL is located, the principal legal framework governing forestry is the Law 3/2009 on Forests of Castille y Leon (Preferred by Nature, 2020, p. 13). The law categorised forests by ownership: public or private, and promote associative structures among private owners to defend their interest and promote sustainable management. Forest management planning is generally voluntary, allowing private owners significant decision-making authority, while public administrations within the ACs are tasked with promoting sustainable forest management (Quiroga et al., 2015). However, forest abandonment remains a persistent challenge. For instance, in Catalonia, only 25% of forested land is actively managed, with the remaining areas left unmanaged (Domínguez and Shannon, 2011), highlighting the limitations of voluntary planning and the uneven capacity for policy implementation across regions.

Inheritance laws, however, especially those in regions retaining historical civil codes, contribute significantly to ownership fragmentation. In communities like Catalonia, Galicia, and the Basque Country, distinct inheritance regimes have led to highly divided properties. These divisions often undermine forest viability, particularly in central and southern regions where markets are weaker (Quiroga et al., 2015). FOAs exist primarily in northern, wood-producing regions, offering technical advice and support in accessing grants, but they remain young and geographically limited (Prokofieva and Gorriz, 2013; Quiroga et al., 2015). Additionally, Spain lacks a widespread cooperative forestry operating in the market, and informal markets remain the dominant mechanism for timber sales (Quiroga et al., 2015).

Germany, operating under a federal system, exhibits a decentralised governance structure in which the federal government defines the overarching legal framework, while the Bundesländer (states) are responsible for promoting and supporting private forest ownership. According to the Forest Strategy 2020, there is currently no significant economic incentive to encourage small forest owners to actively engage in forest management (BMEL, 2020). For small forest owners, the development of a forest management plan is generally voluntary, which often results in non-management practices on their properties (Koch & Maier, 2015). However, such plans become mandatory when owners seek access to certain public funding schemes or participate in certification programmes (BMEL, 2024).

FOAs in Germany are established actors and play a crucial role in assisting private owners with the challenges of managing small and fragmented forest holdings. The formation of

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FOAs is encouraged and formally recognised in the National Forest Law as a strategy to overcome the structural disadvantages posed by fragmented forest ownership (Bundeswaldgesetz [BWaldG], 1975). These associations offer a broad range of services, including forest planning, technical support, joint timber marketing, and policy advocacy.

Germany's inheritance framework, particularly in the western part of the country, promotes equal division of property among heirs, leading to long-term fragmentation of forestland (Koch & Maier, 2015). In eastern Germany, forest governance is further complicated by the post-reunification restitution process, through which land and forests expropriated during the GDR era were returned to pre-communist owners or their descendants (Schmithüsen & Hirsch, 2010). This restitution introduced additional administrative and legal complexities, such as unclear land titles, delays in forest management, and rising absentee ownership (Koch & Maier, 2015). As a result, Germany uniquely reflects both Western Europe's inheritance-driven fragmentation and Eastern Europe's post-socialist restitution legacy, making FOAs and cooperative forestry models essential to ensuring sustainable and integrated forest management.

Switzerland also operates under a federal governance system, with even greater regional (cantonal) autonomy than in Germany. The federal government defines sustainability principles and minimum standards, while cantons hold authority over detailed legislation and policy implementation (Kissling-Näf & Varone, 2004). Forest management is highly regulated, with strict requirements to maintain multifunctional forest services, such as biodiversity conservation, landscape protection, and hazard prevention (FOEN, 2023). The requirement for forest management plan is generally mandatory for forest owners, with exceptions for those owning only very small plots According to the Federal Act on Forests and its implementing ordinance, it is up to each canton to determine which forest owners must prepare a management plan and what elements it should contain. Typically, all forest owners are required to have such a plan, with the exception of those holding only very small forest parcels. (Landolt et al., 2015; Nichiforel et al., 2020).

Switzerland is particularly notable for its strong and historic forms of communal forest management (Schmithüsen, 2007). Many forest owners participate in forest cooperatives or corporations, but the most distinctive institutional form is the *Burgergemeinde* (citizens' community). These legally recognised entities own and manage large forested areas on behalf of people holding traditional municipal citizenship, often regardless of their current residence. Membership is inherited, and *Burgergemeinden* have existed for centuries, functioning both as landowners and custodians of communal heritage. They are responsible for forest management, generate public goods, and frequently reinvest profits into social, cultural, or ecological projects. In urban areas like Basel, the *Burgergemeinde* manages hundreds of hectares of forest. This deep-rooted tradition of shared stewardship plays a crucial role in balancing ownership fragmentation and sustaining viable forest management across generations. Inheritance laws can still lead to parcel division, but the strong presence of cooperatives and *Burgergemeinden*

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mitigates the economic and ecological risks typically associated with fragmentation (Auer, 2016; Landolt et al., 2015).

Across these five countries, a few key patterns emerge. Where forest management is regulated and formalised (as in Romania and Switzerland) there are strong state institutions guiding practices. In more voluntary systems like Norway, Germany, and Spain, outcomes depend more heavily on owner motivation and the presence of effective support networks. Inheritance systems, whether based on equal division or restitution, significantly shape forest ownership structures and management challenges — but countries with strong cooperative traditions or communal institutions, such as Germany, Norway, and Switzerland, might be better equipped to buffer these effects.

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4. Intrinsic Motivations of Forest Owners: Relational Values to the Forest

In order to investigate the intrinsic motivations of forest owners to engage with their forests, a survey was launched across the five project countries. In Table 4, basic socio-demographic information on the respondents of the survey is listed. It can be shown, that the project's aim of reaching traditional and non-traditional small forest owners could be reached: Our survey was responded by small forest owners of various forest sizes from below 0.5 ha up to 200 ha, 43.9% of the respondents are not enrolled in a forest owner association, and 15.5% state that they do not actively manage their forests. In our sample, however, only 15.9% of respondents identify as women, which is below the numbers indicated in the literature: According to the FAO, 20-40% of forest owners across Europe are female[4]. Nevertheless, a sample of 204 female European small forest owners is considered to be of sufficient significance to investigate potential trends as other surveys work with similar shares of female participants.

Geographically, the survey distribution ranges from 119 (9.3%) responses in Switzerland, to 509 (39.6%) in Romania. A quarter of the survey respondents are located within one of the LLs, which shows a high engagement of the project partners with the local stakeholders in the LLs. The difference across countries in this respect, however, is rather large and a country comparison across LLs may thus be unfeasible: While 91.5% of Norwegian responses stem from the LL areas, only 3.6% of the German responses are located in the LL area. In terms of education and profession it can be observed that by far the largest share of the sample has a university degree (52.4%), while most of the respondents are currently retired (28.4%), directly followed by employed in another sector (27%).

Table 4: In a survey, 1292 small forest owners across the five project countries were reached. Summary statistics are listed in the table below.

Variable	***Response***	***Total responses: 1292***
Gender	Male	1059 (82.7%)
	Female	204 (15.9%)
Member of an Association	Yes	703 (54%)
	No	564 (43.9%)
Active Forest Management, as Perceived by Respondents	Yes	1085 (84.5%)
	No	199 (15.5%)
Country	Switzerland	119 (9.3%)
	Share of LL region	38 (32.2%)

[4]https://www.fao.org/4/a1346e/a1346e06.htm#:~:text=The%20majority%20of%20private%20forest,40%20percent%20(Figure%207)

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	Romania	509 (39.6%)
	Share of LL region	32 (6.4%)
	Germany	305 (23.7%)
	Share of LL region	11 (3.6%)
	Norway	153 (11.9%)
	Share of LL region	140 (91.5%)
	Spain	199 (15.5%)
	Share of LL region	92 (46.5%)
	Share of LL overall	313 (24.5%)
Current Profession	Self-employed in forestry or agriculture sector	149 (11.7%)
	Self-employed in another sector	91 (7.2%)
	Employed in agriculture or forestry sector	197 (15.5%)
	Employed in another sector	343 (27.0%)
	Student	5 (0.4%)
	Not employed	8 (0.6%)
	Retired	360 (28.4%)
Highest level of education	Primary school	40 (3.1%)
	Secondary school	201 (15.7%)
	Professional training	274 (21.3%)
	University degree	673 (52.4%)

4.1 Relationality-Based Typology

The concept of relational values was instigated in the 1980s and has received much attention within recent years in the realm of sustainability studies (Brown 1984, Chan et al 2018). Relationality, a theoretical concept mainly based on the work by Haraway (1988, 2008), is the idea that no object or agent is static, but rather consists of an entangled web of interdependent relations. Relational values then, are based on this conceptual understanding of entanglement, while focusing directly on the relationships between people and their surroundings (Himes and Dues, 2024). This is important for our study, as the concept allows to describe the various connections people may have towards their forests also beyond its economic or instrumental use. Himes and Dues (2024) define relational values as "*the meaningful relationships between people and forests*" which "*are core to reciprocal relationships of responsibility, care and stewardship with forests*" (p. 2). Forests and their owners thus find themselves in emotionally charged relational structures in which subjective, local knowledge and memory play just as important roles as public information. At the centre of such relational structures stands a forest owner whose individual reality, together with the spatial individuality of his forest, creates a complex network of attachments.

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Himes and Dues (2024) further argue that relational values of forest owners towards their forests can be characterised by six different types of relations (see Table 5). These comprise ecological relationships, social relationships, spiritual relationships, care relationships, material relationships, and interactions with the forest. They emphasise that this list may not be comprehensive, and the identified types of relations are not mutually exclusive (Himes and Dues, 2024). Following their argument, that every owner/forest relationship consists of several of these elements, we used all six types of relational values as a basis for our analysis.

Table 5: Himes and Dues (2024) call for a relational turn in forestry research. They identify six different types of relational values. In the table below, all six types are defined and the respective survey statements listed.

Type of relational value	***Definition***	***Survey statements, responded by a Likert scale***
Ecological relation	The cycling of matter and energy through the ecosystem.	My forest protects me or others from natural disasters. It is important to me that my forest provides a habitat for flora and fauna. It is important to me that my forest has a positive effect on the water balance.
Social relation	Interactions and connections between people.	My forest allows me to connect with other people. My forest causes conflict with others (friends, family, neighbours, public authority). It is important to me that I have my forest for myself. It is important to me that other people enjoy/benefit from my forest.
Spiritual relation	A feeling of awe or holiness towards the ecosystem.	My forest is part of who I am/part of my identity.
Care relation	Mutual 'sense' of responsibility and dependence between people and ecosystem.	My forest drains my time and energy. My forest gives me a sense of self-sufficiency. I have the right to use my forest the way I want, without considering the effects on plants, animals and other parts of the forest ecosystem. I am responsible for taking care of my forest. I depend on my forest. I perceive my forest as a burden.
Material relation	Material needs satisfied through goods from ecosystem.	To me, my forest is an important source for non-wood products (pine nuts, mushrooms, berries...). It is important to me that my forest creates economic profit.
Interaction	Interactions and perceptions between ecosystems and owners.	My forest allows me to spend my time meaningfully. I appreciate the beauty of my forest. I enjoy working in my forest. I am not interested in my forest.

Aligned with Himes and Dues' (2024) relational turn, we created a typology based on 20 survey questions concerned with the forest owners' relations to their forests (Table 5).

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We follow the assumption that forest owners have various connections to their forests also beyond its instrumental use. A typology based on relational values improves our understanding of motivations and barriers of small forest owners and supports the development of targeted communication, consultancy and support strategies, or diversified policies. Moreover, the nuances of the relational connections between forest owners and forests provided sufficient grounds to generate a robust clustering, which was, for example, not given when only using context factors such as forest size, location and income.

Our clustering results confirm that forest owners' relationships with their forests are linked to their forest management practices. It must be stressed, however, that the demarcations between clusters depend on statistical likelihoods and are not as straightforward as presented here. While our analysis focuses on highlighting the key differences across clusters, it is important to recognise that each cluster is highly heterogeneous. This internal variation underscores the complexity of the owner/forest relationship and highlights that also within clusters forest owners exhibit a variety of connections to their forests. In the following cluster descriptions, we provide p-values only for dependent variables, while the significance of the relational values is supported by the model quality criteria as indicated in chapter 2.3.2.1.

4.2. Three Types of Relations to the Forest

In the analysis at hand, we identified three distinct groups of forest owners. The first group consists of actors with a *conflicted relation* to their forests. They display a strong sense of responsibility and care for their forests while also perceiving them as a financial resource. This group exhibits the most diverse revenue streams, but some also view forest ownership as a potential burden. The second group has an *enthusiastic relation* to their forests. This is the most engaged cluster, actively managing their forests and undertaking a wide range of management operations. They have the strongest ecological connection, value their forests for both personal and environmental reasons, and seek and give the most advice. Lastly, the third group is composed of actors with a *flexible relation* to their forests. They have the lowest economic and ecological attachment, do not perceive their forests as part of their identity, and are least engaged in active management. While they do not see their forests as a burden, they are also least likely to seek advice or participate in forest-related networks. In the following, each of these clusters is presented in detail. A summary of the characteristics of the clusters is also given in Table 6.

Table 6: The three clusters differ with respect to their relation to their forests, their management practices and their income. In the table below, the key characteristics for each cluster are listed.

Conflicted relation	Enthusiastic relation	Flexible relation
High economic and ecological attachment –	Strongest ecological connection – High	Lowest economic and ecological attachment –

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Forests serve as both a financial resource and an important ecosystem. Strong sense of responsibility – Owners feel a duty to care for their forests but sometimes see them as a burden. Diverse revenue streams – Higher engagement in i.e. non-wood products, agroforestry, carbon credits, and tourism. Moderate management engagement – 82.5% actively manage, with a comparatively high focus on harvesting (54.7%). Trust in public forest administration – Strong reliance on local forest rangers and institutional support.	appreciation for biodiversity, forest health, and sustainability. Strong personal attachment – Forests are part of their identity; they enjoy working in them and see them as a cause of connection rather than conflict. Most active in forest management – 91.5% actively manage, engaging i.e. in harvesting, thinning, deadwood retention, and natural regeneration. Largest forest propertyes – Less owners with very small propertyes, significantly more mixed and coniferous forests than other clusters. Highly engaged in networks – Highest enrolment in forest owner associations (66.2%) and most frequent advice-seeking.	Forests are valued but not central to identity. Neutral care and social relation – Neither strongly dependent on nor burdened by their forests. Low revenue – 59.2% earn nothing or spend more than they gain from their forests. Least engaged in management – but still 68.9% actively manage. Time and knowledge constraints are key barriers to management. Limited advice-seeking and engagement – Least involved in forest-related networks and support systems.

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4.2.1 Conflicted Relation

The *conflicted relation* cluster[5] consists of 309 respondents, making up 23.9% of the total survey sample. This group comprises forest owners from all project countries, with a significant concentration in Romania (66% of the cluster) and the lowest representation in Switzerland (1.6%). Additionally, this cluster has with 38.2% the lowest enrolment of owners in forest owner associations as shown in Figure 3.

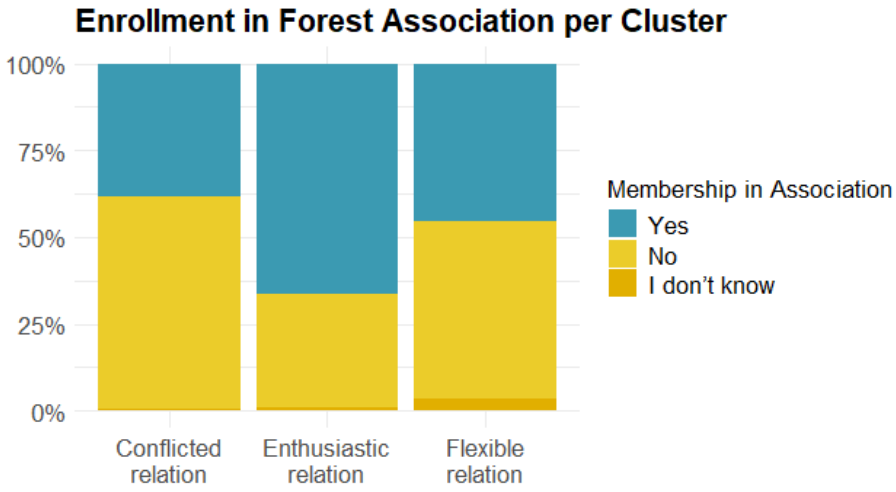

Figure 3: Respondents indicated whether they are enrolled in a forest owner association. The graph shows that respondents of the conflicted relation cluster are least likely to engage in a forest owner association, compared to the other clusters.

Relational values

[5] The cluster images are created with an AI image generator (hotpot.ai).

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Forest owners in this cluster have the strongest ecological connection to their forests, highly valuing ecosystem services such as biodiversity conservation, water retention, and protection against natural disasters. Their material relationship with their forests is also pronounced, with many utilising non-wood forest products and emphasising the importance of an economic benefit generated via their forests. It shows that many in this cluster perceive their forests as an essential financial asset, including as a backup in times of need. Their sense of relationality with the forest is marked by both care and conflict. Many depend on their forests, not only financially, and feel a strong sense of responsibility for their forests' maintenance. This responsibility can also turn into a burden, as many forest owners of this cluster perceive their forests at times as draining their time and energy. At the same time some forest owners in this cluster believe they have the right to use their forest, not necessarily considering any harmful impacts on the forest ecosystem, which additionally shows a conflicted care relation between forest owner and forest. Despite their conflicted relationship to their forests, they find themselves in meaningful interaction with their forest, appreciating its beauty and taking pleasure in working within it. Socially, this group perceives the forest as both a source of connection with other people and a source of conflict. They appreciate the forest as a shared space that benefits others, but they also enjoy having it for themselves. Additionally, they strongly identify with their forests, considering them an integral part of their personal and cultural identity.

Figure 4: The conflicted relation cluster acknowledge their responsibility for forest care.

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Management

A significant portion of this cluster actively manages their forests, with 82.5% engaged in some form of management. While they conduct fewer management operations than the *enthusiastic relation* cluster, they only differ in one point from the *flexible relation* cluster, namely in their harvesting practices: 54.7% of the *conflicted relation* cluster in our sample actively engage in timber harvesting, which is significantly more than in the *flexible relation* cluster (p=0.006). In terms of forest objectives, this cluster places the highest value on maintaining forest health and biodiversity, as well as on wood production. In this regard, they share commonalities with the *enthusiastic relation* cluster, emphasising the dual priorities of ecological sustainability and economic productivity.

Income

Forest owners in this cluster exhibit a more diverse range of income sources compared to the other two clusters (p<0.001), utilising their forests for more than just timber sales (see Figure 5). Beyond selling wood and receiving public funding, they also make use of non-wood forest products and agroforestry, carbon credits, biodiversity offsetting schemes, energy production, Christmas tree sales, tourism, forest bathing and educational services. This diversity in income streams highlights the multifunctionality of their forests and their ability to adapt to different economic opportunities.

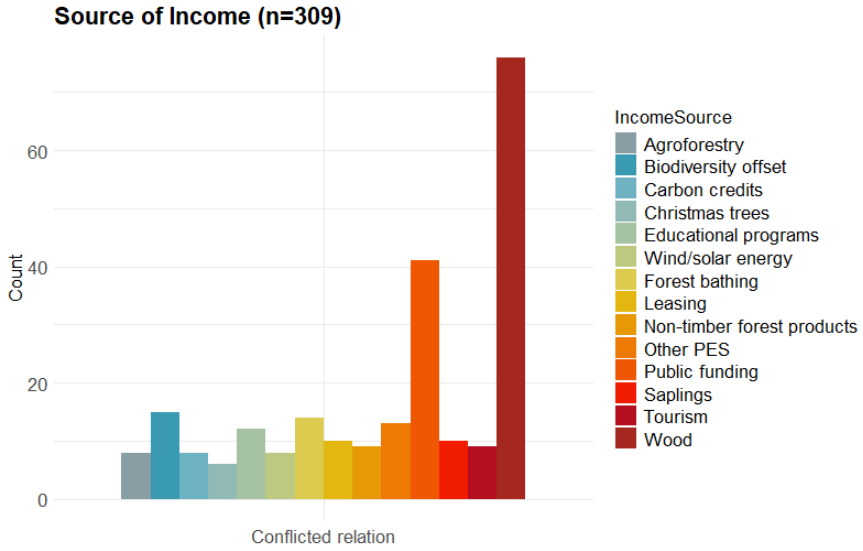

Figure 5: The figure shows the variety of income sources the conflicted relation *cluster exhibits.*

Support Systems

Across all clusters, local public forest rangers exert the most influence on forest owners and receive most trust, and this holds true for the *conflicted relation* cluster as well. However, when asked who or what influences their forest management decisions, respondents of this cluster additionally state the public forest administrations, as well as their own knowledge and experience. They also, additional to the local forest ranger,

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express a strong trust in public forest administrations. This trend may be attributed to the predominance of Romanian forest owners within the group, where the public forest administration plays a crucial institutional role in forest ownership and management (see Chapter 3).

Overall, the *conflicted relation* cluster represents a group of forest owners who engage deeply with their forests, balancing economic and ecological considerations. Their relationship with their forests is multifaceted, encompassing both care and tension, and their diverse income streams and reliance on institutional support highlight their complex engagement with forest management.

4.2.2 Enthusiastic Relation

The *enthusiastic relation* cluster comprises 674 respondents, representing 52.2% of the total survey sample. This group includes forest owners from all project countries, with the lowest share from Spain (12.3%) and the highest share from Germany (30.7%). This cluster has the highest enrolment in forest owner associations, with 66.2% of respondents being members ($p<0.001$). Compared to the other two clusters, this group owns the largest forest properties, with 11.8% of forests being larger than 100 ha and 45.5% being smaller than 5 ha. Compared to the other two clusters, a significantly higher share of the forest properties of this cluster contain mixed and coniferous forest stands ($p<0.01$) which are more affected by disturbances ($p<0.001$, see Figure 6). Furthermore, they live closest to their forest properties, with 82.3% residing less than an hour away ($p<0.001$).

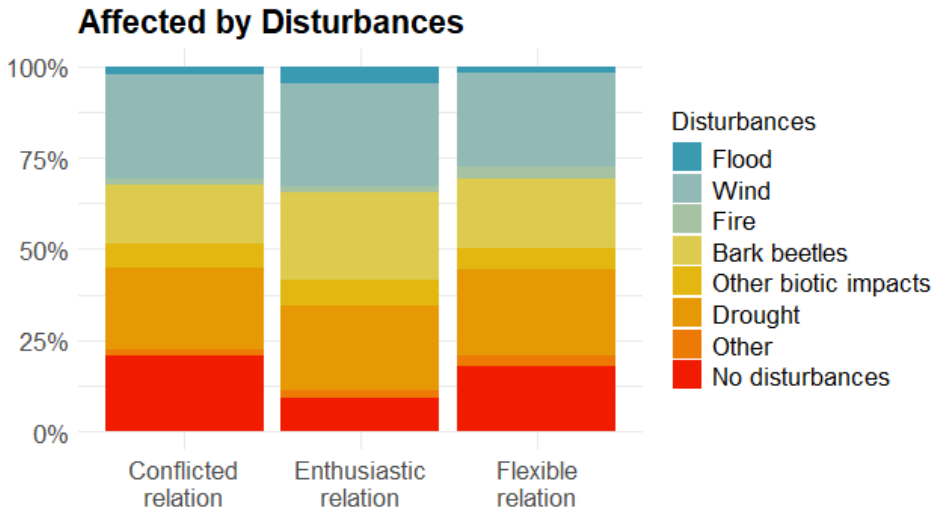

Figure 6: In the graph, forest disturbances as reported by the survey respondents are depicted. It can be seen that the enthusiastic relation *cluster has significantly less mentions of 'No disturbances' compared to the other clusters (based on the number of mentions).*

Relational Values

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The *enthusiastic relation* cluster maintains a strong ecological relationship with their forests, especially valuing their ecological functions. In terms of material relations, this group is highly diverse; while some members find economic benefits highly relevant, others do not emphasise the financial value of their forests. Some owners utilise non-wood timber products, though many remain neutral on alternative income sources.

The forest owners of this group have a strong care relation towards their forests. They feel responsible to take care of their forests and perceive it as important to consider the effects on flora and fauna when managing the forest. In terms of dependency on the forest, this group is divided, which aligns with the findings on the perceived economic benefit: Some forest owners of the *enthusiastic relations* cluster see themselves as dependent on their forests, while others do not or remain neutral. Overall, the forest owners of this cluster do not perceive their forests as a burden or draining energy. Their interaction with their forests is highly positive, as they find time spent there meaningful, enjoy working in their forests, appreciate the forest's beauty, and remain deeply interested in their forest affairs.

Figure 7: The respondents who have an enthusiastic relation to their forests enjoy engaging in forest management operations.

Socially, members of this cluster do not perceive forests as sources of conflict. Most respondents appreciate their forests as a means of connecting with others. However, they are divided regarding the exclusivity of benefits, with the majority valuing both, personal

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enjoyment and communal access. They also strongly perceive their forests as integral to their identity.

Management

This cluster is the most active in forest management, with 91.5% of respondents perceiving themselves as actively managing their forests. They utilise a wide variety of management operations, significantly more than the other clusters. They are more likely to retain deadwood (37.5%), engage in harvesting (64.8%), conduct thinning operations (53.4%), promote natural regeneration (59.9%), and support native tree species (55.3%; $p<0.001$). A detailed list of management operations is shown in Figure 8.Their primary forest objectives align with the *conflicted relation* cluster, with a strong emphasis on forest health, biodiversity, and wood production.

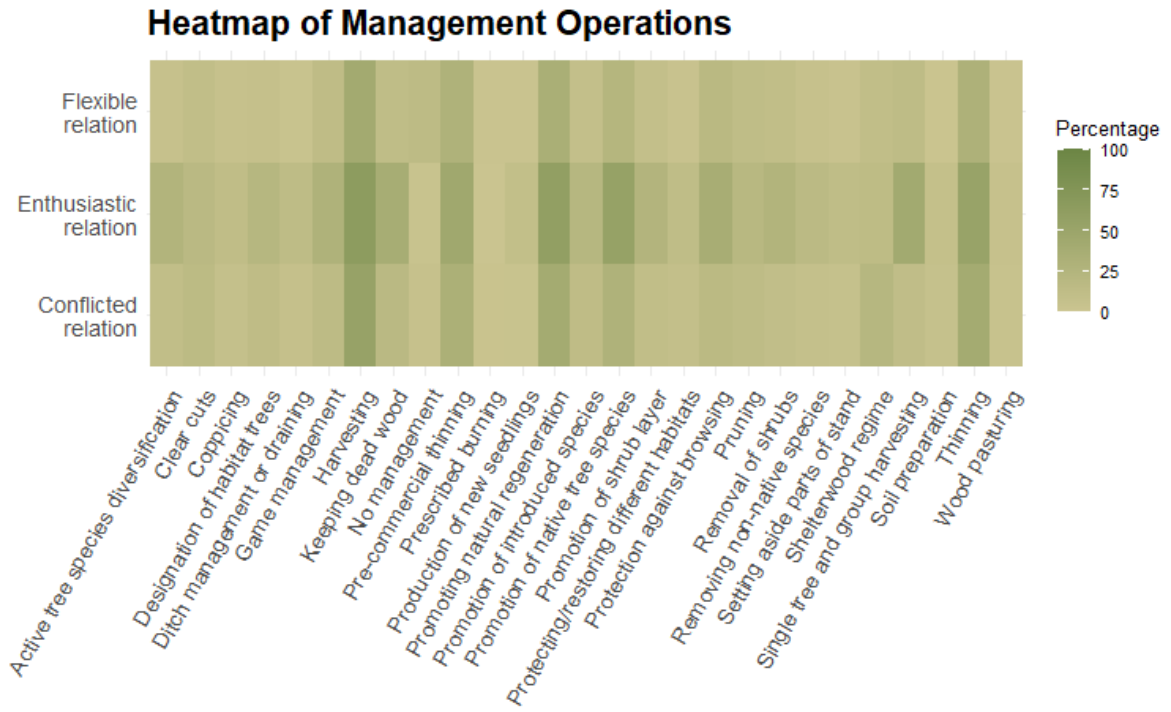

Figure 8: The heatmap presented here shows the management operations conducted according to the respective clusters. It can be seen, that the enthusiastic relation cluster is more engaged in forest management than the other clusters.

Support Systems

It can also be said for this cluster, that local forest rangers exert the highest influence across all clusters and also receive the most trust. In terms of influence, the e*nthusiastic relation* cluster, however, relies even more on their own knowledge and experience, significantly more than the other two clusters ($p<0.001$). They are also the most engaged in seeking advice, particularly for selling timber and conducting silvicultural operations ($p<0.001$). In terms of trust, the *enthusiastic relation* cluster also places a lot of trust in

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forest owner associations (p=0.01) and in friends and family as sources of guidance and support.

Overall, the *enthusiastic relation* cluster represents the most engaged and actively managing forest owners in the survey. They have a strong ecological connection to their forests, value their multifunctionality, and perceive a deep sense of responsibility for their forests. While diverse in their economic perspectives, they engage in a wide range of forest management operations and seek advice more often than other forest owners. Socially, they appreciate their forests as spaces for connection rather than conflict and largely see them as part of their identity.

4.2.3 Flexible Relation

The *flexible relation* cluster comprises 309 forest owners, making up 23.9% of the total survey respondents. This cluster includes owners from all project countries, with the lowest share of Norwegian respondents (3.5%). Compared to other groups, this cluster has a rather low enrolment in forest owner associations (45%). Forest properties owned are comparatively smaller than in the other clusters, with 55% of properties below 5 ha and only 7.1% exceeding 100 ha. This cluster also has the highest share of women (24.5%) and the highest percentage of forest owners without any formal forest-related education (23.9%, p<0.001); which, however, also indicates that approximately three quarters in this group do have some form of forestry education.

Relational values

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Forest owners in this cluster exhibit the lowest economic relation to their forests. While some of them yield financial gain from their forests, they are overall less likely to engage in economic activities related to forest use. Similarly, their ecological connection to forests is the weakest among the clusters. Most owners of this cluster still value ecosystem services such as biodiversity and water retention, but not all share this perspective.

Figure 9: The flexible relation cluster has a less pronounced relationship to their forests, while still enjoying it.

Their care relationship with their forests is neutral; some perceive a responsibility to take care of their land, but there is no strong sense of self-sufficiency from or dependence on their forest. They do, however, also not perceive their forest property as a burden on them. Most in this cluster do not believe they have unrestricted rights to use the forest. Their engagement with their forests is also neutral, with a range of opinions on whether working in their forests is enjoyable. However, they do appreciate the forest's beauty and show a general interest in their forest. In terms of social relations, this cluster remains mostly neutral as well—forest ownership for them is neither a means of connecting with others nor a source of conflict. Likewise, they do not strongly associate the forest with their identity.

Forest Management

This group has the lowest proportion of forest owners that actively manage their forests. However, still 68.9% of respondents indicate to actively manage their forests (see Figure 10 shows that the respondents of the flexible relation cluster engage least in active

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management, compared to the other two clusters. It is, however, important to acknowledge that nevertheless 68.9% of respondents in this cluster do engage in particular forest management activities.). This statement reflects the respondent's own perception of active management, as they were asked whether or not any management operations were conducted by themselves or third parties on their forest property (see question 9.a of the questionnaire in appendix section D).While they share the lower engagement in forest management with the *conflicted relation* cluster, the two clusters differ significantly in harvesting activities, as respondents of the *flexible relation* cluster are the least likely to harvest (42.4%, p=0.006).

Furthermore, forest owners in the *flexible relation* cluster exhibit the lowest appreciation for all forest objectives (p<0.001). They are also more likely to perceive various barriers to management, including limited time, financial constraints, and insufficient knowledge or skills (p<0.001). Despite these trends, the majority of respondents in this cluster still do not report facing many barriers.

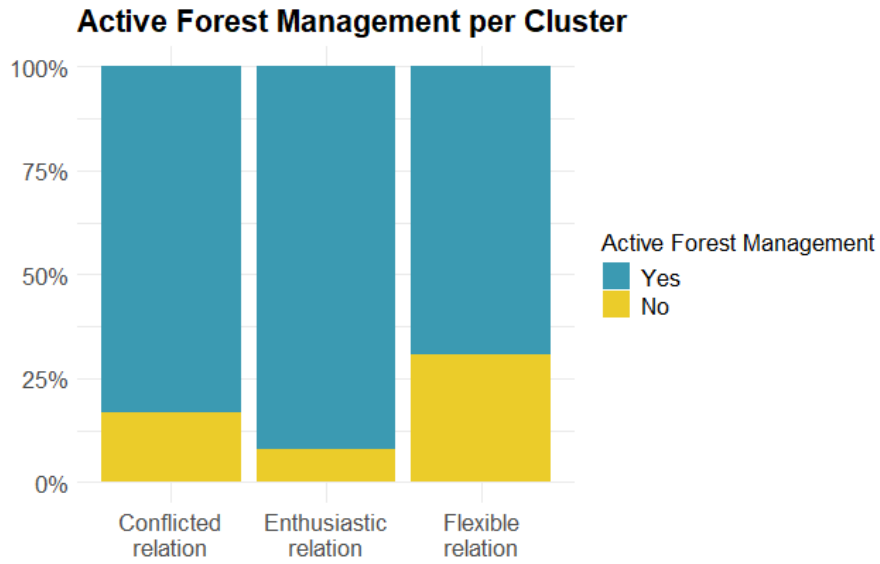

Figure 10 shows that the respondents of the flexible relation cluster engage least in active management, compared to the other two clusters. It is, however, important to acknowledge that nevertheless 68.9% of respondents in this cluster do engage in particular forest management activities.

Income and Financial Incentives

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The *flexible relation* cluster has the lowest overall income among the groups ($p<0.001$). Approximately 59.2% of these forest owners earn nothing from their forests or even spend more than they gain (see Figure 11: Contribution of the forest to the forest owner's household income. It can be seen that the majority of the forest owners allocated to the flexible relation cluster earn nothing from their forests or spends more than they earn.). Additionally, according to the stated answers, they receive fewer financial incentives

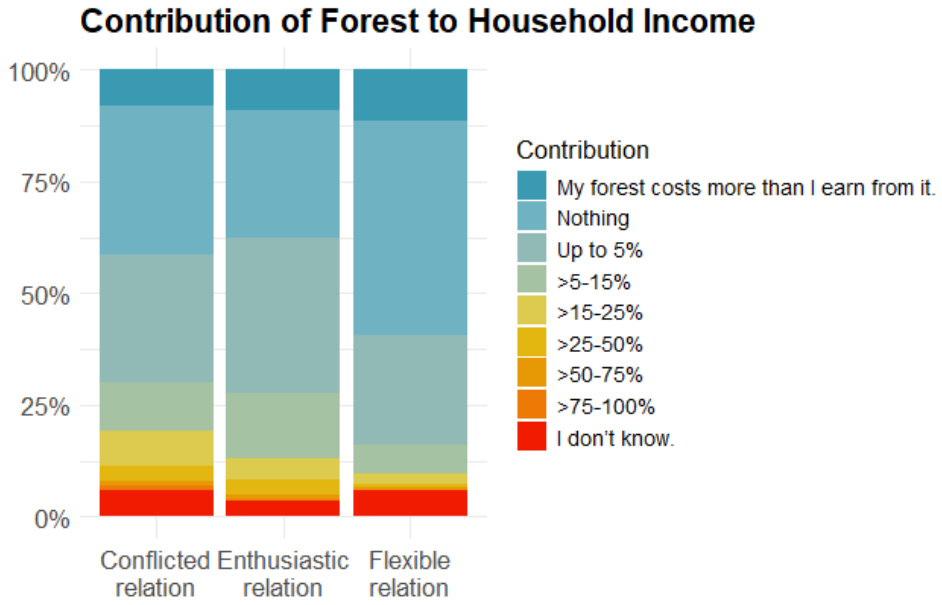

Figure 11: Contribution of the forest to the forest owner's household income. It can be seen that the majority of the forest owners allocated to the flexible relation cluster earn nothing from their forests or spends more than they earn.

compared to the other clusters, indicating a lower engagement with income-generating opportunities related to forestry.

Support Systems

While all clusters report the highest influence from local forest rangers, the *flexible relation* cluster is overall less influenced than the other groups. Similar to the *conflicted relation* cluster, they recognise public forest administration and their own knowledge as the second and third most influential sources. However, they engage significantly less in consultations with others ($p<0.001$) compared to the other clusters.

Overall, the *flexible relation* cluster is characterised by engaging relatively little with their forests. Nevertheless, this cluster comprises a big share of forest holders that do engage in management operations. While they recognise ecological and economic benefits, they are less likely to act upon them, facing time constraints and knowledge gaps, and engage minimally in support systems or professional networks. This might indicate a need for alternative support structures that allow for exchange also amongst promoters of non-traditional forest management.

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BOX Temporality

Forest management is fundamentally about time—trees grow over decades, ecosystems evolve over centuries, and legacies unfold across generations. And yet, time is often treated implicitly and as a background context. As a result, we know only little about how forest owners perceive, relate to, and act within time. This temporal lens builds on a growing body of organisational research that sees time not as a linear sequence of events but as a relational, lived phenomenon (Hernes, 2022; Blagoev et al., 2023). From this view, actors are continually entangling past experiences, present realities, and future expectations in ways that are recursive and situational (Hernes & Schultz, 2020; Feuls et al., 2024).

The survey conducted in the Small4Good project reveals notable differences in how time is factored into the decision-making process of their forest management. These differences are not only institutional but also relational in the way forest ownership is linked to family, legacy, and trust in governance. To explore this further, respondents were asked to indicate the time horizon they consider when making decisions about their forests. The response options ranged from 1 to 200 years, allowing for a wide spectrum of temporal perspectives. Based on these responses, we created a boxplot visualization

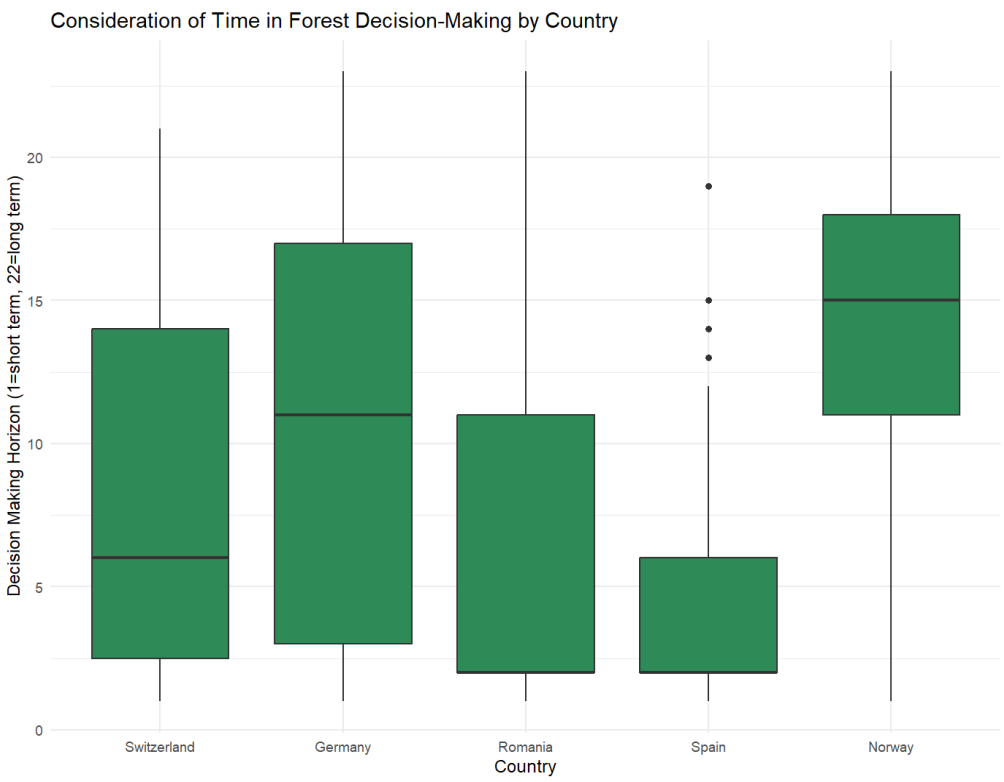

Figure 12 shows the forest decision-making horizon of small forest owners across the five project countries.

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to illustrate cross-country variations and better understand how long-term thinking differs across contexts (Figure 12).

Germany and **Norway** demonstrate the strongest long-term orientation. This observation is likely tied to a view of the forest as a family legacy since most of the private forests in Germany and Norway are obtained through inheritance (Follo et al., 2015). Additionally, forest ownership in Germany does not necessarily mean immediate profit, but also identity, family heritage, and personal responsibility for conserving natural resources (Joa and Schraml, 2020). Also, **Switzerland** exhibits a clear inclination toward long-term forest management among private owners. Swiss forest culture emphasises non-economic values such as recreation, biodiversity, and landscape identity, with ownership often associated with emotional and symbolic meaning rather than financial gain (Wild-Eck et al., 2006). In **Spain**, survey respondents exhibit a more short-term orientation, possibly closely linked to a focus on NWFP. Whereas timber production requires decades of investment, NWFPs yield faster and more predictable income and may thus affect the perception of temporality amongst respondents (Huntsinger et al 2013). In **Romania**, forest owners demonstrate a moderately short-term orientation—less future-focused than in Norway, Switzerland, and Germany, yet not as acutely short-term as in Spain. This tendency may be related to institutional and socio-political conditions: Following the post-socialist restitution of forest lands, ownership became highly fragmented (Nicolescu, 2022) and most of these new owners lack both the technical expertise and the financial means required for long-term forest planning. Additionally, high state regulation may discourage pro-active, future-oriented management (Nicolescu, 2022, Lawrence 2009).

In short, our analysis reveals three distinct temporal dynamics that shape the motivations and barriers of small-scale forest owners across Europe. First, in Germany, Switzerland, and Norway, we observe *enduring temporalities*: forest ownership is approached with a strong sense of long-term responsibility—grounded in family legacy, supported by institutional governance, and reinforced by the symbolic meaning of the forest. Second, Spanish forest owners exhibit *iterative temporalities*, where forest management is organised around the ecological and market cycles of NWFPs such as cork, resin, and acorns. Owners act within mid-term time horizons, responding flexibly to seasonal variation and economic opportunity. Third, in Romania, we observe *constrained temporalities*, shaped by fragmented property rights and restrictive forest governance. These three temporal dynamics highlight that forest owners not only differ in their strategic outlooks, but also inhabit fundamentally different relationships with time itself.

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4.3 Excursion: No Management and Multifunctional Management

Interestingly, there were (almost)[6] no significant differences between the clusters concerning the reasons for not engaging in management activities (see Figure 13: The heatmap shows the reasons given for not managing the forest actively by cluster. It can be seen that the clusters do not differ with respect to why they do not engage in forest management). As this could only be answered by those indicating that they do not

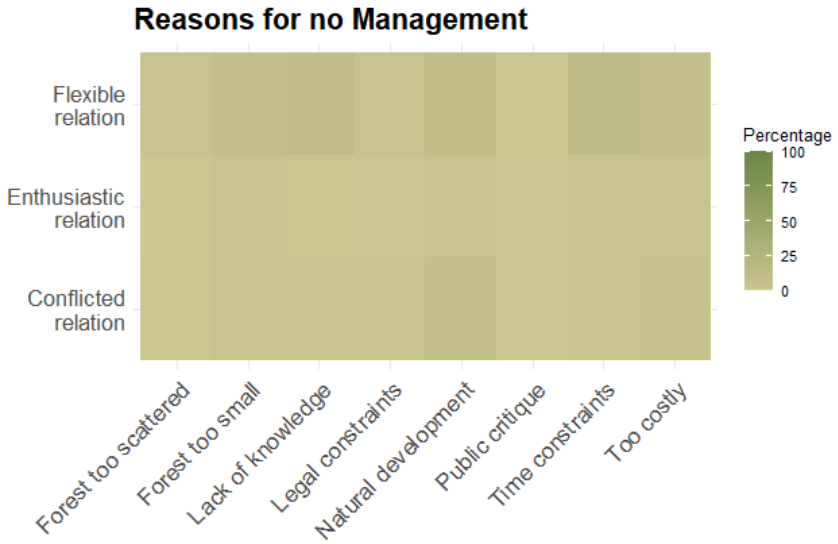

Figure 13: The heatmap shows the reasons given for not managing the forest actively by cluster. It can be seen that the clusters do not differ with respect to why they do not engage in forest management.

manage their forests, we will have a closer look into the group of forest owners that indicated that neither them nor third parties conduct management operations in their forests (n=199).

Forest owners who do not actively manage their forests tend to hold significantly smaller forest properties, with approximately half of them owning properties below 2 ha ($p<0.001$). This group has a significantly lower presence in forest owner associations and differs notably from active managers in their views on key forest objectives such as biodiversity, production, and recreation ($p<0.001$). They also earn significantly less than those who engage in management activities ($p<0.001$).

One of the most striking differences between the two groups lies in the sources of influence and subjects of trust. The non-managing group is significantly more influenced by public forest administration ($p=0.01$), while they are considerably less influenced by friends and family ($p=0.01$) and forest magazines ($p<0.001$). Additionally, their own

[6] One combination was significant, which referred to the response 'no time'. In this category the *flexible* and the *conflicted cluster* differed significantly, as respondents of the flexible cluster saw time constraints more frequently as a barrier.

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knowledge plays a far smaller role in decision-making ($p<0.001$)[7]. They also seek advice significantly less frequently than active managers. When it comes to trust, the non-managing group expresses significantly lower levels of trust toward a wide range of actors, including forest owner associations, local forest rangers, private forest managers, public forest administrations, and other forest owners ($p<0.05$). However, they exhibit a significantly higher level of trust in environmental NGOs ($p=0.02$). This suggests that their perspectives on forest management and external influence may align more with environmental organisations rather than traditional forestry institutions.

Demographically, non-managing forest owners are significantly older and more likely to be retired ($p<0.001$). They also possess significantly less formal forestry education ($p=0.004$). Furthermore, a significantly higher share of this group has inherited their forests rather than purchased them. Additionally, they tend to live significantly further away from their forest properties and are more likely to own broadleaved forests ($p=0.01$). Regarding external pressures, non-managing owners are significantly less affected or less aware by forest disturbances compared to active managers.

Methodologically, it is noteworthy that this group was reached significantly more often through public forest administration and significantly less via forest owner associations. They were not reached through newspapers in this study but got access to the survey significantly more via friends and family.

Factors influencing management

We also analysed possible factors influencing management. Here, our results show that forest owners who rely primarily on their own knowledge ($p < 0.0001$) and those influenced by friends and family ($p = 0.03$) are more likely to refrain from managing their forests. This may reflect broader trends among European forest owners, who are often described as passive, traditional, and lacking technical or policy knowledge (Lawrence et al., 2020). At the same time, the growing reliance on non-professional sources of advice—such as peers and neighbours—can be understood in light of the fact that these sources are often regarded as trustworthy and credible within local social networks (Bieling, 2004; Stoettner and Ní Dhubháin, 2019).

Furthermore, we found that forest owners who perceive themselves as dependent on others in decision-making tend not to manage their forests ($p = 0.015$). This is consistent with the findings of Matilainen and Lähdesmäki (2017), who argue that a lower sense of psychological ownership reduces the perceived responsibility for active management. Interestingly, a similar pattern is observed among owners who perceive themselves as independent ($p = 0.005$), suggesting that management disengagement may also stem

[7] Decreasing forest related knowledge, but also other barriers such a lack of time indicate a growing need for advisory services for forest owners. However, previous research has pointed out the contradicting development of decreasing advice capacities of public forest administrations (Curtis et al., 2023; Follo, 2011).

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from institutional uncertainty. As Löfmarck et al. (2017) explain, when the boundaries of responsibility and compliance with regulatory frameworks are unclear, forest owners may become hesitant or risk-averse, leading to inaction.

Additionally, forest owners who report receiving income from their forests are more likely to engage in active management, suggesting that tangible economic incentives can motivate stewardship. As Ficko et al. (2019) point out, forest owners who are economically independent from their forests may contribute to reduced roundwood supply from private forests due to their tendency toward passive management.

What does management mean to the forest owner?

Interestingly, respondents who stated that neither they nor any other party performs management operations in their forest, at a later state could be shown to, indeed, conduct forest management operations (i.e. 17.6 % harvest trees in their forests, see Figure 14: While the respondents of the no-management group state in an earlier question that there are no management operations conducted in their forests, when responding to specific forest management operations, it can be seen that many have engaged in fores). It can be seen in Figure 14: While the respondents of the no-management group state in an earlier question that there are no management operations conducted in their forests, when responding to specific forest management operations, it can be seen that many have engaged in fores that only 33.7% of those initially stating that there are no management operations performed, also in fact do not perform any management operations. While this finding may be striking, it also alludes to differences in understanding the term 'forest management'. Many actors may perceive forest management as a term referring to large-scale harvesting techniques, and not consider single tree harvesting to produce firewood, the use of non-wood forest products, or retaining deadwood under the umbrella of forest management practices.

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Furthermore, the fact that only a third of the no-management group actually does not manage their forests at all suggests that a large share of survey respondents, namely 95.4%, do manage their forests in some way. While this may be partially due to a selection bias (as discussed in section 7.1), it still indicates that the forests of small-scale holdings are widely used and cared for and rather the concept of *forest management* understood differently across societal groups. Furthermore, it seems that the dichotomy between managing and not managing forest owners, as often emphasised by stakeholders of the forestry sector, does not exist in this distinctiveness. Very close to our findings, Matilainen & Lähdesmäki (2023) find that only one third of Finnish forest owners that are classified as 'passive' in national statistics, are actually not managing their forests at

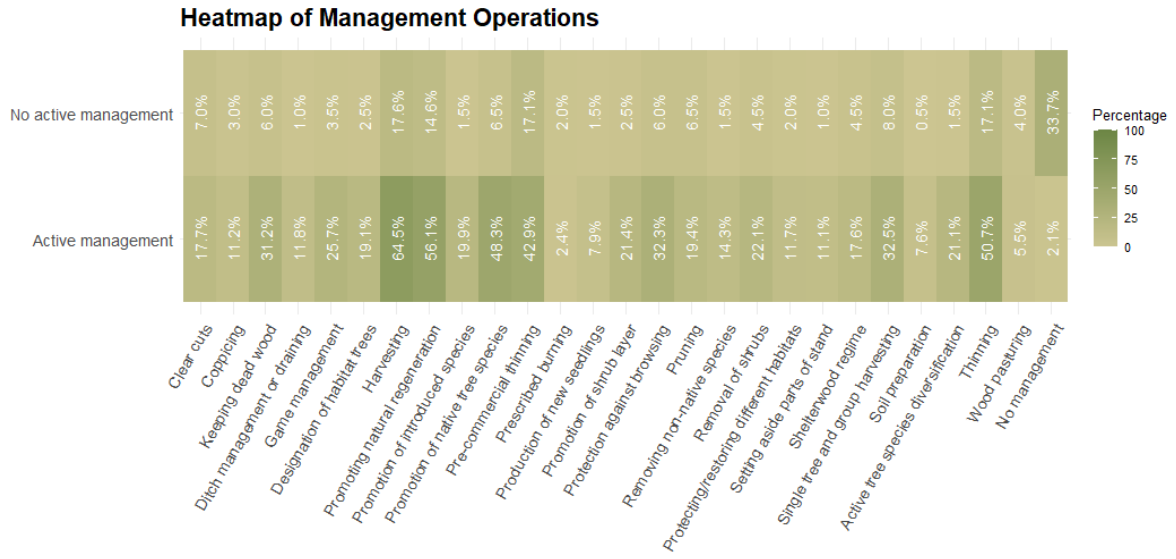

Figure 14: While the respondents of the no-management group state in an earlier question that there are no management operations conducted in their forests, when responding to specific forest management operations, it can be seen that many have engaged in forest.

all. The remaining two thirds still seem to use their forests for personal and household uses. As it is at the heart of the Small4Good project to increase and facilitate the use of multiple forest functions, it may thus be crucial to further reflect upon the different understandings of the term *forest management* and increasingly communicate its diverse meanings, potentially beyond harvesting.

4.3.1 Drivers of Multifunctional Management

To gain a more nuanced understanding of management behaviours, we developed a binary logistic regression model focusing on multifunctional or ecosystem services-related management, which serves as the dependent variable. The independent variables were selected based on Ostrom's Institutional Analysis and Development (IAD) framework (Ostrom, 2009), following the precedent set by prior studies that have used institutional variables to explore how structural conditions influence individual behaviour and decision-making in natural resource management (e.g. Bouriaud et al., 2015; Coleman, 2009; Coleman and Steed, 2009).

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Multifunctional management is defined based on practices that contribute to ecosystem service provision, following the categories outlined by Brockerhoff et al. (2017). These include activities such as promoting native species, supporting natural regeneration, protecting habitat trees and deadwood, managing browsing pressure, enhancing species and structural diversity, and removing invasive or non-native species. In the following, we provide a short overview of the institutional factors that drive ecosystem services related management per country.

In Romania, owners who prioritise non-wood forest products ($p = 0.005$) tend to engage less in multifunctional management. This pattern may reflect a perception that such activities require minimal intervention in the forest, which could be associated with lower involvement in broader ecosystem stewardship.

In Germany, forest owners who are approached by private forest managers ($p=0.007$) or employed outside the forestry sector ($p=0.02$) show significantly negative association with multifunctional management. This may indicate towards the advice from private forest managers prioritising profit or timber production, failing to resonate with those interested in ecological outcomes. Owners working outside the forest sector may also lack the time, expertise, or emotional connection to prioritise forest care, treating their land as a passive rather than an actively managed asset.

In Switzerland, several institutional and value-based factors were negatively associated with ecosystem services-related management. Forest owners who prioritise economic benefits ($p=0.005$), hazard protection ($p=0.02$), or who experienced natural disturbance in their forest ($p=0.01$) tend not to engage in such practices. Similarly, being approached by NGOs or private forest managers was negatively associated with active ecosystem management, suggesting that conventional outreach strategies may not adequately reflect or respond to the needs and motivations of Swiss forest owners, and may even foster disengagement if perceived as irrelevant or intrusive.

In Norway, both membership in a forest owners' association ($p = 0.03$) and the presence of forest disturbance ($p = 0.03$) are positively associated with multifunctional forest management. As noted by Lawrence et al. (2020), forestry in Nordic countries is increasingly shaped by peer-to-peer learning approaches, which are often facilitated through forest owners' associations. These associations serve as platforms for knowledge exchange, capacity building, and the dissemination of sustainable management practices. According to Pezdevšek Malovrh et al. (2024), the topic of forest owners' associations has been most extensively researched in the Nordic countries (Finland, Sweden, and Norway), second only to the United States. This reflects both the historical importance and the contemporary relevance of such associations in shaping forest management behaviour across the region.

Finally, in Spain, owners who place value on economic benefit ($p=0.01$) or carbon storage ($p=0.01$) were negatively associated with multifunctional management. This result

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suggests that while these values may be recognised abstractly, they do not necessarily translate into concrete management actions—possibly due to reliance on external mechanisms (e.g. subsidies or markets) rather than personal initiative.

Since a binary logistic regression model is used to examine multifunctional or ecosystem services-related forest management, several limitations should be acknowledged. First, the binary outcome variable reduces complex management behaviours to a simplified yes/no distinction, which may not fully capture the diversity and nuance of real-world practices. Moreover, the analysis includes only statistically significant predictors, meaning that other potentially relevant variables are excluded, potentially limiting the scope of interpretation. As the model relies on cross-sectional data, it identifies correlations rather than causal relationships and should not be interpreted as providing evidence of causation. Finally, while country-level variation is addressed through separate modelling, this approach may still not fully reflect the depth and complexity of institutional differences across national contexts.

Further analysis on this topic—particularly in understanding how varying institutional arrangements across countries shape different forest management outcomes—will be explored and elaborated on in WP3.

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5. The Role of Social Networks of Forest Owners

Social network theory assumes individuals to be embedded in webs of social relationships that shape their behaviours, decisions, and access to resources (Fuhse, 2018). The position an individual occupies within a network—such as being centrally located or marginal—can profoundly affect their ability to harness resources and exert influence (Freeman, 1977). By examining these network structures, one can uncover patterns of collaboration, identify influential actors, and better understand how information and decisions flow through a community.

As outlined previously in this report, small forest owners exhibit diverse motivations and objectives as well as varied relationships with their forests. Yet, the management of these forests demands access to resources such as knowledge, skills, equipment, and funding, which can pose significant challenges for some SFOs (Haeler et al., 2023). Because such resources are often available through broader social networks, it follows that a forest owner's position within these networks can affect and influence their management decisions. Thus, rather than being solely a matter of individual preference, forest management decisions are also shaped by the information and resources afforded by the owner's social ties.

5.1 Degree Centrality

To estimate the reach of forestry actors in advising SFOs on forest management, we calculated the degree centrality per forestry actor in the communication networks. The norm degree centrality indicates the percentage of small forest owners reporting communication ties with the forestry actor. The analysis revealed that local forest rangers, forest owner associations, and public forest administrations exhibit the highest centralities overall, both in approaching and being approached by SFOs regarding forest management within the past five years (Figure 15: Forestry actors' communication degree centrality. Left: forestry actors which approached SFOs. Right: SFOs which reached out to forestry actors for management advice. Norm Degree: Proportion of SFOs who had contact with the forest actor at least once in the past five years according to the mentioning by SFOs in the online survey.). In our sample, 68% of SFOs stated to have been contacted by local forest rangers, followed by forest owner associations and public forest administrations, each being stated to have reached about 52% of the surveyed population at least once in the 5-year period. Similar patterns emerge in the forest owners' advice-seeking networks. Local forest rangers represent the most widely contacted forestry actor, approached by approximately 70% of SFOs. Forest owner associations were consulted by about 50% of SFOs, while public forest administrations were consulted by 49% of the surveyed forest owners.

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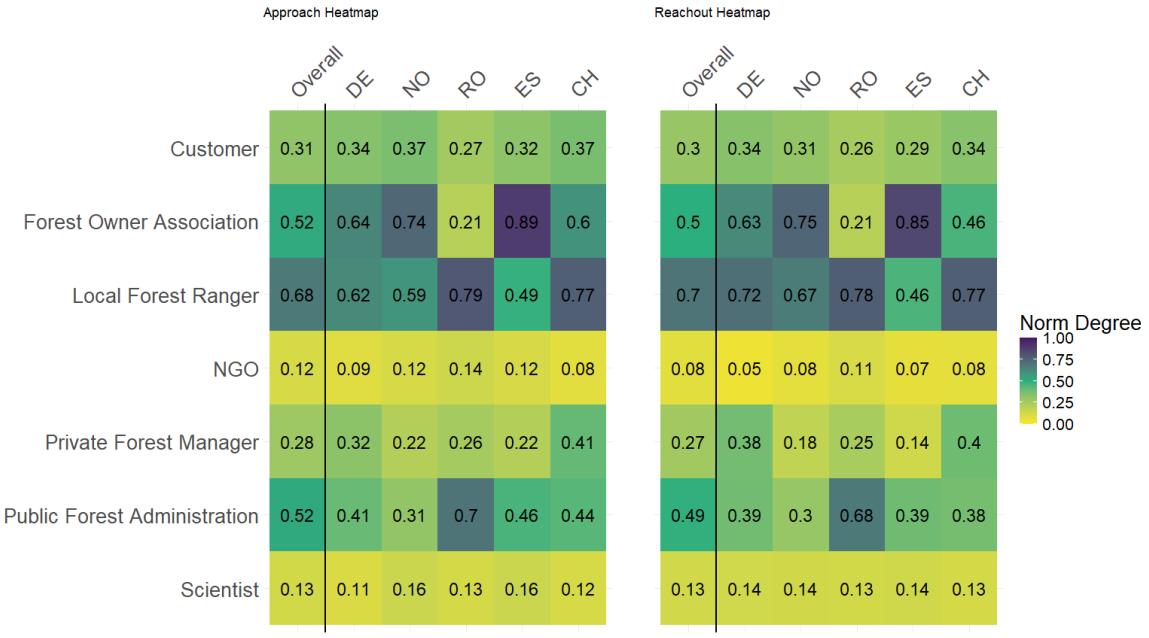

Figure 15: Forestry actors' communication degree centrality. Left: forestry actors which approached SFOs. Right: SFOs which reached out to forestry actors for management advice. Norm Degree: Proportion of SFOs who had contact with the forest actor at least once in the past five years according to the mentioning by SFOs in the online survey.

There are, however, notable national differences. In Germany, Spain, and Norway, forest owner associations and local forest rangers were stated to have approached the highest share of SFOs. Particularly in Spain, forest owner associations exhibit remarkably high degree centrality, with 89% of SFOs stating they have been contacted by them. Switzerland shows a distinct pattern: forest owner associations showed a higher degree centrality for their active approach towards SFOs rather than SFOs who contacted forest owner associations for management advice. Romania presents the most significant divergence in actor centrality. Only 21% of our Romanian sample stated to have been contacted by forest owner associations, which is lower than the reported outreach of customers or private forest managers to the Romanian participants. Conversely, their public forest administration was mentioned to reach about 70% of the Romanian SFOs, remarkably higher than what has been reported in the other countries' samples, where public administration centrality ranges between 31% to 44%. Scientists and NGOs represent the smallest communication networks overall, with 13% and 12% of SFOs stating they have been contacted by these actors. Vice versa, the forest owners reported to have reached out to scientists and NGOs in 13% and 8% of all cases collected.

5.2 Louvain Clusters on Communication

The Louvain clustering identified three distinct clusters within the overall SFO communication network, excluding isolated nodes (SFOs without any reported communication). To preserve the information about these isolated SFOs they were added as a separate fourth cluster labelled as *isolates*, comprising 93 individuals (Figure 16).

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The second-largest cluster is labelled the *informal* cluster, characterized by SFOs with a strong reliance on communication with friends and family (91%) and interactions with other forest owners (68%). This cluster contains 388 SFOs. The third cluster is termed the a*ssociation first* cluster due to the dominant communication role of forest owner associations, which engage with approximately 93% of the SFOs within this group. The *associations first* cluster includes 299 individuals. Finally, the largest cluster is the *formal* cluster, distinguished by significant communication with formal forestry actors, notably local forest rangers (85%) and public forest administrations (73%). This cluster counts 512 members.

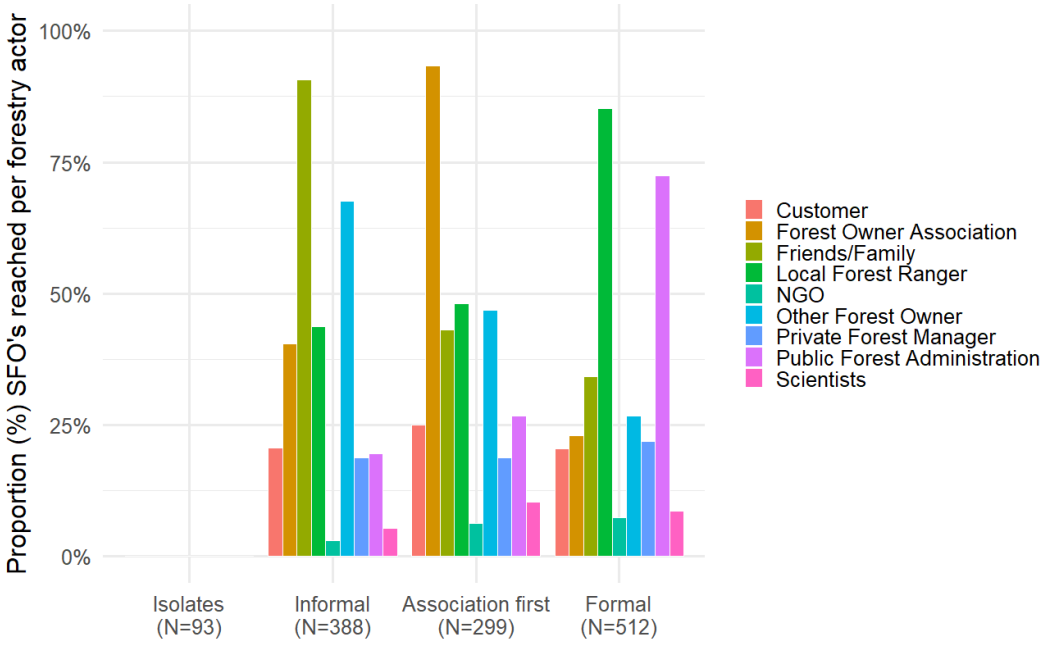

Figure 16: Proportion of SFOs per communication cluster connected to forestry actors. Bars indicate the percentage of owners within the cluster who stated to maintain a communication tie to a particular actor within the last 5 years.

5.2.1 Communication Clusters: National Distribution

Clear country-specific patterns emerged within the communication clusters. In Norway and Germany, over half of the surveyed SFOs belong to the *informal* cluster (52% and 51%, respectively), while approximately one-quarter fall into the *association first* cluster (Figure 17). Romania presents a distinct pattern, with a substantial majority (75%) of its SFOs categorising to the *formal* cluster. In Spain, the *association first* cluster dominates, with 67% of SFOs. Switzerland shows a more balanced distribution, with 39% of SFOs in the *informal* cluster, 34% in the *formal* cluster, and 17% in the *association first* cluster.

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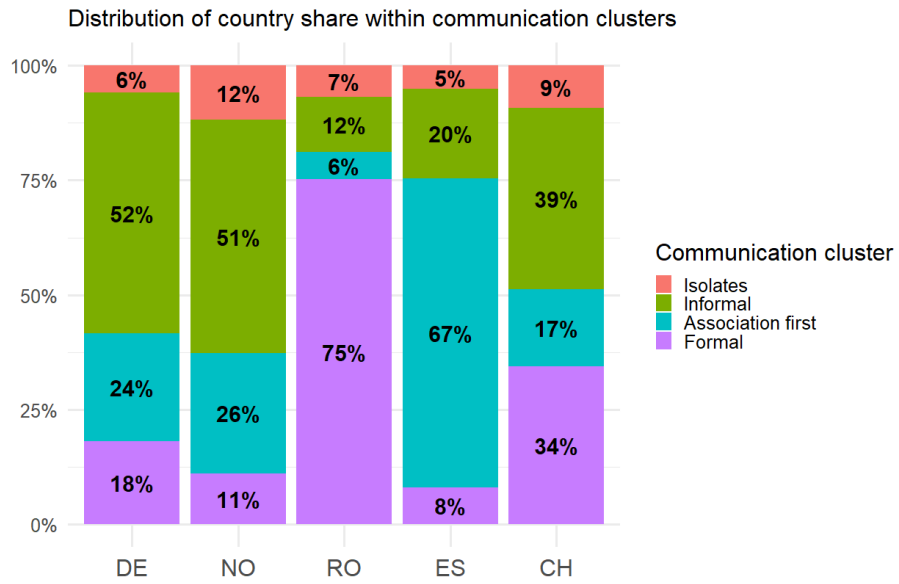

Figure 17: Share of SFOs in each communication cluster per country.

5.2.2 Communication Clusters: Comparison with Relationality-Based Typology

When comparing the communication clusters with the established forest relationship types (Chapter 4), the clusters demonstrate a relatively balanced distribution regarding the SFO forest relationships (Figure 18). Notably, the *informal* cluster shows the highest proportion of *enthusiastic relationships* and the lowest proportion of *conflicted relationships* among SFOs. Conversely, the *formal* cluster exhibits the opposite trend, having a relatively higher share of *conflicted relationships* and fewer *enthusiastic* ones.

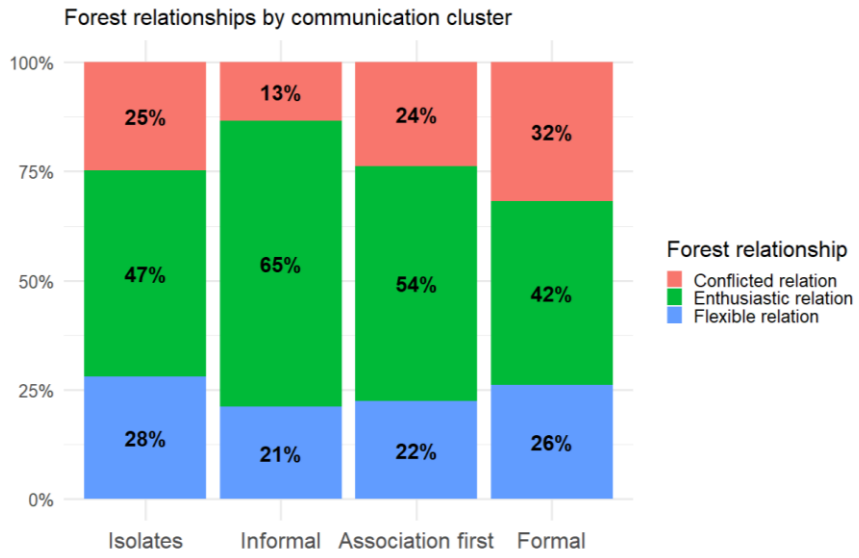

Figure 18: Share of SFOs pertaining to the three forest relation clusters (Chapter 4) per communication cluster.

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5.2.3 Communication Cluster: Differences in Forest Management

In this step, it was evaluated if the produced communication clusters show forest management engagement patterns which can be explained with the social network theories of information and resource access.

Results of comparing the communication clusters to the implemented **management practices** showed that thinning and removal of timber is the most prominent practice, followed by regeneration and forest structure measures in all communication clusters (Figure 19).

The *isolates* cluster, in line with the assumption that forest management requires information and resources which are available through social networks, showed the lowest participation in forestry measures. Still, more than 50% of SFOs in this cluster engaged in thinning and removal which links to the findings of the *flexible cluster* in Chapter 4, where lower engagement still shows over 60% of the SFOs engaging in some sort of forest management.

Informal and *association first* clusters show similar levels of engagement in forest management for thinning and removal practices and regeneration and structure management. Differences stand out for habitat and biodiversity management, which is higher with the *informal* cluster, and site maintenance which is more prominent with the *association first* cluster.

The *formal* cluster exhibits lower overall engagement compared to the *informal* and *association first* clusters. Nonetheless, a majority of over 75% of SFOs within this cluster practice thinning and removal. Surprisingly, engagement in forest regeneration management falls below the rates of the *informal* and *association first* clusters. Management measures related to habitat and biodiversity protection, as well as site maintenance, are among the lowest of all four clusters. This finding is particularly notable, since a higher chance of communicating with more formalized and centrally located actors was assumed to lead to a broader range of opportunities for forest management, including subsidies for biodiversity and ecosystem services (BES) provisions.

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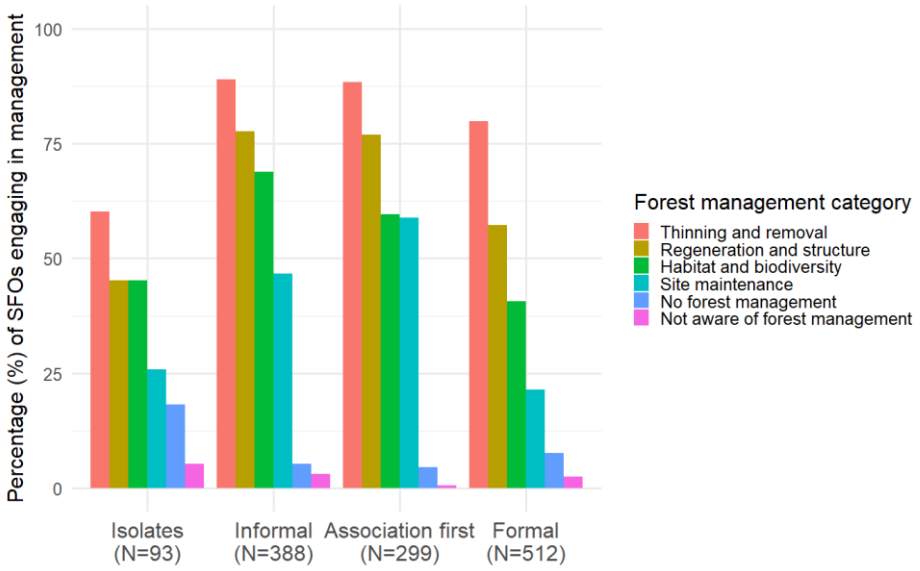

Figure 19: Percentage of small forest owners (SFOs) in each cluster who performed or hired a third party to conduct forest management at least once in the past 10 years.

5.3 Social Networks Summary

In summary, several forestry actors exhibit high degree centrality by engaging with small forest owners (SFOs) and by serving as a source of management advice. This centrality underscores their role in disseminating information and facilitating access to resources. From an analysis of the SFO network, four distinct communication clusters emerged: (1) *isolated* owners, (2) those with predominantly *informal* connections, (3) those linked mainly to forest owner *associations*, and (4) those operating within more *formal* institutional settings (local forest rangers and public administration). The distribution of SFOs across these clusters varied substantially among the surveyed countries, suggesting that differing governance frameworks can shape forestry networks in meaningful ways. On the other hand, no clear distinction between the forest relation and the communication could be defined.

Linking the results to our third research aim, we can show that management practices had the highest overall adoption rates in both the *informal* and *association first* clusters, with measures for habitat and biodiversity protection especially prominent in the *informal* group. This finding is noteworthy as it suggests that increased communication with more specialized forestry actors with a high degree centrality does not translate directly into proportionate engagement. Finally, assuming that more *formal* networks enjoy better access to forestry resources, the high participation in forest health and biodiversity management among the *informal* groups raises questions about available resource channels and the specific BES they aim to support. Hence a deeper insight into available resources and how they are made available for SFOs could increase understanding of the management decisions taken by the SFOs.

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6. PES as Incentive for SFO Participation in Multifunctional Forest Management

Multifunctional forests have the capability to produce a variety of BES. However, some BES are in conflict with each other or not feasible to implement on the same plots (Brockerhoff et al., 2017; Blattert et al., 2023). Therefore, the interests of forest owners to provide a range of BES are important to understand in order to establish support for multifunctional forest ecosystems. The review focused on six BES; timber provision, general ecosystem protection, biodiversity protection, carbon sequestration, water protection and recreation, and accounted specifically for cases in which multiple BES were provided at the same time. This section focuses on the broader motivations of European non-industrial private forest owners (NIPF) to provide BES provisions. Findings from 12 European countries and 7 BES provisions are summarized in this chapter (Figure 20). Both the undertaken meta-regression and the descriptive literature summary provided supporting findings towards increased participation interest beyond economic benefits and timber production (Buckley et al., 2009; Mäntymaa et al., 2009; Boon et al., 2010; Follo et al., 2017; Ficko et al., 2019; Floress et al., 2019; Gołos et al., 2021; Wilkes-Allemann et al., 2021), suggesting a broader engagement effect from environmental motivations (Mäntymaa et al., 2009, 2018; Mitani & Lindhjem, 2015). In the meta-regression, an overall higher participation rate was identified for programs with biodiversity, carbon, recreation and multifunctional BES aims compared to timber-focused programs. These increased engagement rates for a range of BES provisions may be used for a targeted pricing of PES schemes depending on the nature of the provision.

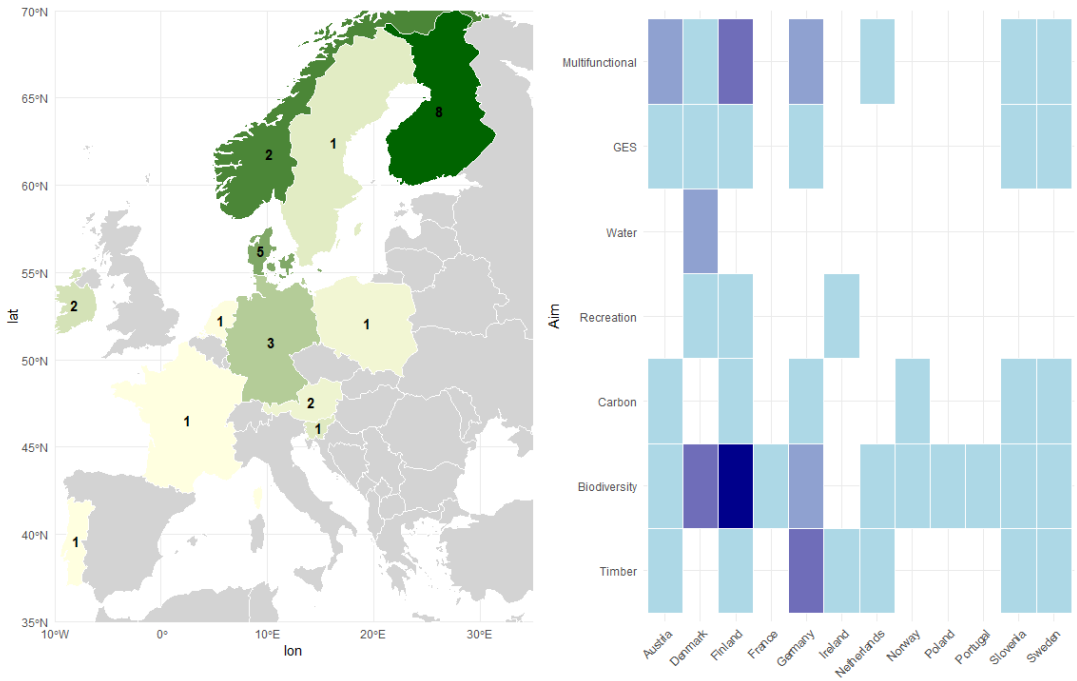

Figure 20: Sample sizes and number of datasets collected per country (left); heatmap of the number of datasets collected per country and aim (right). GES = general (non-specified) ecosystem services.

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On the social networks, trust in contract partners is considered key for increasing NIPF participation in voluntary management programmes for BES provision (Kilgore et al., 2007; Lind-Riehl et al., 2015). However, identifying a common trust variable for a meta-regression of this scale is challenging. The summarizing variable ultimately applied was whether the identity of the contract partners was known to the forest owner. A preliminary analysis supported a positive influence of knowledge of the contract partners, but this effect could not be confirmed in the meta-regression including all moderators. Given the qualitative findings from the evaluated literature, contract partners seem to have influences on a more nuanced level, with a variety of factors influencing the willingness of NIPFs to participate and agree to payment requirements (Abildtrup et al., 2021). NIPFs were most motivated to comply with family members, local forest managers, association advisors and forest centre advisors (Koskela & Karppinen, 2024). Tiebel et al. (2024) established a similar ranking, with foresters, forestry associations and forest owner associations as the most influential forest actors. As program partners, non-profit organizations were preferred over for-profit organizations and authorities (Kosenius, 2024), an effect further supported by locality. Regional contractors have been reported to be the preferred contract partner option of NIPFs, before environmental organizations or government agencies (Pröbstl-Haider et al., 2020). A decreasing factor in participation in forest management programmes was large numbers of owners for the same property (Mäntymaa et al., 2018). In terms of compensation effects, technical advice was positively perceived and increased participation rates (Brouwer et al., 2015). Finally, concerning the initiation of the contract, NIPFs have been reported to prefer to initiate management contracts themselves (Horne, 2006).

Concluding, it can be said that BES such as biodiversity protection or carbon sequestration objectives, trust in known contract partners, and the preference to initiate contracts have a positive effect on the willingness of private forest owners to participate in PES schemes. Meanwhile, factors such as a large numbers of co-owners and less-trusted or for-profit partners can diminish participation rates. This evaluation supports the argument that forest rangers and forest owner associations are influential forest actors to which forest owners reported an increased willingness to comply. Preferences which should thus be considered when designing PES schemes or new business models in forestry where motivations, financial incentives and access to advice networks support BES provision engagement.

Further details on PES schemes preferences concerning compensation and contract attributes which were further evaluated in this review will be taken up in a following deliverable which develops closer insights into business models for small forest owners.

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7. Discussion and Conclusion

7.1 Limitations and Reflections

This study builds on interdisciplinary socio-economic research in five European countries. We leverage qualitative and quantitative social-empirical research methods, grounded in the theoretical frameworks of relational values (Himes and Dues, 2024), social-ecological systems (Ostrom, 2009) and network theory (Liu et al., 2017). The innovation is to bring together these relatively recently emerging theories to better understand motivations and barriers of SFOs. However, these methods and theories inherently also come with limitations and a system understanding which needs to be carefully considered when interpreting our results and transferring them into practice. While the final sample size of the online survey as a key joint method of the deliverable, suggests a high number of responses and allows for statistically valid insights, the results can certainly not represent the various views of all small forest owners across Europe. Through clustering and further differentiation, relevant and statistically robust comparisons between the groups could be developed. However, there are some limitations that may have induced a bias in the research design. Therefore, in the interpretation and the conclusion we triangulated our results with the explorative key-informant's interviews and experience of our LL partners.

Reaching forest owners.
The first limitation concerns the difficulty of reaching small forest owners. In principle, all owners in a sample frame should have equal probability of selection and response. This is hard to achieve in practice. This predicament has already been discussed in several papers that deal with small-scale forestry (e.g Josset et. al, 2023; Matilainen & Lähdesmäki, 2023), as especially those forest owners that are not enrolled in a forest owner association are difficult to reach. As it is the explicit focus in the Small4Good project to reach beyond traditional forest owners and also address less engaged owners that may have different views and aspirations, we put additional efforts in the distribution within the LL regions. Based on the numbers presented in chapter 4, it can be shown that these efforts varied significantly between project countries: Overall, a share of approximately 25% of respondents are located in one of the LL regions. This number, however, ranges from 3.6% in Germany, to 91.5% in Norway, making a comparison across LLs unfeasible.

Social Networks
The social networks analysed were based on reported communication between SFOs and forestry actors, which relied on owners' recall over a relatively long period of five years. This introduces potential recall bias affecting the accuracy of reported interactions. Furthermore, while each communication cluster primarily interacted with specific forestry actors, some individuals within these clusters also reported contact with

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secondary actors. Thus, resources from these secondary actors might still indirectly reach SFOs, albeit potentially with delays. Lastly, national and regional governance contexts significantly shape local forestry actors' roles, as evidenced by the high proportion of Romanian forest owners in the *formal* cluster. Therefore, detailed evaluations of forest management preferences considering these governance contexts would yield deeper insights into how social networks influence management practices.

Norway as a special case

Furthermore, many of the respondents (54%), interestingly especially in those two countries, were enrolled in membership associations. In the case of Norway, the share of respondents enrolled in a forest owner association is 94.8%, a number likely based on a distribution bias that may have additionally led to a rather unified clustering: As presented above, most of the Norwegian responses were clustered similarly, indicating a rather homogenous relation to their forests and forestry in general. The assumption that most Norwegians relate similarly to their forests, however, is misleading, as these were sampled primarily via a forest owner association and conflicting standpoints may thus have been neglected in the sampling process. There is, however, also the possibility that the Norwegian or Nordic forestry culture differs to that of central European and more southern standpoints (Lovric et. al, 2025; Westin et al. 2023), and thus clusters homogeneously. It may be worth further exploring that assumption, as also the survey responses from Germany had a high share of actors enrolled in a forest owner association, and still were distributed across clusters more evenly than the Norwegian responses.

Non-traditional SFOs and gender effects

It can be concluded that the aim to reach beyond associations was met, but that the study's primary focus still lies on traditional forest owners. This aspect can be shown by the example of gender. In the survey sample, we reached 204 women and additionally two respondents stated that they identify as non-binary. This shows that the initial attempt to not only reach cis male foresters[8] with varying opinions, but also heterogeneous living realities, was met to some degree. On the other side, however, the FAO[9] states that in a cross-European study the share of female forest owners was estimated to lie between 20 and 40% - depending on the country. In our statistics, the percentage of women is far below this estimated average and two respondents indicating their gender as non-binary is very few. We thus have to conclude, that our results cannot represent the various viewpoints satisfactorily. The forest sector is a male-dominated sphere (Follo et al., 2017) and the results of our survey are proof of that. We would thus encourage further, possibly qualitative research to include the voices of underrepresented forest owners, identify their viewpoints and establish a set of policy instruments that foster diversity rather than homogeneity.

[8] A person that is cisgender is a person whose gender identification aligns with the sex they were assigned at birth.

[9] https://www.fao.org/4/a1346e/a1346e06.htm#:~:text=The%20majority%20of%20private%20forest,40%20percent%20(Figure%207)

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Relational values

Following Himes and Dues' (2024, p. 2) call for a relational turn in forestry, one of our research aims was to investigate the owner/forest relationship in more depth. First of all, our observations can be understood as a confirmation of the value pluralism that Himes and Dues call for relational forestry (2024, p. 10) is built upon. Our data shows that the forest owners investigated had various and manifold relations to their forests, instead of, for example, a mere instrumental relation. We thus argue that especially when engaging with small forest owners whose properties are often too small for economic relevance, a relational perspective is crucial to capture aspects beyond the forest's instrumental use.

Moreover, our results also show that these relations between forests and their owners are mutually constitutive. While the clustering was solely based on relational values, the clusters differed significantly in many respects: i.e. in forest management, forest type, and in distance to forest property. First and foremost, this observation shows that there is a correlation between the owner/forest relation and the material context. Referring back to the theoretical literature, the owner/forest relation is considered mutual (Himes and Dues, 2024), which lets us assume a bidirectional relationship between forests and owners: It cannot be conclusively resolved whether the owner's predisposition, or the forest's material context dominates the relationship and, according to Himes and Dues (2024), it must be both.

7.2 Conclusive Summary and Policy Recommendations

The complexities of forest ownership extend far beyond economic dimensions, shaping diverse management practices that reflect the very different relationships owners have with their forests. In many cases, as could be shown with the *flexible relation* group, the economic perspective is only of little relevance to the forest owner. This observation, however, also suggests that direct economic incentives can only be part of the bouquet of policy instruments designed to further engage small forest owners.

Forest management practices are significantly influenced by the social networks of the owners, particularly their communications amongst family and friends as well as memberships in associations. Owners engaged in these networks demonstrate increased activity in forest management. Moreover, an additional emphasis on biodiversity and ecosystem services in forest management is more pronounced among owners who maintain frequent interactions with forestry professionals and are members of associations. For policy design and implementation, it is thus crucial to reflect on the role of dominant forest stakeholders and their influence in facilitating or hindering the implementation process.

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Given the heterogeneous contexts the forest owners are situated in, it is necessary to acknowledge these different backgrounds when designing policy instruments. National characteristics and regional contexts significantly shape the priorities of and challenges faced by forest owners, necessitating tailored policy solutions that address the unique needs and capacities of different communities. A one-size-fits-all approach would risk overlooking these differences and hinder the effectiveness of support mechanisms.

Additionally, it needs to be considered that forest management has various meanings to forest owners and is implemented in very different ways. While many forest management operations are beneficial for multifunctionality, there are also management operations that clearly counteract the purpose of a multifunctional forest (i.e. clear-cutting). It is, thus, important that the envisioned policies addressed to SFOs are sensible in terms of their aim and impact. Interestingly, many forest owners manage their lands without explicitly recognising their actions as forest management. This indicates a broader perception issue, where management is often narrowly defined. Promoting a mutual understanding of management as a broader set of activities and also purposive inactivity among forest owners and their consultants could facilitate better communication and diminish polarisation. Embracing the concept of multifunctionality allows for a more inclusive dialogue, where diverse management goals and practices are respected and integrated into policy development.

Policy recommendations

Small-scale forest owners form a heterogeneous group with diverse relationships to their forests, shaped by varying contexts and management goals. To facilitate climate-resilient forest management that balances carbon sequestration, biodiversity, and timber production, a comprehensive set of policy instruments is necessary. In the following, we present policy recommendations based on the results presented above which serve as a starting point to develop a more suitable set of policy instruments that account for the diversity of small forest owners across Europe. The recommendations are organised into five key categories: regulative, operational, financial, participatory, and informational policy instruments.

Regulative policy instruments, modifications to forest management regulations, should aim to empower forest owners, particularly in countries like Romania and in some respects also Switzerland, where forest management is more intensively constrained by legal regulation. Providing owners with agency over their land may foster engagement in forest management for multifunctional uses.

Organisational policy instruments: cover the administrative procedures concerning small-scale forest owners. Here, especially respondents of the *flexible relation* cluster who stated the most time constraints would benefit from supportive offers by state forest administrations. This may particularly involve reducing transaction costs of obtaining

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information on management and logistics, finding suitable market partners, providing legal and administrative consultancy (e.g. sample contracts etc.) and thereby reducing the administrative and logistical burden on owners. To further enhance these efforts, local forest administrations could partner with trusted forestry actors already well-connected in the region, i.e. those of the *enthusiastic relation* cluster. These actors could benefit from support for targeted management programs that preserve forest ownership rights with the SFOs while delegating the production of BES to a third party. By structuring forest management agreements around BES outcomes, rather than defining exact management practices, forest owners can be supported in aligning their decisions with their motivations while requiring less engagement. Furthermore, managing multiple small forest plots collectively further offers mitigation to challenges associated with small forest size, especially when interventions would be more effective across larger areas.

In terms of *financial policy instruments*, tailored support should be directed towards all forest owners to help ease the management burden. For those in the conflicted cluster, financial and material aids such as subsidies and forest management equipment are crucial for facilitating forest management as a side activity. Meanwhile, the *enthusiastic relation* cluster could be encouraged to diversify their revenue stream and include new management activities like eco-tourism or non-timber products into their portfolio to strengthen their financial and ecological resilience and make use of the forest's various ecosystem functions.

Participatory policy instruments can further support all clusters by promoting the establishment of cooperatives that embrace diverse perspectives on forest management. These cooperatives would provide a platform for sharing experiences and strategies, particularly for owners who do not resonate with traditional forestry. By creating inclusive spaces for exchange, these cooperatives can empower owners across the board to advocate for policies that reflect their values and ambitions. Such platforms could further benefit from digital tools to connect forest management communities and SFOs in terms of common forest objectives. Cooperatives which are open to managing new forest plots could thereby promote forest owner's participation, i.e., by providing visual and informational tools for the SFOs.

Informational policy instruments represent another vital pillar in supporting forest owners. The *enthusiastic relation* cluster, with its proactive attitude, can act as multipliers by leading and participating in training initiatives. These owners can play a pivotal role in inspiring and educating others, ensuring that informational outreach has a broad impact. Furthermore, trainings and educational programs tailored to climate adaptation are essential, especially for those most affected by environmental disturbances. Visual tools and practical workshops can enhance their understanding and capability to implement climate-adaptive measures. Additionally, for forest owners without formal forestry education, providing cheat sheets and easy-access AI tools can facilitate understanding and practical management. Accessible educational materials that promote

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climate resilience and multifunctionality in forestry can further strengthen support for owners, catering to various educational backgrounds and preferences.

Implementing these recommendations requires a joint effort among policymakers, forest management associations, and the forest owners. Recognising the varied needs and potentials among these owners is crucial for forming robust, resilient forest stewardship communities. By strengthening support systems and aligning them to the diverse needs of forest owners, we can better equip forest owners to address the challenges of climate change and sustainable management. Success in these efforts will depend on flexibility, inclusivity, and a shared commitment to developing policies that reflect the multifaceted nature of forest ownership.

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Appendix

A. Interview guide – Small Forest Stakeholders

Stage setting

1. Could you tell me about your position and how your work relates to small forest owners?

    1.1 Who is considered a small forest owner in your region? / What characterises a small forest owner in your region?

Defining Multifunctional Forests

2. What forest functions (or Ecosystem Services) are the forests in your region mainly managed for?

    2.1 What forest functions do small forest owners mainly focus on in your region?

    2.2 Which forest functions should/could be enhanced in your region?

    2.3 In how far is forest multifunctionality considered important…

    - among small forest owners?
    - in the forestry sector?
    - on a political level?

Motivations, Drivers and Barriers in relation to multifunctional forests

3. How would you describe the situation for small forest owners in your region?

    3.1 Why do small forest owners not engage with their forests in your region? (If applicable)

    3.2 What measures are taken to support small forest owners in engaging with/ or managing their forest?

4. What are the intentions/goals of small forest owners with their forests in your region?

    4.1 What short term goals do small-scale forest owners pursue with their forests in your region?

    4.2 What long term goals do small-scale forest owners pursue with their forests in your region?

    4.3 Why do you think the focus is on these specific goals?

    4.4 In your opinion, in how are the personal goals of forest owners compatible with multifunctional forests, which provide timber, biodiversity, climate protection and water regulation?

5. What measure are taken to support small forest owners in increasing the multifunctionality of their forests or aspects of multifunctionality (Biodiversity, Climate Protection, Recreation)

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5.1 What keeps small forest owners form increasing multifunctionality in their forests?
5.3 What role do PES play? Is there any in place? Are they used by small scale forest owners?
5.4 What interests could small-scale forest owners have to improve the multifunctionality (provision of biodiversity, climate protection and wood) of their forests?

6. What challenges do small scale forest owners face in your region?
6.1 What are the current management challenges?
6.2 What are the current environmental challenges?
6.3 What could be future challenges for small forest owners?
6.4 Do you think small forest owners are sufficiently informed and equipped to act upon these challenges to their forests?

Decision making Context

7. Can you explain to me which rules and regulations small forest owners have to follow when taking actions in their forest?
7.1 How independent can forest owners decide over management actions in their forests?
7.2 What administrative steps are necessary for forest owners to take actions in forests?
7.3 How can management decisions made and actions taken by small forest owners be influenced/supported?
8. Can you describe the usual forest management of your region? (Apart from small forest owners)
8.1 What are the presumed best practices/most common ways of forest management? (Existing traditions/norms/values/customs)
Does forest multifunctionality play a role there?
8.2 How do these decision-making of small forest owners?

Cooperation

9. How do small forest owners support each other and or collaborate with others in your region?
9.1 What is the purpose of these forms of cooperation?
9.2 How do these forms of cooperation relate to forest multifunctionality (wood production, biodiversity protection, climate regulation, water regulation)?
9.3 Why do small forest owners engage in these forms of cooperation? Why not?

Vision and Conclusion

10. How does a desirable future for small-scale forest owners and their forests like?
11. Is there anything else you would like to share in this context?

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B. Interview guide – Small Forest Owners

Stage Setting and Attachment

1. Tell me about your forest?
    1.1 Where is it? How big is it? What's the tree species composition?

2. What role does your forest have in your life?
    2.1 What's the meaning of your forest to you?
    2.2 What does forest ownership mean to you?
    2.3 How would you describe your role for the forest?
        What do you do for your forest?

Motivations, Drivers and Barriers

3. What intentions/management goals do you have with/for your forest?
    3.1 What short-term goals do you have?
    3.2 What long term goals do you have?
    3.3 Why do you focus on these goals/forest functions?
    3.4 Do you gain any income with your forest? Why? /Why not?

4 In how far do you consider- biodiversity protection (habitats for flora and fauna), carbon accumulation, recreational uses or wood production -in your forest management strategy?
    4.1 What possibilities do you see for increasing these forest functions?
    4.2 What could facilitate these measures/actions?
    4.3 What keeps you from taking these measures/actions?
    4.4 What role does monetary compensation for non-marketable goods play?

5. In how far do you feel supported or constraint in your management goals by - legal obligations, public administrations, forest owner interest groups/forest owner associations, or other forest owners and people living nearby your forest?

6. What are the challenges you currently face as a SFO in your region?
    6.1 What are management challenges?
    6.2 What are environmental challenges?
    6.3 What could be future challenges for small forest owners?
    6.4 Do you feel sufficiently equipped to face these current and possible future challenges?
    6.5. Do you know other forest owners who do not engage with their forests?
        6.5.1 Why do you think this is the case?
        6.5.2 How could they be motivated?

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Decision making context

7. How do you decide on management actions in your forest?
    7.1 What support do you use?
    7.2 Why do you use this strategy for decision making?
8. Can you describe to me how forest management usually works in your region?
    8.1 What are considered best practices/most common ways in managing forests? (norms/values/unwritten rules/ traditions)
    8.2 How do these influence your decision-making?

Cooperation

9. Do you work / collaborate with others to achieve your management goals for your forest?
    9.1a If yes: Why?
    9.2a How does the collaboration look like? What's its purpose?
    9.3b How would you envision the perfect collaboration?
    9.1b If no: Why not?
    9.2b Could you describe a form of cooperation you could see yourself being part of?

10. In your opinion, how could different forms of cooperation affect the provision of forest functions (Biodiversity protection, wood production, recreation, climate regulation/carbon accumulation)?

Vision

11. How does a desirable future for you and you forest look like?
12. Is there anything else you would like to share?

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C. Interview guide – EU-Level Organisation

1. Tell me about your work and how it relates to small forest owners?
    1.2 What role do small forest owners play in XX's work?/What role does XX play for small forest owners
    1.3 From your perspective, what are the main challenges or topics concerning small forest owners in Europe?
    1.3.1 What regional differences do exist?
    1.4 How are small forest owners adapting to the impacts of those challenges?
2. What role do SFO play for the multifunctionality of Europe's forests?
    In your opinion, what is needed to secure and enhance forest multifunctionality in the forests of SFO

3. In how far is the group of SFO relevant for and considered in EU forest politics/forest policy making?
    3.1 Ideally, what should be done at EU Level to support SFO in increasing multifunctionality in their forests.
    3.2 In your opinion, what policy or regulatory changes at EU level would be most beneficial for small forest owners and help to address the challenges they face?

4. Could you take me through the process of how XXs positions are formed?
    4.1 Do you distinguish between the interests of small and larger forest owners? How? Or why not?
    4.2 How do you strike balance between the diverse and possibly divergent interests of your members and more importantly their members?
    4.2 How do you include the interests of Small Forest Owners in your positions? EXAMPLE
    4.3 Which SFO's positions/interests do – did you bring forward in current EU forest policy debates?

5. Why is active management considered important and what does that mean for small forest owners?
    5.1 What hinders active engagement of SFO?

7. Is there anything you would like to add to our conversation?

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D. Questionnaire

☐ Hereby I confirm to participate in this survey voluntarily. My responses will be handled confidentially and in agreement with the European General Data Protection Regulation (GDPR).

1. In which country is your forest located?

- ☐ Switzerland
- ☐ Germany
- ☐ Romania
- ☐ Spain
- ☐ Norway
- ☐ Other, please specify: _____

2. What is the total area of the forest you (co-)own? (1 hectare = 100 m x 100 m = 10,000 m2)

- ☐ I don't know
- ☐ Up to 0.5 hectare
- ☐ > 0.5-1 hectare
- ☐ > 1-2 hectares
- ☐ > 2-5 hectares
- ☐ > 5-10 hectares
- ☐ > 10-20 hectares
- ☐ > 20-50 hectares
- ☐ > 50-100 hectares
- ☐ > 100-150 hectares
- ☐ > 150-200 hectares
- ☐ > 200 or more hectares, if you own 200 hectares or more, please specify: _____

3. In comparison to other private forest owners in your region, how would you classify the size of your forest?

- ☐ Very small
- ☐ Small
- ☐ Medium-sized
- ☐ Large
- ☐ Very large
- ☐ I don't know

4. My forest consists of several unconnected plots/patches.

- ☐ Yes, please specify how many: ____
- ☐ No, it is one stand
- ☐ I don't know

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5. How long does it take you to get to your forest (or your largest forest patch) by your preferred means of transport?

- ☐ My forest is part/connected to my primary residence.
- ☐ Up to one hour.
- ☐ > 1-2 hours
- ☐ > 2-3 hours
- ☐ > 3-4 hours
- ☐ > 4-5 hours
- ☐ > 5-6 hours
- ☐ More than 6 hours.
- ☐ My forest is not accessible for me.
- ☐ I don't know.

6. How frequently do you visit your forest?

- ☐ Daily
- ☐ At least once a week
- ☐ At least once a month
- ☐ At least once in half a year
- ☐ At least once a year
- ☐ At least once every 5 years
- ☐ Less than every 5 years
- ☐ Never

7. How important are the following objectives for you in your forest management?

1=Very important, 2=Moderately important, 3=Neutral, 4=Not important, 5=Not at all important, -9=Not answered

	1	2	3	4	5	-9
The health and diversity of the forest ecosystem, including its flora and fauna						
The production of quality timber, fire wood and/or other material goods from the forest						
Forest recreational use						
Water retention						
Carbon storage						
Protective functions against natural hazards (e.g. flooding, avalanches)						
Other, please specify:						

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8. Please assess whether the following factors help achieve your forest management objectives.
1=Fully agree, 2=Somewhat agree, 3=Neutral, 4=Somewhat disagree, 5=Fully disagree, -9=Not answered

	1	2	3	4	5	-9
My Knowledge						
My Skills						
Personal Interest						
Available personal funds						
Available time						
Available information						
Decision support/advice provided by public institutions						
Decision support/advice provided from private organisations						
Other, please specify: _____						

9a. 'No management operations are being done (by me or others) in my forest':

- ☐ True, no management measures (by me or others) are carried out in my forest.
- ☐ False, I actively manage my forest.

9b. The reasons for no management operations being done (by me or others) in my forest entail that... *Multiple answers possible*

- ☐ ...I would like my forest to develop naturally, without any human interventions.
- ☐ ...I am concerned about possible public critique towards me.
- ☐ ...I do not have time to actively manage my forest.
- ☐ ...I want to keep my expenditures in regard to my forest low.
- ☐ ...legal requirements prevent me from actively managing my forest.
- ☐ ...I do not have the knowledge.
- ☐ ...the forest is too small to be of significant interest.
- ☐ ...the scatterdness and or the size of my forest makes it difficult to manage it.
- ☐ Other: _____

10. What management operations have been applied in your forest (either by you or by third parties) in the last ten years? *Multiple answers possible*

- ☐ Thinning (with revenue)
- ☐ Pre-commercial thinning (without revenue)
- ☐ Ditch management or draining
- ☐ Setting aside parts of the stand
- ☐ Single tree/small group selection and harvesting
- ☐ Planting/promotion of native tree species
- ☐ Promoting natural regeneration

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- ☐ Protection of young trees against browsing (mechanically and/or chemically)
- ☐ Designation of habitat trees
- ☐ Promotion of shrub layer and/or forest edge management
- ☐ Protecting/restoring different habitats
- ☐ Removal of non-native species
- ☐ Active tree species diversification
- ☐ Game management
- ☐ Soil preparation/ fertilisation
- ☐ Harvesting
- ☐ Keeping of dead wood
- ☐ Coppicing
- ☐ Planting/promotion of introduced tree species
- ☐ Wood pasturing
- ☐ Pruning
- ☐ Removal of shrubs
- ☐ Shelterwood regime
- ☐ Prescribed burning
- ☐ Clear Cuts
- ☐ Production of new seedlings
- ☐ None
- ☐ I don't know
- ☐ Other: _____

11. What time span do you usually consider when making relevant decisions for your forest on average?

- ☐ not applicable
- *respondents had the possibility to choose numbers in a time span between 1 and 200 years*

12. If you were to adopt a new income-oriented approach to forest management TODAY, in how many years would you expect the next significant income from your forest? In..."

- ☐ not applicable
- *respondents had the possibility to choose numbers in a time span between 1 and 200 years*

13. If you were to adopt a new forest management approach focused on ecological sustainability (e.g., biodiversity protection, carbon sequestration, water regulation), in how many years would you expect to observe significant ecological improvements?

- ☐ not applicable
- *respondents had the possibility to choose numbers in a time span between 1 and 200 years*

14. Forests typically fulfill a variety of roles for their owners. Please indicate your agreement with the following statements in relation to you and your forest:

1=Fully agree, 2=Somewhat agree, 3=Neutral, 4=Somewhat disagree, 5=Fully disagree, -9=Not answered

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	1	2	3	4	5	-9
The plants and animals living in my forest have a right to exist and be respected.						
My forest protects me or others from natural disasters.						
My forest allows me to spend my time meaningfully.						
My forest allows me to connect with other people.						
My forest drains my time and energy.						
My forest causes conflict with others (friends, family, neighbors, public authority).						
My forest gives me a sense of self-sufficiency.						
My forest is part of who I am/part of my identity.						
My forest needs my protection.						
To me, my forest is a place of recreation.						
To me, my forest is an important source for non-wood products (pine nuts, mushrooms, berries...).						
It is important to me that my forest persists as a forest now and in the future.						
It is important to me that my forest provides a habitat for flora and fauna						
It is important to me that my forest stores carbon.						
It is important to me that my forest provides timber and/or firewood.						
It is important to me that I have my forest for myself.						
It is important to me that other people enjoy/benefit from my forest.						
It is important to me to preserve the forest as a family property.						

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It is important to me that my forest has a positive effect on the water balance.						
It is important to me that my forest creates economic profit.						
It is important to me that my forest creates enough revenue to cover the costs of management.						
It is important to me how I treat my forest, because it is part of my family/kin.						
I take care of my forest because I want to honor the legacy of past generations.						
I need to adapt my forest to climate change.						
I want to make my forest fit for the future because I believe in long-term sustainability.						
I have the right to use my forest the way I want, without considering the effects on plants, animals and other parts of the forest ecosystem.						
I appreciate the beauty of my forest.						
I am always interested in new revenue streams from my forest.						
I feel emotionally connected to my forest.						
I see my forest as a financial back-up.						
I associate pleasant memories and/or experiences with my forest.						
I am responsible for taking care of my forest.						
I depend on my forest.						
I enjoy working in my forest.						
I enjoy trying out new things in my forest.						
I enjoy that my forest brings people together.						
I am in awe of my forest.						
I perceive my forest as a burden.						

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I am not interested in my forest.						
I stay up to date and follow trends in forest management.						

15. Are you generating income from your forest?

- ☐ Yes
- ☐ No
- ☐ I don't know

16. How much did your forest contribute to your total household income in the last five years?

- ☐ Nothing
- ☐ Up to 5%
- ☐ > 5-15%
- ☐ > 15-25%
- ☐ > 25-50%
- ☐ > 50-75%
- ☐ > 75-100%
- ☐ My forest costs more than I earn from it.
- ☐ I don't know.

17a. How important were the following income sources related to your forest in the last five years?

If you don't generate income with your forest, proceed to the next page.

1=very important, 2=important, 3=neutral, 4=not important, 5=not important at all, -9=Not answered

	1	2	3	4	5	-9
Public funding						
Wood: Selling wood for firewood and timber						
Non-Timber Forest Products: Harvesting and selling mushrooms, olives, berries, etc.						
Christmas trees: Growing and selling Christmas trees						
Leasing: Land leases, e.g., for hunters or for other purposes						
Agroforestry: Growing trees with farm crops						
Tourism: For example, glamping (renting luxury tents or spaces for campers in your forest); wildlife viewing tours (guided tours to see forest wildlife); Events (hosting weddings or team buildings in your forest); Treehouse rentals (renting out treehouses as unique accommodations); Fishing; Adventure activities (offering zip lines, rope courses)						

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Carbon Credits: Selling carbon credits through carbon offset programs						
Biodiversity offsetting (conservation: (payments for nature conservation schemes, voluntary market and public funding, e.g., Ökopunkte)						
Other sponsoring (from private funding) for ecosystem service provision (other voluntary payments for ecosystem service)						
Educational Programs: Offering workshops and educational tours in the forest						
Forest Bathing: Providing guided forest therapy walks						
Saplings: Growing and selling young trees						
Wind/Solar Energy						
Others, please specify: _____						

17b. Did you do something new in your forest in the past 5 years to generate income from the forest?

- ☐ Yes, please specify: _____
- ☐ No

18a. Would you be willing to adapt your management practices, if you received adequate financial support or compensation for:

1=Very likely, 2=Likely, 3=Neutral, 4=Unlikely, 5=Very unlikely, -9=Not answered

	1	**2**	**3**	**4**	**5**	**-9**
Biodiversity conservation						
Increased carbon storage						
More suitable for recreation and tourism						
Other, please specify: _____						

18b. Which of the forest functions you already provide with your forest, would you like to be adequately financially supported or compensated for: *Multiple answers possible*

- ☐ Biodiversity conservation
- ☐ Carbon storage
- ☐ Recreation and/or tourism
- ☐ Other: _____

19. Are you a member of a forest owner association or cooperative?

- ☐ Yes
- ☐ No
- ☐ I don't know

20. In your perception, how independent are you in taking forest management decisions?

- ☐ Very independent
- ☐ Independent

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- ☐ Neutral
- ☐ Dependent
- ☐ Very dependent

21. Who/What do you consider most influential in decisions on your forest management?

1=Very influential, 2=Influential, 3=Neutral, 4=Not influential, 5=Not at all influential, -9=Not answered

	1	2	3	4	5	-9
Forest Owner Association and/or cooperatives						
Local Forest Managers/ Forest Rangers (publicly Employed)						
Forest manager (privately employed)						
Public Forest Administration (publicly employed)						
Environmental NGOs						
Scientists						
(Potential) customers of my forest's services/products						
Friends and family						
Other forest owners						
Print media and TV						
Digital Media (Internet)						
Forest related magazines/journals/scientific publications						
My own knowledge and experience						
Others, please specify: _____						

22. How often have you been actively approached by the following actors regarding your forest?

1=Monthly, 2=Several times a year, 3=Once a year, 4=At least every 5 years, 5=At least every 10 years, 6=Less than 10 years/ Never, -9=Not answered

	1	2	3	4	5	-9
Forest Owner Association and/or cooperatives						
Local Forest Managers/ Forest Rangers (publicly Employed)						
Forest manager (privately employed)						
Public Forest Administration (publicly employed)						
Environmental NGOs						
Scientists						
(Potential) customers of my forest's services/products						
Friends and family						
Other forest owners						

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Others, please specify: _____						

23. How often do you actively consult the following actors for advice on your forest?
1=Monthly, 2=Several times a year, 3=Once a year, 4=Once every 5 years, 5=Once every 10 years, 6=Less than every 10 years/ Never, -9=Not answered

	1	2	3	4	5	-9
Forest Owner Association and/or cooperatives						
Local Forest Managers/ Forest Rangers (publicly Employed)						
Forest manager (privately employed)						
Public Forest Administration (publicly employed)						
Environmental NGOs						
Scientists						
(Potential) customers of my forest's services/products						
Friends and family						
Other forest owners						
Others, please specify: _____						

24. For which of the following aspects of forest management did you seek advice?
Multiple answers possible

- ☐ Long term forest management plan
- ☐ Short term goals of forest management
- ☐ Silvicultural operations (thinning, harvesting, planting)
- ☐ Conservation measures (biodiversity protection, promotion of special structures, deadwood)
- ☐ Selling of timber and wood
- ☐ Selling of non wood timber products (e.g mushrooms, pine nuts)
- ☐ Subsidies
- ☐ Alternative sources of income or new business models
- ☐ Rights and obligations as forest owners
- ☐ I did not seek any advice
- ☐ Other, please specify: _____

25. How many other forest owners do regularly ask you for advice on forest management?

- *Respondents were asked to specify the number.*

26. How many other forest owners do you regularly ask for advice on forest management?

- *Respondents were asked to specify the number.*

27. Do you need any kind of permission from one or several of the following actors to set actions in your forest? *1=Yes, 2=No, 3=I don't know, -9=Not answered*

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	1	2	3	-9
Forest Owner Association and/or cooperatives				
Local Forest Managers, Forest Rangers (publicly employed)				
Forest manager (privately employed)				
Public Forest Administration (publicly employed)				
Environmental NGOs				
Scientists				
(Potential) customers of my forest's services/products				
Friends and family				
Others, please specify: _____				

28. Do you receive any kind of incentives for forest activities from one or several of the following actors? *1=Yes, 2=No, 3=I don't know, -9=Not answered*

	1	2	3	-9
Forest Owner Association and/or cooperatives				
Local Forest Managers, Forest Rangers (publicly employed)				
Forest manager (privately employed)				
Public Forest Administration (publicly employed)				
Environmental NGOs				
Scientists				
(Potential) customers of my forest's services/products				
Friends and family				
Others, please specify: _____				

29. How would you rate your trust in the following actors? *1=High trust, 2=Trustful, 3=Neutral, 4=No trust, 5=Distrust, -9=Not answered*

	1	2	3	4	5	-9
Forest Owner Association and/or cooperatives						
Local Forest Managers, Forest Rangers (publicly employed)						
Forest manager (privately employed)						
Public Forest Administration (publicly employed)						
Environmental NGOs						
Scientists						
(Potential) customers of my forest's services/products						
Friends and family						
Others, please specify: _____						

30. Please indicate whether you agree with the statements.

Tick box, if you agree -Multiple answers possible

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Forest Owner Association and/or cooperatives	Forest Owner Association and/or cooperatives	Forest Owner Association and/or cooperatives	Forest Owner Association and/or cooperatives	
☐	☐	☐	☐	respect my goals.
☐	☐	☐	☐	...try to incorporate my interests.
☐	☐	☐	☐	...try to impose their management goals on my forest.
☐	☐	☐	☐	...are mainly interested in maximising their profit.
☐	☐	☐	☐	...try to do what's best for my forest.
☐	☐	☐	☐	...have an active collaboration with me.

31. In which year were you born?

- ☐ I prefer not to answer
- *Respondents were asked to indicate their year of birth.*

32. What is your gender?

- ☐ Male
- ☐ Female
- ☐ Non-binary/gender queer/gender fluid
- ☐ I prefer not to answer

33. What is your highest level of education?

- ☐ No school education
- ☐ Primary
- ☐ Secondary/ High school
- ☐ Professional training
- ☐ University degree (Bachelor)
- ☐ University degree (Master or Doctorate)
- ☐ Others
- ☐ I prefer not to answer

34. What is your primary occupation?

- ☐ Self-employed in forestry or agriculture sector
- ☐ Self-employed in another sector
- ☐ Employed in agriculture or forestry sector
- ☐ Employed in another sector
- ☐ Student

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- ☐ Not employed
- ☐ Retired
- ☐ Other, please specify: _____
- ☐ I prefer not to answer

35. How did you gain your forest knowledge? *Multiple answers possible*

- ☐ Hands-on experiences
- ☐ Formal forestry education
- ☐ Forest related courses and seminars
- ☐ Other, please specify: %input:E102_01%
- ☐ None

36. Which year did you first become a forest owner?

- *Respondents were asked to indicate the year in which they became a forest owner.*

37. How did you become a forest owner? *Multiple answers possible*

- ☐ Purchase
- ☐ Inheritance
- ☐ Gift
- ☐ Marriage
- ☐ Other, please specify: _____

38. Do you have any plans to sell/pass on your forest?

- ☐ Yes, within 3 years.
- ☐ Yes, in 5-10 years.
- ☐ Yes, in more than 10 years.
- ☐ No specific plans (yet).
- ☐ That is out of the question for me.
- ☐ I do not want to specify.

39. Do you have any plans to buy further forest areas?

- ☐ Yes, within 3 years.
- ☐ Yes, in 5-10 years.
- ☐ Yes, in more than 10 years.
- ☐ No specific plans (yet).

40. How would you describe your forest (or your largest forest patch)? *Multiple answers possible*

- ☐ 1=Not checked, 2=Checked
- ☐ Coniferous
- ☐ Broad-leafed
- ☐ Mixed
- ☐ I don't know

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41. How would you describe the age structure of your forest (or your largest forest patch)?
Multiple answers possible

- ☐ Even-aged
- ☐ Uneven-aged
- ☐ Old-growth forest
- ☐ I don't know

42. Which of the following disturbances have occurred in your forest in the last ten years? Multiple answers possible

- ☐ None
- ☐ Wind
- ☐ Fire
- ☐ Bark beetles
- ☐ Other biotic disturbances (pests and diseases apart from bark beetle)
- ☐ Drought
- ☐ Floodings or disturbances due to ice or snow
- ☐ Others, please specify: _____

43. Our project has a special emphasis on four regions in Europe in order to gain a more nuanced understanding also on the local level. Please indicate if your forest is located in the following region: Kleines Wiesental, Basel-Landschaft, Tierra de Pinares (Valladolid-Segovia), Brasov, Norge or Østlandet.

- ☐ Yes
- ☐ No

44. How did you hear about this survey? Multiple answers possible

- ☐ Forest owner association/ Forest owner cooperative
- ☐ Local Forest administration
- ☐ Municipality channels (website, local magazine, social media, ...)
- ☐ Newspaper
- ☐ Friend, family, acquaintance
- ☐ Other, please specify: _____

45. Is there anything else you would like to tell us about your forest property or do you have any additional comments on the survey?

- *Respondents could write their comments in an open box.*

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