Institut für Lebensmittel- und Ressourcenökonomik

Land in transition

–

Perceptions, narratives, and the governance of natural forest regrowth on abandoned land in Southwest Europe

Dissertation

zur Erlangung des Grades

Doktorin der Agrarwissenschaften (Dr. agr.)

der Landwirtschaftlichen Fakultät

der Rheinischen Friedrich-Wilhelms-Universität Bonn

von

Theresa Frei

Bielefeld, Deutschland

Bonn 2023

Referent: Prof. Dr. Georg Winkel

Co-Referent*innen: Prof. Dr. Jakob Rhyner

Prof. Dr. Claudia Bieling

Tag der mündlichen Prüfung: 17. März 2023

Angefertigt mit Genehmigung der Landwirtschaftlichen Fakultät der Universität Bonn

Acknowledgements

This thesis could be realized thanks to many people who were involved in the work during the last years. Especially I am grateful to Georg Winkel as supervisor of this thesis, who has accompanied my research work since Freiburg times and who has been supportive since then with the confidence that I am doing well with my thesis. Especially, I am thankful that the human dimension of daily (research) life was always taken seriously – and that my personal approach to the PhD was supported.

I would like to thank Jakob Rhyner for serving as a second reviewer, Claudia Bieling for participating as external member of the thesis committee and Jan Börner for taking the chair of the thesis committee.

The thesis emerged in collaboration with (former) colleagues of mine who supported the Sponforest research. I would like to thank Carmen Rodríguez, Jakob Derks, and Kim Edou for carrying out with me the data collection and analysis, for reviewing the work and for many good discussions on the topic, which are so important to create new ideas. I am grateful to Carmen who welcomed me in Barcelona when I just started this research and who accompanied the PhD research since then, which was essential especially in difficult phases. Furthermore, I would like to thank my former colleague and team leader Agata Konczal who helped a lot with giving advice and inspiration when the motivation sometimes gets lost. My (former) colleagues Elena Górriz and Inazio Martínez de Arano supported me with sharing their contacts and experiences in Catalonia and Elena also contributed to one of my manuscripts. Thanks also to the EFI Bonn team.

Furthermore, I would also like to thank the people from the Sponforest consortium who were of great help at different stages of the work and who were always very interested in our "social part" of the research. Especially Arndt Hampe, Josep Maria Espelta, Joan Pino, Françoise Lefèvre, Irene Martín-Forés and Fernando Valladares supported us during the field work and shared contexts and experiences from "their" case studies; and with some we collaborated in joint manuscripts. The PhD research was funded through a BiodivERsA call for research proposal.

Other people supported with crucial help especially when studying words and meaning: Amelia Pope did an excellent proofreading of all my manuscripts and Lyla O'Brian helped out with the synopsis text. Jèssica Marzal transcribed the Spanish interviews.

I would like to thank all interview partners, who spent their time and expertise with us and showed us their villages, forests, and fields, which was the basis for this research. They gave us the opportunity to learn from their experiences and perceptions. I hope we have done their words justice and have represented their values and views in a fair way.

Finally, I am very grateful to all people who are close to my heart and who accompany me in my life. And I don't want to forget to thank the main actor of this thesis: the forests for always being there for us.

Contents

List of publications

Parts of this thesis have been published in peer-reviewed journals:

Manuscript 1: Frei, T., Derks, J., Rodríguez Fernández-Blanco, C., & Winkel, G. (2020). Narrating abandoned land: Perceptions of natural forest regrowth in Southwestern Europe. *Land Use Policy*, *99*, 105034. https://doi.org/10.1016/j.landusepol.2020.105034

The published version can be found in chapter 2. This is an open access article under the CC BY license.

Manuscript 2: Frei, T., Edou, K., Rodríguez Fernández-Blanco, C., & Winkel, G. (2022). Governing abandoned land: Storylines on natural forest regrowth in France and Spain. *Environmental Science & Policy*, *135*, 58–66. https://doi.org/10.1016/j.envsci.2022.04.022

The published version can be found in chapter 3. The copyright is owned by Elsevier.

Manuscript 3: Frei, T., Espelta, J. M., Górriz-Mifsud, E., Hampe, A., Lefevre, F., Martín-Forés, I., & Winkel, G. (2023). Can natural forest expansion contribute to Europe's restoration policy agenda? An interdisciplinary assessment. *Ambio*, 1–12. https://doi.org/10.1007/s13280-023-01924-2

The published version can be found in chapter 4. This is an open access article under the CC BY license.

The PhD research contributed to the following co-authored publication, which is not included in the dissertation:

Martín-Forés, I., Magro, S., Bravo-Oviedo, A., Alfaro-Sánchez, R., Espelta, J. M., Frei, T., Valdés-Correcher, E., Rodríguez Fernández-Blanco, C., Winkel, G., Gerzabek, G., González-Martínez, S. C., Hampe, A., & Valladares, F. (2020). Spontaneous forest regrowth in South-West Europe: Consequences for nature's contributions to people. *People and Nature*, *2*, 980–994. https://doi.org/10.1002/pan3.10161

The published version can be found online. This is an open access article under the CC BY license.

Summary

Agricultural land abandonment is a widespread land use change in some regions of Europe. This change is driven by a complex interplay of ecological, socio-economic, and political factors, with rural depopulation as an important among them. Land abandonment is usually followed by natural forest regrowth (NFR), the establishment of secondary forest through natural succession. NFR contributed substantially to an increase in forest area in Europe since the 19th century, leading to a forest area decrease to an overall increase since then. The change from agricultural to forest land is embedded into large-scale societal and agricultural transitions that has far-reaching consequences for the local culture and identity of people and raises the questions if and how the land should be managed in future. Additionally, the trade-offs and opportunities for biodiversity and climate change objectives are under dispute at the political level, for instance regarding the loss of open landscapes, increase in wildfire occurrence but also increase in carbon sequestration through NFR. Despite the socio-political relevance, social science research on NFR is largely missing, which is needed to support land use governance linked to NFR.

The thesis aims to contribute to the existing research gap by exploring the narratives voiced by different actor groups as well as the underlying ideas and values that are attached to NFR and how these shape the governance of NFR. The geographical focus of this empirical work is on Southwest Europe, a region where NFR plays an important role in landscape transition. Specifically, the research questions are addressed (1) what narratives of NFR are voiced by local actor groups managing and using the land, and (2) how NFR is discursively constructed by policy actors at the regional/national policy level in France and Spain. Additionally, the thesis aims to take an interdisciplinary perspective on trade-offs and opportunities of NFR to draw conclusions for the governance of NFR at the European scale. Therefore, the research question is assessed (3) what can be learned for the policymaking of NFR related to Europe's restoration policy agenda from an interdisciplinary perspective.

Regarding the first research question, we find three narratives at the local level: a rural fatalism narrative, a pro forest management narrative, and a pro nature narrative. In each narrative, NFR carries different symbolic meanings, spanning from representing a lost territory for the actors to a recovered land with new opportunities. Additionally, regional nuances in the narratives exist across our case studies, which depend on ecological and socio-economic contexts and shape the local perceptions of NFR. Regarding the second research question, we identify four competing narratives at the regional/national level: (1) extensive agriculture, (2) forestry, (3) landscape conservation, and (4) wilderness. While the extensive agriculture, forestry, and landscape conservation narratives rather conceive NFR as a problem to be tackled, the wilderness narrative highlights opportunities connected to NFR. Additionally, elements of an insignificance narrative are shared by some actors in France, which suggests that NFR should be ignored and there should be a focus on more relevant land use issues. The findings also suggest that there are no policy strategies specifically on NFR. Regarding the third research question, we assess that NFR has the potential to contribute to a restoration policy agenda in some regions, if local contexts and possible trade-offs are properly considered and managed.

Overall, the findings show that there are three main governance pathways for NFR: (1) revert the land back to a use of extensive agricultural and cultural landscape conservation, 2) restore the land for forestry uses, or 3) restore the land for rewilding purposes. So far, especially opportunities of NFR have been remarkably overlooked by policymakers at national and EU level, for example for climate change mitigation and adaptation at the European scale. Given its spatial importance and a rising

restoration policy agenda at the EU level, NFR will likely become more important for future policymaking in the EU. However, the findings also demonstrate that NFR is only one puzzle piece among many other land uses, especially in Mediterranean areas with mosaic landscapes. Given that NFR is embedded into a complex socio-political situation, governance approaches need to consider trade-offs and opportunities of NFR based on the local context and integrate them into a wider landscape perspective. Engaging in further research from the social sciences and across disciplines is necessary to further study NFR and its possible management and governance options.

Zusammenfassung

Die Aufgabe landwirtschaftlicher Flächen ist in einigen Regionen Europas eine weit verbreitete Veränderung der Landnutzung. Diese Landnutzungsänderung wird von einem komplexen Zusammenspiel ökologischer, sozioökonomischer und politischer Faktoren verursacht, von denen die Landflucht ein bedeutender ist. Nach dem Einstellen jeglichen Managements erfolgt in der Regel eine natürliche Wiederbewaldung (NW) der Flächen – die Entstehung von Sekundärwald durch natürliche Sukzession. NW trägt seit dem 19. Jahrhundert wesentlich zur Vergrößerung der Waldfläche in Europa bei, was insgesamt von einer Abnahme zu einer Zunahme der Waldfläche geführt hat. Die Umwandlung von Agrar- in Waldflächen ist eingebettet in weitreichende gesellschaftliche und landwirtschaftliche Veränderungen, da Kulturlandschaften sich grundlegend verändern. Dies hat bedeutsame Folgen für Mensch und Natur und birgt Fragen in Hinblick auf die lokale Identität sowie zukünftige Landnutzungen. Die Potentiale und negativen Folgen der NW werden auf politischer Ebene unterschiedliche bewertet, was einerseits u.a. den Verlust von Offenlandschaften und vermehrten Waldbrandaufkommen und andererseits vermehrte Kohlenstoffeinspeicherung durch NW betrifft. Trotz der gesellschaftspolitischen Relevanz fehlt es bisher weitgehend an sozialwissenschaftlicher Forschung zur NW.

Die vorliegende Dissertation will einen Beitrag zu der Forschungslücke leisten, indem sie untersucht, welche diskursiven Narrative von verschiedenen Akteursgruppen bestehen, die in die Landnutzungen und Management involviert sind. Die Arbeit erforscht die Werte und Vorstellungen, die mit dem Prozess der NW verbunden sind und wie diese sich auf politischer Ebene auswirken. Der geografische Schwerpunkt der empirischen Arbeit liegt auf Südwesteuropa, einer Region, in der NW eine bedeutende Rolle im Landschaftswandel spielt. Die Forschungsfragen lauten 1. welche Narrative zu NW von lokalen Akteursgruppen bestehen, die das Land bewirtschaften und nutzen, und 2. wie NW von politischen Akteuren auf regionaler/nationaler Ebene in Frankreich und Spanien diskursiv konstruiert wird. Darüber hinaus zielt die Arbeit darauf ab, eine interdisziplinäre Perspektive auf die Möglichkeiten und Zielkonflikte von NW einzunehmen, um Schlussfolgerungen für die politische Handhabung von NW auf europäischer Ebene zu ziehen. Daher lautet die Forschungsfrage (3), ob und was aus einer interdisziplinären Perspektive NW zur politischen Agenda zu ökologischer Restaurierung in Europa beitragen kann.

In Bezug auf die erste Forschungsfrage finden wir drei Narrative auf lokaler Ebene: Ruraler Fatalismus, Pro Forstwirtschaft und Pro Natur. In jedem Narrativ hat NW eine andere symbolische Bedeutung, dargestellt als für jegliche Nutzung verloren gegangenes Land bis hin zu einem wiedergewonnenen Land für Wildnis, die entstehen kann. Darüber hinaus gibt es in unseren Fallstudien regionale Nuancen

in den Narrativen, die von ökologischen und sozioökonomischen Kontexten abhängen und die lokale Wahrnehmung von NW prägen. In Bezug auf die zweite Forschungsfrage finden wir vier konkurrierende Narrative auf regionaler/nationaler Ebene: (1) extensive Landwirtschaft, (2) Forstwirtschaft, (3) Landschaftsschutz und (4) Wildnis. Während die Narrative der extensiven Landwirtschaft, der Forstwirtschaft und des Landschaftsschutzes die NW eher als Problem begreifen, das es zu bewältigen gilt, hebt das Narrativ der Wildnis die damit verbundenen Chancen hervor. Darüber hinaus werden von einigen Akteuren in Frankreich Elemente eines Narrativs der Bedeutungslosigkeit geteilt, das nahelegt, NW zu ignorieren. Die Ergebnisse deuten darauf hin, dass es seitens der Akteure keine politischen Strategien speziell zu NW gibt. In Bezug auf die dritte Forschungsfrage kommen wir zu dem Schluss, dass NFR in einigen Regionen das Potenzial hat, zu einer Politikagenda für die ökologische Restauration beizutragen, wenn der lokale Kontext und negative Auswirkungen angemessen berücksichtigt und gemanagt werden.

Insgesamt zeigen die Ergebnisse, dass NW (1) rückgeführt werden kann in eine extensive landwirtschaftliche Nutzung zur Erhaltung der Kulturlandschaft, (2) für forstwirtschaftliche Zwecke oder (3) für prozessschutzorientierten Naturschutz (Rewilding) genutzt werden kann. Bislang wurden insbesondere die Möglichkeiten von NW von den politischen Entscheidungsträgern auf nationaler und EU-Ebene übersehen, was beispielsweise das Potential für Kohlenstoffeinspeicherung betrifft. Angesichts der räumlichen Bedeutung von NW und einer zunehmenden europäischen Agenda zur Vergrößerung der Waldfläche kann NW für die zukünftige Politikgestaltung in der EU an Bedeutung gewinnen. Die Ergebnisse dieser Arbeit zeigen jedoch auf, dass NW nur ein Puzzlestück unter vielen anderen Landnutzungen sein kann, insbesondere in mediterranen Mosaiklandschaften mit erhöhtem Waldbrandvorkommen. Da NW in eine komplexe sozio-politische Situation eingebettet ist, müssen Governance-Ansätze die Potentiale ebenso wie die negativen Auswirkungen auf der Grundlage des lokalen Kontexts berücksichtigen und in eine umfassendere Landschaftsmanagement integrieren. Weitere sozialwissenschaftliche und interdisziplinäre Forschung ist notwendig, um NW und ihre möglichen Management- und Steuerungsoptionen weiter zu untersuchen.

List of abbreviations

ADA	Argumentative Discourse Analysis
CAP	Common Agricultural Policy
EU	European Union
NFE	Natural forest expansion
NFR	Natural forest regrowth
NW	Natürliche Wiederbewaldung
ha	Hectare

List of tables

List of figures

1. General introduction

1.1 Research gaps, objectives, and questions

Agricultural land abandonment is one of the most remarkable transitions in land use in some regions of Europe (Lasanta et al., 2017), with far reaching consequences on ecological, societal, economic and political scales. Drivers of land abandonment are multi-faceted and depend on local contexts. Among the most prominent include demographic changes (e.g., rural depopulation), socio-economic changes (e.g., agricultural transition), and political factors (e.g., the EU's Common Agricultural Policy), but also biophysical factors (e.g., erosion) are interlinked with other drivers and play an important role in driving land abandonment (Keenleyside, 2004; Lasanta et al., 2017; Terres et al., 2015). Consequences of land abandonment are manifold and of different nature. The loss of open landscapes habitats, biodiversity, and traditional cultural landscapes is often addressed (MacDonald et al., 2000; Plieninger et al., 2014). However, increases in biodiversity and carbon sequestration have also been reported, although this depends on various factors, e.g. site conditions and legacies (Bell et al., 2020; Chazdon et al., 2020; Vilà-Cabrera et al., 2017).

Land abandonment is usually followed by natural forest regrowth (NFR), which is defined as the establishment of secondary forest through natural succession, implying a land cover change from agricultural to forest land (FAO, 2020). NFR on abandoned land has contributed to a steady increase in forest area in Europe since the 19th century, leading to a reverse in trends from forest area decrease to increase – the so-called forest transition (Mather & Needle, 1998; Palmero Iniesta, 2021; Rudel et al., 2020). While we lack precise data to understand the exact extent of NFR in Europe, studies predict that there is a high probability of 200,000 km^2 of EU farmlands being abandoned from 2015-2030 (Perpiña Castillo et al., 2018). Today, the highest rates for annual forest area increase are found in Southwest Europe (+0.78 %) (Forest Europe, 2020). Furthermore, studies estimate that for the Iberian Peninsula, 20-25 % of the existing forests since the 1960s have established on former agricultural land (Basnou et al., 2016; Palmero Iniesta, 2021; Vilà-Cabrera et al., 2017), showing the high relevance of NFR in Southwest Europe today. The Mediterranean represents an exceptional case for NFR, as the phenomenon occurs in rural but also peri-urban areas at high rates (Palmero Iniesta, 2021), thereby making NFR a highly relevant topic for management and land use policy in the region (Varela et al., 2020). For that reason, NFR in Southwest Europe is the geographical focus of this thesis with empirical research in France and Spain. In Spain, the probability of land abandonment is comparably high and NFR is expanding at higher rates compared to other European areas (Lasanta et al., 2021; Palmero Iniesta, 2021). In France, land abandonment rates differ depending on the region, with larger areas of abandoned land located in Southern France and smaller patches in the North (Navarro & Pereira, 2015; Schnitzler & Génot, 2022).

Existing literature mostly addresses land abandonment from a natural sciences perspective. Research in landscape science, ecology, and physical geography has addressed the diverse drivers and consequences of land abandonment (e.g. Lasanta et al., 2017; Russo, 2007; Subedi et al., 2021; Terres et al., 2015; van der Zanden et al., 2017). On the other hand, the social sciences have paid little attention to the issue of land abandonment, although existing research shows that NFR is closely interlinked with societal questions of culture, identity, and land transitions. A few studies exist which

cover local perceptions of land abandonment (and partly NFR) across Europe (e.g. Bieling, 2013; Ruskule et al., 2013; Soliva et al., 2008; van der Zanden et al., 2018) and policy related aspects (e.g. Keenleyside, 2004; Renwick et al., 2013). Therefore, NFR is often only considered as a minor issue in related study fields (e.g. rural studies, Barnaud & Couix, 2020, or wildfire research, Corona et al., 2015) or consequence of land abandonment but is not the main focus of the research. During the course of this research, we saw an increasing interest among social scientists in land abandonment and NFR, with studies related to discourses (Barnaud et al., 2021) and policymaking at local and EU scale (Fayet et al., 2022a, 2022b; Varela et al., 2020).

Overall, the socio-political ramifications of NFR are only marginally explored. This lack of research in the field of social science is surprising given its importance at societal and political scale, particularly related to biodiversity conservation, forest restoration, and rural development, and demonstrates the need to enlighten the "social dimension of an apparently ecological debate" (Barnaud et al., 2021, p. 63). Particularly, an in-depth understanding of the governance and related policymaking of NFR with involved actors is missing, although much needed if land use governance should take place to deal with challenges and opportunities arising from NFR.

Additionally, there is a gap in interdisciplinary research on such a cross-cutting and complex phenomenon as NFR. Combining natural and social sciences is key in understanding the phenomenon in its complexity at ecological and societal scale. Depending on the discipline and conceptual approaches, land abandonment is often either treated as a threat or an opportunity (Dolton-Thornton, 2021). For instance, rewilding approaches which consider land abandonment as an opportunity, often originate from one epistemic community from the natural sciences (Navarro & Pereira, 2015; Palau Puigvert, 2022; Pettorelli et al., 2019). Thus, scientific disciplines and epistemic communities may create their own disciplinary or conceptual biases in the context of land abandonment (Knierim et al., 2021). Interdisciplinary research can help to identify these biases, reaching conclusions that go beyond the individual research fields and obtain a more nuanced understanding of opportunities and trade-offs of NFR in different landscapes.

This thesis aims at filling the existing research gaps in the social sciences by an in depth-assessment of perceptions, narratives, and the governance of NFR with a focus on Southwest Europe. Specifically, the thesis applies a discourse analytical and interpretive research approach to contribute to the needed understanding of how NFR is conceived by involved actors at the management and policy level and what political strategies exist connected to NFR. Therefore, this research puts a spotlight on the social construction of reality. Following the discourse analytical approach, actors constantly 'make sense' of the reality and ascribe different meanings to objects, such as a forest, through discursive framings (Hajer, 1993). Therefore, the analytical interest does not lie in NFR as an ecological process but in how actors discursively frame NFR based on their ideas, values, and political interests. Thus, whether NFR is understood a political problem or not is discursively constructed by those different actors (ibid.). These discursive constructions can be analysed as narratives, i.e., condensed stories that are shared by groups of actors about a political issue and that are embedded into larger discourses. Narratives identify specific problems that need to be addressed and suggest solutions to solve them.

More specifically, the thesis first aims to explore how different actor groups involved in land use and management perceive opportunities and trade-offs related to NFR at the local level. There has been little research in the Mediterranean on these actor groups' perceptions of NFR, especially on forestry actors, despite their relevance when new forests emerge (Hunziker et al., 2008; van der Zanden et al.,

2018). Therefore, this thesis investigates narratives of those most affected and most involved in the land use and management of NFR in local case studies in France and Spain. Second, the thesis aims to understand how NFR is dealt with at the regional and national policy level in France and Spain by exploring discursive constructions of NFR by different policy actors. By doing so, the research enlightens the political interest, strategies, and underlying power dynamics that exist connected to NFR. Based on the existing considerations, the following empirical research questions are formulated:

1) What are narratives of natural forest regrowth by local actor groups managing and using the land and how do these narratives compare depending on the context and across case studies? (Chapter 2)
2) How is natural forest regrowth discursively constructed by policy actors at the regional/national policy level and what are the embedded policy strategies and power dynamics? (Chapter 3)

Third, the thesis aims to contribute to the lack of interdisciplinary research on NFR by building on the experiences from the interdisciplinary consortium of the Sponforest project, which funded this thesis. Therefore, the third research question connects research from different disciplines to assess trade-offs and opportunities of NFR and discuss policy implications. Specifically, the third research question is formulated:

3) What can be learned for the policymaking of NFR related to Europe's restoration policy agenda from an interdisciplinary perspective? (Chapter 4)

By addressing these research questions, the thesis contributes to the empirical enrichment of the forest and land use policy literature with novel in-depth empirical findings on how NFR is perceived and narrated in Southwest Europe. By studying narratives of NFR, the thesis provides a basis for understanding the ideas, values, and political strategies by those actors involved in the management and policymaking of NFR. Therefore, the results enlighten the knowledge of how NFR is dealt with at the management and policy level and what governance pathways exist in regards to NFR. The results can serve as a foundation for further effective land use decisions on NFR at the management and policy level in Southwest Europe, while at the same time dealing with the challenges and exploring existing potentials of NFR. Such insights are much needed in land use policy in Southwest Europe today, as highlighted by recent studies (Fayet et al., 2022a; Varela et al., 2020). Additionally, the results of this thesis contribute to an interdisciplinary assessment of NFR on existing trade-offs and opportunities and links natural and social sciences perspectives, which does not currently exist in regard to NFR. On a theoretical level, the thesis contributes to the discussion of how environmental discourses interact with ecological processes and socio-economic changes, using the example of NFR.

1.2 Theoretical concepts and analytical lens

The empirical research of this thesis is rooted in qualitative, interpretive policy analysis, which developed out of the 'argumentative turn in policy analysis'. The 'argumentative turn' was an issue challenging the positivist approaches in policy analysis (F. Fischer & Forester, 1993), which results out of a development that started since the 1970s in the social sciences. This 'argumentative turn' led to the assumption that there is no such thing as objective knowledge or truth, but instead reality is socially constructed and these social constructions shape policy (Durnova et al., 2016; F. Fischer & Forester, 1993). Therefore, new approaches emerged in policy analysis that focus on the words,

meanings, and arguments that actors use in order to understand make sense of reality (Durnova et al., 2016). During the last two decades, these interpretive approaches became more common in environmental as well as forest policy (Behagel et al., 2019; Leipold et al., 2019). Unlike positivist and rational choice understandings, research following a constructivist approach is not interested in finding an absolute "truth" nor is it interested in "testing" whether identified narratives are "true", "good" or "bad". Instead, the interest lies in understanding how reality is constructed, which framings and discursive stories are told and by whom, while critically reflecting on the researcher's own involvement in the constructed reality (Durnova et al., 2016; Yanow, 2000, 2007).

1.3 Qualitative, interpretive policy analysis

First, this section explains the ontological and epistemological approach of this thesis. The chosen interpretive approach means that the thesis applies a constructivist ontology and an interpretivist epistemology (Yanow, 2007). In regards to ontology (i.e., concern for the question of what exists in the human world), constructivism assumes that subjects (actors) create a reality of objects through interactions (Moon & Blackman, 2014). When it comes to epistemology (i.e., how knowledge is created), the interpretive approach is interested in meanings, values, and beliefs in policymaking and governance processes and how these are communicated. The underlying assumption is that knowledge is created through language and deliberation (Arts, 2021). Therefore, "[i]nterpretivism views human action as inherently meaningful and therefore qualitative researchers interpret the subjective meaning of action (grasping the actor's beliefs, desires, etc.) from an objective manner." (Sadovnik, 2007, p. 420). The important characteristics of interpretive research are word-based methods, the reflexivity of the researchers themselves, and the interest in the complexity of meanings, for instance of contested policy issues (Yanow, 2007, p. 409).

There are stronger and weaker approaches of constructivism, the latter called "weak constructivism" by Sadovnik (2007), assuming that knowledge may not only be the result of construction but that a certain underlying structure exists. To use an example from Hajer (1993, p. 44) related to dead trees in the debates surrounding acid rain: "Dead trees as such are not a social construct: the point is how one make sense of dead trees. In this respect there are many possible realities.". A similar understanding is applied to NFR in this thesis: while NFR exists as ecological process, different realities are created about this process by different actors. In addition, the philosophical pragmatism described by Arts (2021, and the references therein) is considered in this thesis. Philosophical pragmatism explicitly calls for an understanding that different epistemological approaches of knowledge creation can and should be acknowledged in research approaches. The approach explicitly considers different 'sources' and assumptions of knowledge creation as relevant: logic and mind (subjectivism), experience, measurement, and data (objectivism), as well as language, argumentation and deliberation (constructivism; Arts, 2021, p. 22). While this thesis builds on constructivist assumptions and follows the tradition of an interpretive discourse approach by focusing on qualitative methods solely, it also works with other forms of knowledge creation. For instance, in chapter 4, different disciplines are brought together independently from the philosophical origin of their discipline.

More specifically, the empirical research of this thesis conducts narrative and discourse analysis, common analytical approaches in interpretive research and environmental policy (Leipold et al., 2019). In chapter 2, we assess local narratives and their embedded values and beliefs, in the assumption that local actors also shape policies and hold a particular relevance for land use governance (Yanow, 2007). Additionally, we assess how they compare across case studies, therefore asking the question of how materiality of things– ecological, biophysical, or the socio-economic situation – plays a role in narrative

creation and practice. In the discussion, the narratives are linked to the Cultural Theory by Thompson et al. (1990), a common approach in positivist rooted perception research. Therefore, interpretive analysis is enriched by discussing the results against the background of the Cultural Theory which originates from a different philosophical assumption. While stemming from different assumptions, both approaches share the interest in ideas and how these may play a role in policymaking (Winkel et al., 2011).

Chapter 3 carries out a discourse analysis following Hajer's Argumentative Discourse Analysis (ADA). ADA defines discourses as "an ensemble of ideas, concepts, and categories through which meaning is given to social and physical phenomena, and which is produced and reproduced through an identifiable set of practices" (Hajer, 2006, p. 67). Furthermore, the existing storylines, from now on synonymously called narratives, are a central element for analysing a discourse (Hajer, 2006; Leipold et al., 2019; Warner, 2019). Storylines are defined as "narratives on social reality through which elements from many different domains are combined and that provide actors with a set of symbolic references that suggest a common understanding" (Hajer, 1995, p. 62). Thus, narratives are condensed stories of a certain phenomenon, making sense of the complex realities that exist. Actors sharing a certain narrative become discourse coalitions. Importantly, the written or spoken words must be analysed in the context in that it has been produced, as "actors argue (and act) in the context of specific socio-historic discourses and institutional practices" (Winkel et al., 2011, p. 369). This points to the relevance of practices in discourse creation. Therefore, the temporal aspect is important to notice, as social construction is based on continuous practices among agents. It is therefore important to have in mind that this construction is "specific in time and space, and culturally founded" (Elands & Wiersum, 2001, p. 8). Overall, ADA looks into "interpretive struggles that these actors wage in order to influence the choice of policy instruments." (Durnova et al., 2016, p. 42). Additionally, ADA is particularly interested in discursive change in policymaking and power dynamics among actors, as well as their agency that leads to change.

Summing up, the analytical focus in this chapter is explicitly put on actors, their ideas and meaning attached to NFR, and potential underlying values and beliefs. While the underlying theoretical assumptions apply to all chapters, the analytical lenses vary between chapters. By choosing a discourse analytical lens, the thesis can contribute well to the identified research gaps, but also build on the existing research. By doing this, the thesis can contribute to existing research with empirical work that was missing when this thesis began: a discourse perspective on NFR.

1.3.1 Forest related discourses

In the following I give a short overview of the existing literature on forest related discourse studies that are particularly relevant for this thesis. Additionally, I give some outlooks into other, connected topics that link to rural development and forest fires. This is to give a broad understanding of the existing empirical findings on forest related discourse research, on which this thesis builds upon. Different scholars have reviewed the existing forest related discourse literature (Arts et al., 2010; Arts & Buizer, 2009; Leipold, 2014; Winkel, 2012). Leipold (2014) finds that there is an increasing number of forest related discourses studies and that the topics addressed are particularly diverse, addressing various topics and policy levels. Explicit conceptualisation of discourse approaches are often missing in the reviewed literature (also found in Arts et al., 2010; Arts & Buizer, 2009; Winkel, 2012). Furthermore, she addresses the need to look more into the interactions between different policy levels, given the role forests play at all governance levels (Leipold, 2014).

In the literature, meta level discourses related to (mainly Western) forest governance are identified (Arts et al., 2010; Bäckstrand & Lövbrand, 2006). The environmental meta discourses comprise the 'modernity' discourse, which arose in the 1960s and postulates economic growth as an overall solution (Arts et al., 2010). The 'limits to growth' discourse emerged in the 1970s as a critical response, which sees absolute limits to growth due to limited natural resources. The discourse emerged connected to events such as the publication of the Club of Rome and Rachel Carson's book 'The Silent Spring' on biodiversity loss (Carson, 1962) (ibid.). The 'ecological modernisation' discourse emerged in the 1980s and has been dominant in the last decades. The discourse postulates that economic growth is possible while ensuring environmental integrity mainly through technical solutions. However, it also led to strong counter discourses, for example by indigenous movements that challenged the technocratic approach and called for a focus on environmental and social justice. Subsequently, the 'sustainable development' discourse emerged in the 1990s with the Brundtland report and the United Nations Rio Conference. It does not postulate necessarily limited resources – partly overlapping with ecological modernisation – but it highlights the need for participatory governance and equal rights for future generations. In the last two decades, climate change gained importance as new meta discourse connected to forest management (de Koning et al., 2014; Edwards et al., 2022).

The existing meta discourses can be found in national and regional forest discourses on the ground. Empirical research shows how forests, forest management, and forest conservation are framed differently at different times, in different regions and by different actors. Edwards et al. (2022) analyse forest discourses in a longitudinal perspective in different European countries since 1945, which can be linked to existing meta-discourses. They find that it was in the 1970s with growing environmental awareness, when discourses emerged related to multifunctional forest management.

In the early 1990s, sustainable forest management became the dominant discourse in Europe "characterized by a small shift from the ecological modernization discourse, adding social perspectives to forest management" (Edwards et al., 2022, p. 8). The discourse added perspectives about "new forms of governance through private and societal participation in political decision making" (ibid.). Related to sustainable forest management, probably the most debated question in Europe has been how to best balance economic forest use with biodiversity conservation, especially due to a growing environmental public awareness. For example, this conflict field is apparent in the much debated implementation of the Natura 2000 network in forest habitats, which is the major instrument for protecting biodiversity in the EU (Winkel et al., 2015). The implementation of Natura 2000 caused many local idea-based and value-laden conflicts, often showing a 'classical' coalitional divide of actors into either forestry and conservation actors (Bouwma, 2017; Hiedanpää, 2002; Sotirov et al., 2021; Sotirov & Winkel, 2016; Winkel et al., 2015; Young et al., 2013). Varying and often conflicting narratives emerged on how forests should (not) be managed, showing how narratives are embedded into local practices and cultural and socio-economic contexts, but also values and identity of those voicing the narratives (Edwards et al., 2022). Although 'classical' coalitions exist, studies show that the practice is much more diverse, also with forest managers having their own motivations for forest conservation (Konczal et al., 2023). In any case, sustainable forest management remains a contested and discursively constructed term in itself, narrated in various ways and closely interlinked with forest practices that are strongly rooted into local cultural and socio-economic contexts (de Koning et al., 2014; Ferranti et al., 2017). It must be noted that with changing societal demands the role of forests also changed over time, transitioning from a primary source of economic goods towards delivering crucial ecological and societal needs (Bäckstrand & Lövbrand, 2006; Buijs et al., 2006). This changing demand is relevant in the light of NFR to see to which needs NFR can or cannot contribute.

Connected to climate change, the global role of forests for climate change mitigation through carbon sequestration was highlighted (Arts et al., 2010; Bäckstrand & Lövbrand, 2006; de Koning et al., 2014; Winkel et al., 2011). De Koning et al. (2014) analyse discourses related to Natura 2000 conservation and climate change. They show that different conceptualisations of forest conservation exist in Europe: (1) a threat discourse that views biodiversity as threatened by climate change and that there is a need for stricter implementation of biodiversity policies, (2) a dynamics discourse that highlights the dynamic effects of climate change on forests, and sees the need for also dynamic implementation approach of Natura 2000, and (3) a pragmatic discourse that highlights the unknown effects of climate change, and therefore there is a need to wait until more knowledge is out there (ibid., p. 274). The bioeconomy discourse can also be mentioned, which connects elements of the limits to growth (crisis) and the ecological modernisation (such as technological developments and the need for renewable resources) with economic arguments, thus the neoliberal discourses. Social aspects such as the question of societal participation and global governance are not voiced under this discourse (Pülzl et al., 2014). Given the relevance of climate change in the light of land use change, a question arises of how this meta discourse plays a role in the narrative of NFR. Overall, the change of existing discourses as well as the creation of new ones raises the question of how discourses develop over time and why.

Looking at the policymaking level, there is also a rich literature analysing forest related policy with a discourse approach. Among the many existing discourses, the illegal logging discourse is undoubtedly important, which emerged in the 1990s connected to deforestation (Arts et al., 2010; Winkel et al., 2017). Emerging illegal logging politics – legislation that bans illegally harvested timber from national markets in consumer countries – was an important policy change that took place in Australia, the US, and the EU (Heeswijk & Turnhout, 2013; Leipold et al., 2016; Leipold & Winkel, 2016b; Winkel et al., 2017). An interesting aspect researched by Leipold et al. (2016) is how actors strategically introduced the 'legality' frame for supporting illegal loggings politics, as they thought this to be more accepted, and enabled the forming of coalitions between environmental groups and parts of the industry (companies importing or suing tropical timber). Thus, this was essential for creating legislation on timber imports into national markets in the Global North. This example shows the power of discursive construction of a phenomenon at a strategic level, and how a framing can strategically be changed and adapted, if the existing framing does not align with certain policy objectives or broader coalitions. Thus, it links to questions addressed in this thesis, such as the current framing of NFR in Europe and if actors aim to change it or not.

NFR on abandoned land is not only linked to forest management and policy, but interlinked with other land use topics, such risk management (Corona et al., 2015; Oliveira et al., 2017), and rural development and agriculture (Elands & Wiersum, 2003; López-i-Gelats et al., 2009; Sanz-Hernández et al., 2022; Selby et al., 2007). Related to risk management, the question of fire is particularly important, especially in the fire prone Mediterranean, where landscapes have evolved and are shaped by fire (Keeley et al., 2011). It should be noted that while climate change is considered a major driver for wildfire increase in Central and Northern Europe, in Southern Europe it is under debate how much other socio-economic drivers, such as land abandonment, play a role as well (Keeley et al., 2011; Pausas & Keeley, 2021). Forest fires are a highly debated issue in the context of NFR, as the accumulation of biomass in young stands during NFR can lead to higher fire occurence. Therefore, the ongoing debates on forest fire management is directly linked to the contexts in which NFR occurs and deals with questions of human intervention in landscapes. In the past, the human dimension of wildfires was often neglected in fire management approaches (Rodríguez Fernández-Blanco et al., 2022). Discourse research helped to show the human dimension of wildfires connected to the sense of place and identity (Champ et al., 2009) or to current management approaches that are overly

focused on technocratic approaches (Buizer & Kurz, 2016). Such approaches can also be a good starting point to discuss narratives on NFR.

Related to rural development, Elands and Wiersum (2001) analysed the role of forestry in socio-political discourses on rural development in Europe. With the changing role of forests from economic functions towards more ecological functions, the role of forests in rural development is also changing. They identify five ideal type discourses on rural development based on existing literature: (1) The agri-ruralist discourse conceptualises farmers as the stewards of the countryside and as essential for preserving cultural values. The crisis in farming is considered a main problem, therefore focusing on strengthening their role in rural areas. While forests are narrated as a potential contribution to the local economies, in economically weak regions they should not expand too much, or else they are perceived as a threat to the traditional agricultural use. (2) The hedonist discourse perceives the rural areas as contributing beauty and recreational landscapes. The problem is considered the loss of natural and aesthetic values, where the discourse sees a need to increase these values again among others through forests. (3) The utilitarian discourse is interested in areas for production purpose, seeing the main problem as a lack of economic development and calling for innovative economic actions to foster rural development. Forests are mainly perceived as production sites. (4) The community stability discourse constructs rural areas as remote areas, seeing the problem as the deterioration of socio-economic structures and a marginalisation of livelihood, which needs to be strengthened again. Forests may be perceived as support for local economies, but when forest regrows on agricultural land, it is perceived as a further decline of the rural identity. Finally, (5) the nature conservation discourse is presented related to rural development, considering ecological destruction as a main problem and demanding sustainable land use in a balanced way. Forests are not perceived as a tool but as a goal that should be preserved for ecological reasons (Elands & Wiersum, 2001, p. 10ff). While this study was published already in 2001, it still gives a relevant overview of the existing discourses in this field and how they may link to NFR. Today's discourses certainly may have adapted in response to climate change discourse. In any case, the insights on rural development and forests are also relevant for understanding the social construction of NFR on abandoned land. The discourse analyses showed how the socio-economic context can shape the perceived role of forests and its use, and thus, how local contexts and practices shape the creation of different discourses (Elands et al., 2004; Elands & Wiersum, 2003; Selby et al., 2007), questions that will be explored in more detail connected to NFR.

1.3.2 Own positionality

In the interpretive research design, I am part of the research process, as a researcher myself. Yanow (2007, p. 408) states that "interpretive researchers are attuned to the ways in which their own presence might, in many ways, potentially affect what they are learning in their research." Further, she states that "objectivity is not possible […] as situational sensemaking draws on prior knowledge and builds on intersubjective understanding" (Yanow, 2007, p. 407). In that sense, it is different from other approaches that assume an objectivity of researchers, and with that, assume that research can be carried out separate from the researcher who conceptualised, carried out, and drew conclusions from the gathered data. Hence, the self-positioning is contrary to how interpretive researchers understand their role. These contrary understandings of self-positioning link again to the different assumptions about how knowledge can and is created, which I introduced in the previous section.

Leipold and Winkel (2016a, p. 11) introduce the concept of "trialectic agency" which is "comprised of the (analysed) individual discourse agent, the (discursive) structures, and the interpreting researcher", as we write in chapter 3 (Frei et al., 2022, p. 59). This is a useful concept for interpretive researchers

to portray their own role in the research process. While my aim may be to understand the discursive construction of NFR in my data, I must be aware of my own role in this construction. Thus, my positionality needs to be critically reflected and to be considered when reading the results of this thesis.

My research interest is driven by previous work on forest and nature conservation policy in Europe, always ultimately leading to the crucial question of how to manage and govern forests today in a sustainable and socially just way. Therefore, this previous knowledge and the personal interest play a role in how my research was designed and developed. In addition to my personal background, other, external factors need to be mentioned. With interviews chosen as the main method for the empirical work, we were interested in how people experience things in the real world, whether it be a political process, or the landscape and the regrowth of forest around them (Sadovnik, 2007). While I can go to a village in Central Spain, I never lived there, nor did I experience what my interviewees have experienced connected to NFR. My daily life is not connected to the NFR, at least not at practice level. I obtained my understating of land management and policies in Spain and France by reading, observing, and talking to people. These factors can limit the research due to a restricted understanding of the subjects, but at the same time enriching, as I can look at things with a more distanced view and with "fresh eyes".

Another aspect to be mentioned is that the thesis was funded by the BiodivERsa Sponforest project, which investigated the "potential of spontaneous forest establishment for improving ecosystem functions and services" (INRAE, 2022). The project umbrella certainly had an impact on some aspects of the research design, namely the selection of case studies and a specific interest in trade-offs and opportunities of NFR. While the above mentioned aspects, and likely others, existed while conducting this thesis research, the intention of my and our research was to follow an open approach to all possible opportunities or challenges (or narratives) that may exist in the field, regardless of whether they were in line with project ambitions or with my own research interest. This intention was supported by following the procedures of established qualitative research design. For instance, we developed a design for the data collection and analysis and followed a systematic procedure for implementing this design (Sadovnik, 2007). It was also supportive to have other researchers involved in data collection and analysis, as this made it necessary for me to discuss and justify each research step. Similarly, results and conclusions drawn were critically reflected among the researchers. Furthermore, the longer timespan working on NFR allowed me to reflect on interpretations, conclusions, or assumption about NFR with actors from the practice during the data collection and with researchers from other disciplines.

1.4 Research design and methodology

1.4.1 Methods and data

This cumulative thesis consists of two empirical research manuscripts (chapter 2 and 3) and one perspective manuscript (chapter 4). The following section gives a brief overview of the case studies, methods and data used. More detail can be found in the manuscripts themselves. In line with the theoretical approach, interpretive, qualitative methods were used for the empirical research. This means that methods "are word-based, from data 'collection' instruments to data analysis tools to research report formats and contents." (Yanow, 2007, p. 407). Qualitative methods do not aim for objective 'truth' but can show experiences of the actors and make sense of it through the theoretical lens applied (Yanow, 2007).

Table 1. Overview of case studies with data collection, analysis and resulting manuscripts.

Data from case studies step 1 - 08-2017 to 03-2018				
Focus	**Case study area, country (number of interviews)**	**Collected by…**	**Analysed by…**	**Resulted in…**
Perceptions by local actor groups involved in management and use of the land	Alto Tajo region, Spain (12)	Theresa Frei	Theresa Frei	Frei et al., 2020 (Chapter 2); Martín-Forés et al., 2020
	Barcelona Metropolitan Area, Spain (8)	Carmen Rodríguez Fernández-Blanco	Theresa Frei, Carmen Rodríguez Fernández-Blanco	Frei et al., 2020 (Chapter 2); Martín-Forés et al., 2020
	Catalan Pyrenees, Spain (12)	Theresa Frei	Theresa Frei	Frei et al., 2020 (Chapter 2); Martín-Forés et al., 2020
	Landes de Gascogne, France (10)	Jakob Derks	Theresa Frei, Kim Edou	Martín-Forés et al., 2020
	Mont Ventoux/ Luberon region, France (10)	Jakob Derks	Theresa Frei, Jakob Derks	Frei et al., 2020 (Chapter 2)
Case studies step 2 - 08-2017 to 03-2018				
Focus	**Case study area (number of interviews)**	**Collected by…**	**Analysed by…**	**Resulted in…**
Discursive construction of NFR by actor groups involved in/influencing policymaking at regional/national level	France (15)	Kim Edou	Kim Edou, Theresa Frei	Frei et al. 2022 (Chapter 3)
	Spain (12)	Theresa Frei (9), Carmen Rodríguez Fernández-Blanco (3)	Theresa Frei	

For both manuscripts, a case study design was implemented. Table 1 gives an overview of the case studies, what data was collected, by whom, and the resulting manuscript. In a first step, a case study approach was implemented in five local case studies, three in Spain and two in France. The selection

of the case studies was done in deliberation with the project consortium of the BiodivERsA SPONFOREST project, for which this thesis research was carried out. For the publication of **chapter 2**, four case studies were selected for the analysis given the regional context of the case studies and the interest of the manuscript's research objectives (see Figure 1 and Table 1). The aims were (1) to identify narratives by local actor groups and (2) to compare those narratives across different case studies and their local contexts. Specifically, the case studies were selected by the criteria that NFR has occurred on agricultural abandoned land in that region. Furthermore, the case studies should show a variety of different cases concerning the ecological, societal, and socio-economic context. Therefore, two rural and two peri-urban case studies were selected. Regarding the rural case studies, the Alto Tajo region (Spain) and the Catalan Pyrenees (Spain) both experienced enormous rural exodus since the 1950s and today are sparsely populated with little economic perspectives for local livelihoods (Cervera et al., 2019). In the Alto Tajo region, a high percentage of NFR occurs mainly due to a loss of pastoralism. Similarly in the Catalan Pyrenees, a rural mountain area, NFR mainly occurs on former pastoralist land. Land abandonment is still an ongoing process in both regions (chapter 2; Martín-Forés et al., 2020). The peri-urban case studies, the Mont Ventoux/Luberon region (France) and the Barcelona Metropolitan Area (Spain), are both located close to large urban agglomerations. In the Mont Ventoux/Luberon region, NFR occurs on small-scale abandoned agricultural land due to loss of pastoralism. The abandonment is halted but NFR continues on existing abandoned land (chapter 2; Derks, 2017). In the Barcelona Metropolitan Area, land abandonment is partially still ongoing. NFR occurs on small-scale patches of abandoned farmland (chapter 2; Martín-Forés et al., 2020).

In line with the research questions, semi-structured interviews were selected the key method to explore the field. Actors involved in management were selected as key interviewees, coming mainly from the field of extensive agriculture, forestry, and conservation. The data consists of a total of 42 semi-structured interviews that were carried out with the different actor groups in each case study, respectively. More details about the interviews can be found in chapter 2. All interviews were fully transcribed and analysed through coding in their original languages (French and Spanish). The coding process was guided by the theoretical lens, and theoretical categories were set up deductively, as often done when analysing narratives (Leipold & Winkel, 2016a). These deductive codes were structured along problems and solutions and ascribed responsibilities related to NFR, therefore constituting the main elements of a narrative. Subsequently, a mix of thematic and inductive coding was implemented. Therefore, the coding can be understood as a non-linear process, by which the researcher is going back and forth in coding a part of the text until a final shared set of code categories can be developed (Creswell, 2009; Keller & Truschkat, 2013). Additionally, the code system was tested by the involved researchers through coding of a text segment with more than one person. The final set of codes was then applied to all transcripts. The coding was implemented using MAXQDA, a programme for qualitative data analysis.

In addition to chapter 2, the data was used for an interdisciplinary, co-authored publication, written by with the project consortium. For this publication, the data from the case study Landes de Gascogne (France) was included. The paper analyses the consequences of nature's contribution to people through NFR (see Martín-Forés et al., 2020). The collected interview data (see Table 1) was used for analysing the cultural ecosystem services (also called non-material nature's contributions to people). Further details on the analysis can be found in the supplementary material of the publication.

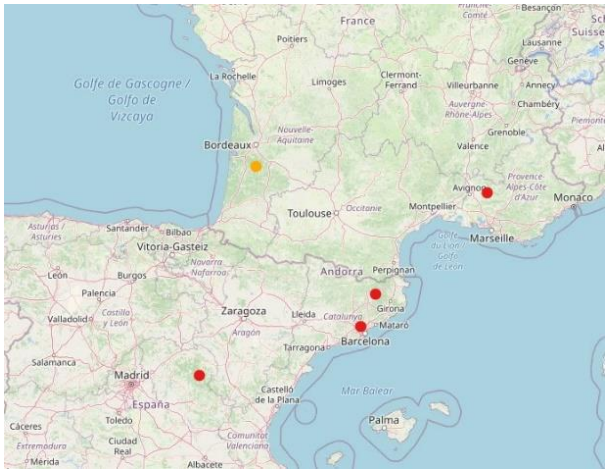

Figure 1. Map with the location of local case studies for step 1. Northernmost point: Landes de Gascogne. The others points, from West to South: Alto Tajo region, Barcelona Metropolitan Area, Catalan Pyrenees, Mont Ventoux/ Luberon region; Source: openstreetmap.org, adapted by the author.

In the next step, **chapter 3** analyses narratives of actors involved in or influencing policymaking at regional/national level in France and Spain. Spain and France were selected as the main countries of analysis after deliberation with the project consortium as NFR on abandoned land plays a crucial role in some regions of the countries (see manuscript 3). Additionally, the aim was to complement the research at the local scale with the regional/national policymaking scale. First, a textual review in existing practice and sector journals in France and Spain was carried out. However, the review as well as existing policy documents brought little insights into actors and their policy ideas connected to NFR. Therefore, semi-structured interviews were again chosen as the main source of data. In total, 27 interviews were carried out with policy actors mainly from the fields of extensive agriculture, conservation, and forestry. Similarly to chapter 2, the interviews were fully transcribed, coded in their original languages (French and Spanish) and analysed using MAXQDA. As this manuscript sets a specific focus on the discursive construction of NFR, these discursive patterns were explicitly searched for during the coding process.

In a third step, **chapter 4** was developed as a perspective manuscript that builds on empirical work with already published findings of the involved researchers combined with a literature review of existing studies in different research fields connected to NFR. The disciplinary perspectives need to be brought together more consequently, as others have also stated before (Barnaud et al., 2021; Dolton-Thornton, 2021). By doing so, the manuscript was intended to deliver an overview of existing research connected to NFR, bringing findings from different disciplines and 'mindsets' together, in order to discuss trade-offs and opportunities of NFR in Europe. From that assessment, we draw conclusions for NFR policymaking. In that sense, although interdisciplinary, chapter 4 holds a discursive element as well, as it aims to bring together and contrast disciplinary findings and potential biases. This chapter builds upon the research done in the previous steps and represents the third level of analysis for this thesis, which first looked at the local level, then at the regional/national level, and finally at the European level connected to NFR.

1.4.2 Reflection on methods

The chosen research design is well suited for research in NFR, as it allows for in-depth results of a of a complex and multifaceted phenomenon, which NFR certainly is. Using a qualitive research design allows researchers to 'zoom in' on the specific cases and explore them in detail. Furthermore, the

discourse approach puts a spotlight on the existing ideas and social constructions of NFR by actors. By doing this, the approach works with people's own experiences and NFR is explored by those actors involved in management and policymaking. Therefore, the results are based on the actors' own categories of created meaning attached to NFR (Sadovnik, 2007; Yanow, 2007).

However, the chosen analytical research design automatically obscures other relevant aspects and has its limitations, for instance its limited consideration of institutions and existing policies that impact NFR governance. Namely, the specific policy systems and politics underlying the existing governance of NFR are not analysed, or rather, only through the perspective of the interviewed actor groups. A more detailed study of these policies and institutions could have been fruitful in gathering additional insights about NFR, such as by analysing ongoing policy discussions in related policy fields. Studying policy documents from a discourse approach was intended in the research approach but discarded due to a lack of existing policy documents that address NFR specifically (see chapter 3).

Furthermore, the temporal dimension of NFR was an issue that came up various times during interviews and conversations in the field: At what stage NFR is considered a 'proper' forest and what forest or succession type do actors have in mind and imagine when we ask them about 'natural forest regrowth'? At what ecological stage do we assess NFR from a discourse perspective? The temporal dimension of NFR was often addressed in the interviews, in a conversation, or when looking at forests around the interview site, but is less visible in the presented results. Given the relevance of these questions, they could have been addressed more explicitly in the research results. Working more extensively with participatory observations – e.g. analysing field visits as part of the interviews – could have helped to make these questions more explicit, at least at the local level. Therefore, future research on NFR could benefit from taking this dimension more directly into account, especially when looking into future scenarios of landscapes where NFR occurs.

Additionally, we narrow down our analysis to some actor groups and related policy fields, given the numerous policy fields that play a role in land abandonment and NFR. We prioritise those fields considered most relevant, limiting our results above to the fields of extensive agriculture, landscape conservation and rewilding, and forestry.

Methodologically, it could have also been interesting to discuss the analysed narratives again with actors from the practice. This is a common approach today in the social sciences (Soliva et al., 2010). While results were shared with the interviewees, such a workshop could not be realised for budget and time reasons.

In chapter 4, we aim to assess opportunities and trade-offs of NFR in an interdisciplinary way. The chapter aspires to look beyond the own disciplinary findings and potential disciplinary biases. Exchanging with different disciplines and contrasting results of different research communities helps to 'escape' such disciplinary biases, yet it must be acknowledged that the own reflexivity is limited. Therefore, this chapter can be seen as a first step to contrast different findings on NFR, but further dispute on the topic is needed involving more epistemic communities.

While the chosen approach has its limitations and open questions, the explored narratives represent a strong foundation for better understanding NFR in Southwest Europe as well as support for governance and policymaking connected to the topic. This shows the overall suitability of the approach to address the objectives of this thesis. Additionally, the interdisciplinary work done during

the thesis helped to 'think outside the box' and offers a basis for further elaborations of trade-offs and opportunities of NFR in Europe.

1.4.3 Thesis structure

Table 2. Overview of the chapters with the manuscripts constituting this cumulative thesis.

Chapter and title	Focus and research question	Status of publication
Chapter 2: Narrating abandoned land: Perceptions of natural forest regrowth in Southwestern Europe	Empirical research paper about perceptions by actor groups in 4 local case studies: ▪ How do local actors in the case study regions perceive NFR? ▪ To what extent do narratives differ across case studies?	**Published** in the Journal Land Use Policy
Chapter 3: Governing abandoned land: Storylines on natural forest regrowth in France and Spain	Empirical research paper about discursive stories by actors in regional/national policymaking: ▪ What storylines are voiced about NFR governance on abandoned land in France and Spain? ▪ What can be learned about power dynamics and future governance of NFR?	**Published** in the Journal Environmental Science & Policy
Chapter 4: Can natural forest expansion contribute to Europe's restoration policy agenda? An interdisciplinary assessment	Interdisciplinary perspective paper about NFR in European policymaking connected to restoration: ▪ What is known about the challenges and opportunities connected to NFR in relation to the EU's forest policy objectives? ▪ What can be concluded for the policymaking on NFR in Europe?	**Published** in the Journal Ambio

The chapters 2, 3, and 4 present the main results of the thesis based on the three manuscripts of this cumulative thesis. Table 2 gives a detailed overview of these manuscripts. Chapter 5 discusses the overall findings and draws conclusions related to the conceptual, empirical, and political dimension of the research.

Chapter 2, titled "Narrating abandoned land: Perceptions of natural forest regrowth in Southwestern Europe", analyses narratives of actors that are involved in or have a stake in the management of land

and considers ecological and socio-economic contexts that may play a role. Therefore, the chapter responds to the overall research question 1. The chapter outlines a detailed understanding of the perceptions of NFR by actors in the Mediterranean region, including actors from forestry, extensive agriculture, and conservation. This understanding did not exist before in such detail, especially for the forestry perspective. The results find three main narratives: the rural fatalism narrative, the pro forest narrative, and the pro nature narrative, which is divided into two sub-narratives: landscape conservation and wilderness. The identified narratives show the symbolic functions that NFR holds for different actor groups, from representing a lost territory, to unstructured forest land, to new wilderness opportunities. Additionally, we show that similar narrative patterns exist across case studies with shared underlying cultural values and beliefs. However, they are not equally voiced across the case studies as their creation is shaped by local contexts such as the ecological and socio-economic situation. Therefore, we discuss that these narratives connect to existing cultural society-nature interrelations, so called 'cultures of abandonment'. Overall, the chapter highlights the importance of NFR as a symbol for other processes, that are embedded into larger land use and rural development transitions. Addressing NFR politically requires the consideration of the local conditions and existing culturally biased perceptions of NFR.

Chapter 3, titled "Governing abandoned land: Storylines on natural forest regrowth in France and Spain", analyses narratives on NFR by policy actors, looking into how NFR is discursively constructed at the regional/national policymaking level in France and Spain. The objective is to explore what ideas, values and political strategies are attached to NFR by those involved in or influencing policymaking, developing an understanding of underlying power dynamics related to NFR. A discourse analysis using Hajer's ADA (Hajer, 1995) is applied based on interviews with actors in the field. We identify four storylines that are voiced about NFR: the extensive agriculture, the forestry, the landscape conservation, and the wilderness. Additionally, elements of an insignificance storyline are voiced by some actors in France. The storylines show that while some narratives portray NFR as connected to cultural loss and risks (extensive agriculture and landscape conservation) and therefore view it rather negatively, others construct NFR as an opportunity in connection to wilderness development and forest use (wilderness and to a certain extent forestry). Regarding power dynamics, the chapter discusses the finding that the extensive agriculture and the landscape conservation narratives are better institutionalised in existing land use policies. The narratives connect to highly emotional topics such as the loss of traditional landscapes, therefore making them potentially powerful. The forestry narrative seems to be less stringent and therefore less powerful, as it sees opportunities but also threats connected to NFR. The wilderness narrative holds clear arguments, as it presents a future vision for NFR – specifically for rewilding – but is less institutionalised in land use policy. Additionally, we discuss that the insignificance storyline may link to large-scale industrial agriculture positions. Overall, the chapter highlights that there are only a few actors with explicit policy strategies and interests related to NFR, showing how NFR is (not) dealt with at the policy level, and asks how this may change in future.

Chapter 4, titled "Can natural forest expansion contribute to Europe's restoration policy agenda? An interdisciplinary assessment" assesses the challenges and opportunities of NFR in view of the EU's restoration policy. The objective is to better understand potentials of NFR by applying an interdisciplinary perspective and drawing conclusions for the policymaking of NFR. To achieve this objective, we synthesise existing literature related to climate change mitigation and adaptation, biodiversity conservation, and forest management and use. Additionally, we summarise current findings to societal perceptions of NFR and the policymaking related to NFR. Several challenges and opportunities are determined, showing again the high context dependency of NFR. Furthermore, we recommend to 1) integrate NFR as a tool for European forest restoration policy; 2) develop regional

restoration strategies that considers local needs and contexts; and 3) support interdisciplinary research and monitoring of NFR. Overall, the chapter complements the previous chapters with an interdisciplinary perspective on the policymaking of NFR at the European scale and highlights the role of passive forest restoration in upcoming years.

2. Narrating abandoned land: Perceptions of natural forest regrowth in Southwestern Europe

Published in Land Use Policy

Full reference: Frei, T., Derks, J., Rodríguez Fernández-Blanco, C., & Winkel, G. (2020). Narrating abandoned land: Perceptions of natural forest regrowth in Southwestern Europe. *Land Use Policy*, *99*, 105034. https://doi.org/10.1016/j.landusepol.2020.105034

ABSTRACT

The abandonment of agricultural land leads to landscape changes in many parts of Europe, often followed by natural forest regrowth. These landscape changes have far-reaching social and ecological consequences. Our research addresses the question of how local actor groups involved in land management perceive natural forest regrowth on abandoned land. Based on 42 interviews with local actors, we analyse narratives on natural forest regrowth in four case studies, one in France and three in Spain. Across the case studies, we find three narratives: a rural fatalism narrative, a pro forest management narrative and a pro nature narrative, each with its own problem definitions and solution strategies on natural forest regrowth. Our analysis reveals regional nuances, which depend on land use characteristics that shape the perceptions of local actor groups. We conclude that natural forest regrowth holds different symbolic functions, ranging from lost territory to recovered land. Any assessment of trade-offs and opportunities needs to consider the local situation. Furthermore, management and governance approaches need to acknowledge different cultural beliefs, which shape the perception of actor groups.

2.1 Introduction

2.1.1 Background and research objectives

The abandonment of agricultural land has been a major trend in several European landscapes for decades (Estel et al., 2015; Keenleyside & Tucker, 2010; MacDonald et al., 2000). Studies say that by 2020 there will be 16 million ha of abandoned farmland in the EU (Keenleyside & Tucker, 2010). Drivers for land abandonment in Europe are related to geographic and ecological factors, such as decreasing soil fertility, exposition and site location, demographic and socio-economic factors, such as rural depopulation and market incentives (Gellrich, 2006; Pointereau et al., 2008), and European and national policy effects (Pointereau et al., 2008). These factors are interrelated and may mutually support or compensate for each other. Land abandonment occurs particularly in areas of low productive agriculture, such as mountain areas and areas with poor soils or rough climates (Keenleyside & Tucker, 2010). Extensively grazed areas are especially affected by abandonment (Keenleyside & Tucker, 2010). Abandonment is often followed by natural forest regrowth (NFR), which can reach significant dimensions in parts of Europe, contributing to a general increase of forest area in Europe since the mid of the 20th century (Gold, 2003; Keenleyside & Tucker, 2010; San Roman Sanz et al., 2013).

NFR resulting from land abandonment can have far-reaching social and ecological consequences for habitats and species and the ecosystem services provided by the land, as well as for the local population and actors using and managing the land (see for instance Bauer et al., 2009; Bieling, 2013;

Zavalloni et al., 2019). The specific consequences of NFR vary from case to case. For instance, the process can have varied impacts on biodiversity, so that overall conclusions about biodiversity impacts cannot be drawn (Plieninger et al., 2014). NFR may reduce landscape heterogeneity (Otero et al., 2015), resulting in a loss of open landscape species and/or a loss of cultural and aesthetic values (Fernández-Giménez, 2015; Soliva et al., 2008; van der Zanden et al., 2017). NFR can, however, have positive effects on woodland species (Smallbone et al., 2014) and improve the connectivity of woodland patches (Palmero-Iniesta et al., 2020). Furthermore, NFR may bear conservation opportunities regarding restoration attempts and rewilding (Carver, 2019; H. M. Pereira & Navarro, 2015; Proença et al., 2012).

NFR following land abandonment is a cross-cutting topic connected to agriculture, forestry, conservation and rural development, posing challenges and questions that concern various scientific disciplines. Drawing on a set of four case studies in Spain (3) and France (1), this paper focuses on the perceptions of NFR on abandoned land by different actors involved in or who have a stake in the management of the land. NFR connected to land abandonment is a major land use change factor in these two countries (Keenleyside & Tucker, 2010; Pointereau et al., 2008; Schnitzler & Génot, 2013). From 1990 to 2015 the forest area has increased by an annual average of annually by 0.66 % in France and 1.16 % in Spain (incl. afforestation, NFR and deforestation) (Forest Europe, 2015). Even though exact numbers about NFR are not available, studies on land use changes in Southwestern Europe show that NFR on abandoned land is decisive for the expansion of forest area (Gold, 2003; Pointereau et al., 2008).

Specifically, our research questions are:

1. How do local actors in the case study regions perceive NFR? (chapter 2.3.1)
    a. What are the main problems addressed?
    b. What are the main solution strategies to tackle those problems?
2. To what extent do narratives differ across case studies? (chapter 2.3.2)

By answering these questions, the paper aims to contribute to a better understanding of perceptions of NFR. Furthermore, we aim to contribute empirical data to the rich body of research on narrative analysis (cf. Van Eeten, 2007).

2.1.2 State of research on societal perceptions of land abandonment and NFR

Societal perceptions of land abandonment have been studied in various parts of Europe. Perceptions are frequently linked to the societal consequences of land abandonment. Research shows that critical perceptions are frequent (see for instance Aretano et al., 2013; Bieling, 2013; Hunziker et al., 2008; Soliva et al., 2008; Zagaria et al., 2018). Case study research in six European countries finds that the local stakeholders often associate land abandonment with "agricultural decline and its negative consequences for livelihoods and rural viability" (Soliva et al., 2008, p. 62). A case study in Portugal (van der Zanden et al., 2018) reports such negative perceptions by the local population. The emotional attachment to traditional and well-known landscapes plays an important role in these perceptions. Exploring the emotional and cultural dimension of landscape for stockbreeders in the Pyrenees, Fernández-Giménez (2015, p. 29f) shows "the role of cultural landscapes in shaping individual identity". In Portugal, local actors express emotions such as "sadness" and "nostalgia" (van der Zanden et al., 2018, p. 1514) when asked about land abandonment. Additionally, various studies address the loss of cultural heritage and human attributes of the landscape (Höchtl et al., 2005; Soliva et al., 2008).

Some studies indicate differences in perceptions among social groups. For instance, while local actors frequently perceive land abandonment rather negatively, visitors are more positive about the process (Höchtl et al., 2005; Hunziker et al., 2008). Differences in perceptions amongst different social groups are a prominent finding in the Swiss Alps studies of Soliva (2007) and Soliva and Hunziker (2009). They identify four ideal type narratives on land abandonment, which imply underlying values and assumptions on landscape changes. Only one of them is positive towards land abandonment, while the others perceive it rather negatively:

- The wilderness narrative refers to an intrinsic value of nature, with the ideal that landscapes should develop naturally, in a mosaic-cycle, while focusing on process-oriented conservation strategies. Humans are not in an active role in this narrative but are seen in need to re-establish the connection to nature. This narrative is especially positively addressed by habitants that have recently moved into the investigated region (Soliva, 2007; Soliva & Hunziker, 2009).
- The modernisation narrative refers to a utilitarian anthropocentric nature concept, focusing on production purposes and the economic potential of nature and landscapes. Modernisation favours intensive, large-scale production in agriculture. This is particularly supported by farmers with large holdings (Soliva, 2007; Soliva & Hunziker, 2009).
- The subsistence narrative is also based on a utilitarian nature concept but criticises the capitalistic economic system. It favours instead an extensive subsistence agriculture independent from market pressures, which sustains the biodiversity and cultural richness of the landscape. This narrative is popular among people working in small-scale agriculture (Soliva, 2007; Soliva & Hunziker, 2009).
- The endogenous development narrative refers to diversity and sustainable rural development, focusing on the potential of the region, strengthening the "development from within" (Soliva, 2007, p. 69) through various sectors and local participation. This narrative favours multifunctional agricultural practices with several land uses (Soliva, 2007; Soliva & Hunziker, 2009). It is especially prominent among people working on environmental and culture topics.

In most of these perception studies, NFR is addressed as one of the scenarios following land abandonment but is not in the specific focus. Hunziker et al. (2008) find that NFR is the most negatively viewed scenario by local inhabitants (see also Höchtl et al., 2005). Soliva et al. (2008) also find negative assessments of NFR following land abandonment and link this to an increasing risk of natural hazards (Soliva et al., 2008). Specifically, biomass accumulation increases risks of wildfire (Höchtl et al., 2005; Soliva et al., 2008; van der Zanden et al., 2018). Furthermore, the perceived loss of biodiversity value and the homogenisation of the landscape is a topic associated with NFR (Ruskule et al., 2013). At the large scale, NFR may result in whole landscape sceneries changing, thereby affecting aesthetic dimensions. In a case study in the Black Forest, locals describe that through NFR the landscape became "too dark and lacks scenic views" (Bieling, 2013, p. 36). While these findings present valuable insights into the closely connected perceptions of land abandonment and NFR, there is not much literature on how different societal groups perceive the opportunities and trade-offs of NFR in Europe (Hunziker et al., 2008; van der Zanden et al., 2018). Understanding these perceptions of NFR is crucial to support and set up management and governance strategies to deal with the phenomena of natural forest expansion in Europe in the upcoming decades. Our research addresses this gap and provides knowledge for different regions in Europe.

2.2 Methods

2.2.1 Narrative analysis

This paper uses narrative analysis to structure the presentation of perceptions. Analysing narratives is an often used approach in land use and environmental policy (McBeth et al., 2005; Roe, 1994; Warner, 2019; Winkel et al., 2017), but the approach has so far been applied less in landscape research (Soliva, 2007). Narratives are comprehensive stories told on an issue. They entail a problem definition and address who is held responsible to act, what are the solutions proposed, which rhetoric figures are used, and which aspects are excluded (Winkel et al., 2017). Narratives not only depict what has been said, they assume there is a deeper meaning behind the story told that connects to societal discourses or values (Winkel et al., 2017; Yanow, 2000). In this way narratives "offer a powerful tool to an analyst seeking a hermeneutic explanation" (Kaplan, 1993, p. 172).

Table 3. Overview of interviews carried out between Sept. 2017 and March 2018.

Case study (abbreviation), country	**Number of interviews, reference code (date of generation)**	**Landscape and socio-economic characteristics**
Alto Tajo region (AT), Spain	12, AT1–12 (Oct. 2017);	Rural, very remote and sparsely populated region; high percentage of large-scale abandoned agricultural land mainly due to loss of pastoralism where NFR occurs; ongoing abandonment and NFR
Barcelona Metropolitan Area (BCN), Spain	8, BCN1–8 (Oct. 2017–March 2018)	Urban, sub-urban region; small-scale patches of abandoned agricultural land mainly on formerly cultivated land where NFR occurs; partially ongoing abandonment and NFR
Catalan Pyrenees region (PYR), Spain	12, PYR1–12 (Jan.–Feb. 2018)	Rural mountain region; small and large-scale abandoned agricultural land mainly due to loss of pastoralism where NFR occurs; partially ongoing abandonment and NFR
Mont Ventoux/Luberon region (VAU), France	10, VAU1–10 (Sept. 2017)	Rural region with nearby urban agglomerations; small-scale abandoned agricultural land due to loss of pastoralism where NFR occurs; abandonment halted but NFR on already abandoned terrain ongoing

2.2.2 Selection of case studies

The analysis of narratives here builds upon data generated from four case studies in Spain and France. The research was carried out in the framework of the BiodivERsA SPONFOREST project, which investigates the ecology, genetics, landscape and societal dimensions of NFR in France and Spain. The case study selection was done in deliberation with the project consortium, also considering the research needs of other partners and disciplines. Out of the five project case studies, four were selected for the narrative analysis in this paper based on the criteria that the region includes abandoned agricultural land on which NFR occurred (or is occurring) in patches or whole stands. Table 3 presents the case studies and their characteristics, showing their wide range of socio-economic

conditions: from the urban, densely populated case of the Barcelona Metropolitan Area (BCN) to the Vaucluse case study in the Mont Ventoux/Luberon region that is well connected to urban centres (VAU) to the remoter, mountain and rural cases in the Alto Tajo region (AT) and Catalan Pyrenees (PYR).

2.2.3 Selection of interviewees and data gathering

In each case study a set of complimentary local actors was selected for interviews. Interviewees were identified by purposeful sampling (Creswell, 2009). First, existing local contacts of the different research groups involved in SPONFOREST were consulted. The portfolio was then complimented through searching for relevant actors and institutions in the web. The interviewees were subsequently contacted via email and phone. This approach was combined with snowball sampling (ibid.), asking for suitable interviewees during the interviews and in informal conservations. The empirical data consists of 42 semi-structured interviews carried out between August 2017 and March 2018. Table 3 shows the case studies, the number of interviews and its numbering as it appears in the text, as well as related landscape and socio-economic characteristics. Interviews were conducted with local actors involved in the management of NFR on abandoned land. These included actors from forestry, the forest industry, governmental agencies, conservation, agriculture and tourism agencies. In each case study, at least one interviewee from each respective category was interviewed. These groups were approached to analyse the various perspectives of actors directly involved in the management of abandoned land and NFR. Interviews were conducted in Catalan, French and Spanish. They consisted of a set of open-ended questions about land management, the personal perceptions of trade-offs and opportunities through NFR, the management of NFR, and governance of NFR in the case study area. Interviewees also addressed the perceptions of other actors. The questions were adapted to case study specific characteristics, such as regarding the tree species, which establish naturally (see main interview guideline in Appendix A).

2.2.4 Data analysis

The analysis follows the basic understanding of interpretive methodology (Yanow, 2000). This means that the qualitative analysis of the data is done based on words and their meaning in relation to the re- search questions. All interviews were recorded and fully transcribed. The transcripts were coded with MAXQDA, a programme for qualitative text analysis. The coding aimed to extract relevant text elements and to cluster them according to categories (Creswell, 2009; Flick, 2015). The first coding round was done deductively under thematic categories such as “NFR characteristics”, “forestry and management”, “agricultural practices”, “policy and governance” and “ecosystem services obtained” to give an overview of the data. In a second round, the coding system was set up following the structure of narratives (cf. Winkel et al., 2017). The leading questions to the data were:

- What are the main problems ascribed to NFR on abandoned land?
- What are the described causes for the problem and who is responsible for the existence of the problem?
- What are the solution strategies and who is held responsible to act?

Narratives were built through clustering related codes in a manner that a consistent “story” containing problem definitions, causes, solution strategies and ascribed responsibilities was constructed (Winkel et al., 2017). Under these main codes, sub-codes were established inductively based on what was said in the interviews. For instance, under the main code “problems”, sub-codes

were added such as “structure of forestry and agriculture” (e.g. “centralised forest administration”, “no economic interest in forest use”); “failing policies” (e.g. “local policies not well adjusted”, “too protective nature policies”), and “negative associations with abandoned land” (e.g. “loss of cultural heritage”, “forest fire risk”, “increase wild animals”). This resulted in a detailed table with the different viewpoints on NFR that were subsequently summarised into coherent narratives, which could again be connected to different actor groups.

2.3 Results

The analysis reveals three narratives on land abandonment and NFR: rural fatalism, pro forest management and pro nature (chapter 2.3.1). Aside from the rural fatalism narrative, which was absent in the highly urbanised Barcelona case study, the three main narratives were identified in all the case studies, albeit with specific adaptations to the specific contexts (chapter 2.3.2).

2.3.1 Narratives on NFR

Table 4 gives an overview of the three narratives shared across the case studies.

Table 4. Overview of narratives.

	Rural fatalism narrative	**Pro management narrative**	**Pro nature narrative** **Landscape conservation subnarrative** **Wilderness subnarrative**
Problem definition	Landscapes should serve human needs; land abandonment represents lost territory Increased risk of natural hazards is the main problem, above all forest fire The achievements of local land management, which has created the landscapes, are neglected by those "from outside"	Nature needs innovative management approaches to make the best use of resources The lack of forest management in general and a weak forest sector with a lack of capacities is the key problem If spontaneous forests are managed, they may bear opportunities for forest resources in the future	The natural development of ecosystems has a value as such; intensification of forestry and agriculture harms the environment and biodiversity (L) The loss of open landscapes and dependent species is a problem (W) SFE may bear positive aspects in that ecosystems can develop naturally
Causes	There is a lack of financial support for preventing land abandonment through management Local actors are powerless, and there is no hope to overcome the challenging situation in rural areas; the generational transition represents a challenge	There is a lack of interest in the commercial use of forest products; local timber and biomass markets need support and investment instead of wood imports Forestry subsidies are badly designed and used	The hierarchical control of forest management and the loss of ownership leads to bad or no forest management at all Agricultural subsidies are badly designed, surpassing extensive small-scale farming
Solution strategies	Agriculture is needed to sustain or restore traditional landscapes Adequate funding for this and fire management is needed Landowners need acknowledgment and appreciation for their work; policymaking needs to consider local needs	Forest management is needed to make use of forest resources, based in local chain of custody and added value products, and to reduce risks Forests need to be respected as property, inter alia to reduce conflicts with visitors	Ecotourism is an important pillar of rural economy (L) Need to sustain or restore heterogenous mosaic landscape with extensive agriculture, with various uses coexisting (W) Natural development and rewilding bears opportunities to recover degraded land
Responsi-bility to act	Governmental actors	Forestry actors; governmental actors	Governmental actors; land users and managers
Main actors voicing the narrative	Farmers, landowners, governmental agencies (agriculture)	Forest owners, forest technicians, forest industry, local administration (forestry)	Environmental groups, tourism representatives

2.3.1.1 Rural fatalism

The main actors voicing this narrative are farmers, landowners and agricultural governmental agencies. Under this narrative, a utilitarian view of nature and the landscape is expressed. From this perspective, landscape is primarily the result of land use in a region, and the natural resources are there to be used sustainably. As a farmer in the Pyrenees expressed this: “We don’t put the snow down because they [visitors] like to find snow, but it is a meteorological phenomenon which bears many problems for us. Or if there is a cow, it isn’t a decorative element, but it is an animal of production” (PYR11). According to this view, visitors “romanticise” the landscape without seeing the work and livelihoods behind it (esp. PYR and VAU). For landowners and managers, this landscape is the place of their daily work. Consequently, the change from a cultivated landscape towards abandoned land is regarded by them as a problem. Abandoned land with NFR is frequently perceived as “lost territory” without any use.

NFR is further connected to risks under this narrative. One main perceived challenge is an increased risk of fires and a higher intensity of the fires (esp. AT) due to biomass accumulation: “The important thing is to clean it [NFR] up. If we don't do this, the Pyrenees will end in fire, it will end up burning. A dry year will come, a year of wind will come and depending on how it goes it will burn” (PYR9). This risk is seen as particularly significant when NFR happens nearby human settlements (especially PYR, VAU). The same holds true for potentially harmful animals (e.g. the wild boar), for which new forests provide habitat. Hence, this narrative sees NFR as a problem “since it's not going to be cleaned by the cattle or by the people. It's going to be dirtier, that's what abandonment is” (AT9). Related to this, actors supporting this narrative argue that NFR is also viewed negatively by the local population, who do not want abandoned land: "Almost everyone here sees it as a bad thing that the forest takes ground. Because people want more open spaces. They see it as a fire hazard that the forest reaches the village so much and they would prefer a more cultivated, more humanised landscape" (PYR9). NFR is seen here as symbolizing the marginalisation of the region and the loss of agriculture: the locals “view the forest like a reflexion of the rural abandonment. Therefore, they don’t like that the forest colonises so much land” (PYR3). Additionally, landscape change is seen critically from an aesthetic viewpoint. The familiar and desired landscape disappears: “What we used to know our whole life disappears” (AT7). In line with this, some actors argue that the negative perception of NFR is particularly prominent amongst the elder generation, while the younger generation are used to NFR.

As causes of the problems, actors highlight the difficult economic situation in the case study regions (esp. AT, PYR). There are few economic perspectives for the local population, especially for those working in the primary sector. The generational transition away from primary production is seen as challenging for farmers, since young people do not want to take over the work. Actors express feelings of powerlessness. Those with power would take advantage of the marginalised position of local actors, such as farmers, as expressed in the following quote: “let’s cut [the money from] the weakest who don’t protest. Who are the weakest who don’t protest? Those in the Alto Tajo, who nobody knows” (AT9). Related to this, there is a perceived lack of appreciation and acknowledgement of the work of local land managers, who have managed the land for centuries and have maintained a cultivated landscape despite challenges (AT, PYR, VAU). The different worldviews of urban and rural populations are described as a key challenge in the rural transformation process (AT, PYR, VAU).

A shared perception is that policies and decisions are made by “outsiders” in the cities, far away from the local conditions, who do not know what is locally suitable. The rural people feel overlooked by

and distanced from the (urbanised) political class: “That illustrates also a great characteristic of the French forest, that in Paris or Nancy they do not understand and they do not know how to manage the Mediterranean forest, it’s really two different ecosystems and two different value chains and different issue” (VAU1). The people “from the cities” are also associated with conservation policy, which is seen as: “the policy of the cities, it is not the policy of the rural people” (PYR9). In line with this, overly protective conservation policies are described as burdensome and are criticised content-wise. For instance, in the Alto Tajo region, conservation policies that protect the formerly endangered Spanish Juniper would lead to a huge colonisation by Juniper on former agricultural land. In the Pyrenees, the return of the brown bear and wolf, promoted by conservation projects, is criticised by land managers and owners. As described by one interviewee, the bear would come back with all the problems and conflicts that were resolved when it had disappeared.

A topic highlighted in the Alto Tajo region and the Pyrenees is the lack of financial means to support local traditional agriculture and to undertake any forestry measures – clearing for fire prevention and forest use. Small-scale farmers on marginal lands are highly dependent on financial subsidies for economic viability. Silvo-pastoral systems are the traditional cattle management system in the Mediterranean region and the Alto Tajo region, contributing to the familiar agricultural landscapes. Under the EU Common Agricultural Policy (CAP), however, silvo-pastoral systems are often not covered, since they would only apply to agricultural land with less than 15 % tree coverage. Furthermore, the high bureaucratic burden of obtaining CAP subsidies is highlighted.

Solutions presented under the rural fatalism narrative focus on fighting NFR and recovering lost territory. Agricultural management is needed to sustain cultivated landscapes and to prevent or revert land abandonment: “don’t leave the territory and then lose it, but recover the territory and what was before, how they managed it before” (PYR9). This interviewee adds that recovering all abandoned land “is impossible, but some parts of the territory we need to recover. Management is needed” (PYR9). To achieve this, financial means and adequate investment are needed in the given region to support traditional agricultural practices and to use forest management for fire prevention. In some cases, landscape recovery has proven to be possible on a small-scale, but only with substantial financial incentive. An example is subsidised sheep herding in Vaucluse, a traditional practice that almost disappeared due to low profitability. Furthermore, economic returns from Non-Timber Forest Products (NTFPs) – especially hunting, mushroom and truffle picking – would help the primary sector. This is especially highlighted in Vaucluse, where hunting is mentioned as the most important forest use in economic terms (also AT). However, all NTFPs would need economic compensation, which is not yet the case for mushroom picking.

Core to any solution under this narrative is the need to appreciate the farmers and the rural population. Farmers are described as promoters of the landscape: “behind those landscapes – the farmer's hand, cleanliness, fields, green, the cared green in contrast with the forests (…). We, the farmers, are the promoters of the Pyrenees” (PYR9). Thus, people need to acknowledge that and pay attention to the local knowledge of farmers: “It is much more valuable to accompany a farmer one morning, listening to his experiences and his issues; […] these are the issues that we are forgetting about” (PYR9). The argument from this narrative is that acknowledging the tacit knowledge of local landowners and managers would support decision making on policies, which should be based on local needs.

2.3.1.2 Pro forest management

The main actors voicing this narrative are forest managers and owners and local forestry governmental agencies. The pro forest management narrative expresses a utilitarian view of nature. The main focus is on using the emerging forests, instead of fighting them back. According to the proponents of this narrative, forests need to be managed to make them desirable forests, to use their resources, and to reduce risks. The main problem addressed under this narrative is a lack of forest management.

Actors argue that the weak forest sector is an important issue that needs to be tackled. The pro forest management narrative addresses the lack of capacities – financial means and workers – to implement forest management at private and public levels. This is linked to the fact that forestry measures often do not pay off economically due to poor or non-existent local wood markets and low wood prices, compared to the high costs for extracting wood from the forest (esp. AT, BCN, PYR). Since there are no economic incentives to use the forest resources, there is no management. A related problem addressed is the lack of interest in the commercial use of forest. Reasons mentioned for this vary depending on the region: a difficult generational transition (AT, VAU), low profitability (AT, BCN, PYR), and little economic incentives (AT, BCN, PYR, VAU). For example, in Catalonia (BCN, PYR) the forest industry has been confronted with high costs of extracting wood and products with little added value (pallets, biomass). Another highlighted problem is that forests are often not considered as private property by the public, which causes problems in areas with high recreational use, as visitors tend to object to forest management measures. Related to this, some interviewees mention that there is no economic reward for the cultural ecosystem services (esp. recreation) provided by foresters.

Regarding abandoned land, actors point to the fact that NFR is usually not managed and hence considered “bad forest”. If managed, NFR would bear opportunities for additional natural resource use. NFR is described in more neutral terms under this narrative, in a sense that the future outcome remains to be seen: "we don’t know if it will be better or worse, but we are certainly not used to it" (AT7). Unmanaged areas of NFR are described as fragile stands – not yet mature, too dense and with little biodiversity. As described by one interviewee, these forests are not wanted: “[Naturally grown forest] is not the forest we wanted, it's the forest product of abandonment. Therefore, it is an unstructured forest, a forest where no measures have been realised, and without plans to do so. It is a wild, but not mature forest" (PYR6). The main threat of unmanaged forests, particularly areas of NFR, would be forest fires due to biomass accumulation. High efforts and capacities need to go into fire management for managers and owners. Wind and snow damage also play a role (PYR, AT, VAU). The fact that NFR colonises areas nearby settlements, increasing both the ignition and damage potential, was also mentioned under this narrative (esp. BCN, PYR, VAU). This leads to additional challenges and efforts for forest owners and managers.

As indicated above, wood markets on a global and local scale are mentioned as causes of a weak forest sector. The low wood prices and the low profitability of forest management are especially highlighted in the Spanish case studies. Related to this, the lack of political support for forestry use and management, and badly designed subsidies, are seen as problems in all cases, hinting to a lack of financial means to implement forest management well. While more investment into the local forest sector is demanded for, some interviewees describe the “culture of subsidies” in agriculture and forestry as an important cause of the problem. They argue that people would become “lazy” and would no longer be innovative (AT, PYR): “You neither get paid for being productive nor do you get

paid for being innovative or anything. They give you money so that you can cover your expenses and do what you've done all your life. No one becomes rich, poor neither, and you keep going. If the people who are now in charge of the farms are 50–60 years old, why should they innovate if they have 5 years left to retire?" (PYR7).

Under this narrative, forest management is promoted to provide various services and products to society and the markets, and hence also to use potential resources of NFR. According to this view, forest management should be implemented wherever possible. The use of provisioning ecosystem services such as wood, biomass and NTFPs are specifically emphasised (AT, PYR, VAU), also to boost the local forest economy. Policy initiatives should consequently focus on the "dynamisation" of the local forest sector. This means there is a need to promote forest products, woody biomass for energy (only AT and PYR), NTFPs and their economic use, and new wood markets such as construction. As an example, some interviewees address the idea to form local business groups and institutions at the municipal level, instead of the centralised forest administration (PYR, VAU). Subsidies need to be temporary with the aim to make the system self-sustaining (PYR). Furthermore, the need for local supply chains for added value wood products is emphasised (PYR, VAU).

The pro management narrative also highlights the societal services that forest managers and owners provide related to recreation and tourism. Erosion control is mentioned as a positive benefit from NFR (AT, VAU). Although tourism is seen as a pillar of rural development, potential conflicts for landowners and managers are stressed, not only with visitors but also with municipalities (BCN, PYR, VAU). Related to this, the need to understand and respect forests as property (as opposed to a common good) is highlighted (esp. BCN, PYR), and even the need to regulate forest access is mentioned to prevent damages through excessive recreational use (BCN). Furthermore, tourism is mentioned as a justification for economic compensations for landowners and managers for providing and taking care of the landscape. Regarding conservation, one interviewee exemplarily made clear that compensations for owners are necessary: "The formula for not exceeding ourselves in this protectionist eagerness that societies are acquiring is to economically value the limitation that you produce. That is to say, whoever wants to make a network of freely evolving forests has to value it economically and has to pay for it to the affected property, because you are limiting a basic property right" (PYR6).

Summing up, the pro management narrative argues that NFR bears opportunities, but only if the area can be managed. As local people tend to think that NFR carries risks and dangers (AT, PYR, VAU), this narrative aims to change those concerns into a vision that the new forest can bring new resources. As one representative in the Pyrenees points out, forest resources are the only opportunity they have, and hence need to be used: "Only forestry, in the broadest sense, [remains]: hunting, mushrooms, public use of the forest; […] as a forest worker, I see it as an opportunity for those villages who were no longer doing anything on the land, and who have a lot of land; and for the country, because we import a lot of wood and a lot of energy, so it is strategic to have that forest well managed" (PYR6).

2.3.1.3 Pro nature narrative

The main actors voicing this narrative are environmental groups and tourism representatives. Two subnarratives are presented under the pro nature narrative: landscape conservation and wilderness. Under the landscape conservation subnarrative, actors highlight risks for the loss of species and habitats of open grassland. Furthermore, the change of landscape due to land abandonment is described as a challenge that needs to be tackled to sustain extensive agricultural practices. Actors

point to the homogenisation of landscapes due to the loss of the mosaic landscape with various habitats and open areas. Regarding the expansion of Atlas Cedar in Vaucluse, one actor states that NFR is "the standardisation of the landscape, of the forest as such, because it tends to dominate the other species, to expand, and then the management that is practiced favours it even more […]. We are moving towards a general loss of biodiversity and rather a willingness to let it [Cedar] spread" (VAU5). Under the wilderness sub-narrative some see opportunities related to ecological benefits, such as rewilding and ecological restoration. Actors argue that the question of habitats depends on the question which species should be favoured. Through NFR open landscape species get lost whereas forest dependent species may benefit (AT, PYR). Additionally, the natural development of ecosystems is viewed positively (AT, PYR).

Both pro-nature subnarratives have in common that overly intense agriculture and forestry practices are seen as problematic. Additionally, a loss of connection to nature and of spiritual landscape values in the population, especially the younger generation, is highlighted (AT, PYR). The pro-nature narrative argues that such connections are needed: "for us it is very important that as a society we have a relation with this ecosystem, of which we are part" (PYR1).

Similar to the other narratives, badly designed CAP subsidies are mentioned by some as causes to the loss of small-scale agriculture. The CAP would favour big farms and those who have money, and hence extensive agriculture would be replaced by intensive farming elsewhere (AT, PYR). Additionally, the hierarchical administration related to land management is criticised, highlighting the loss of communal rights over the land (esp. AT and VAU). For example, in the Alto Tajo region: "the decision centres, they're not here in the territory, they're not here. […] If you can no longer decide about what you have here and how to do things, you have a problem, of democracy, of management; of governance, above all" (AT1). This situation demotivates locals to work with the landscape. A similar challenge is addressed in Vaucluse, where the decision to build a biomass power plant was described as being taken without involving local people – despite having potentially significant impacts on land use options. In Catalonia (BCN, PYR), the lack of a long-term vision in local forest policies is highlighted, as well as a lack of a shared landscape vision among different policy sectors, which makes policy obsolete: "here it has never been thought in the long term, never. Therefore, a forestry policy that has not been thought through with the agreement of all political formations, in the long term, is of no use at all" (PYR5).

The landscape conservation subnarrative focuses on the need to sustain heterogenous landscapes with extensive agriculture. Thus, solution strategies should focus on fighting NFR and strengthening measures for extensive small-scale agriculture. In contrast, the wilderness subnarrative sees a potential for rewilding on abandoned land. In accordance with the idea of wilderness, some describe the natural development of ecosystems as bearing potentials from an ecological viewpoint, "recovering" degraded agricultural land. New forest types could develop, and interesting landscapes could be created. Also, more fauna would appear. The restorative character of NFR is highlighted: "with this recovery, with this abandonment, the forest has recovered parts of the territory […]. Therefore, these forests can progressively become forests with much more splendour, with much more complexity. And in other parts, with a lot of wood production capacity, looking for a balance between which areas could be left to natural dynamics or for landscape or for health and welfare uses "(PYR8). In the Alto Tajo region, Juniper is described as a positive example since it could regenerate, from being almost extinct to establishing itself on a large territory of abandoned land.

While both subnarratives highlight ecotourism as an important and welcome pillar of the rural economy, the wilderness subnarrative has a stronger focus. The landscape conservation subnarrative refers to the demand for traditional land uses with its historic mosaic landscape, which is desirable to visitors (BCN, VAU, BCN). Under the wilderness subnarrative, wild and reforested landscapes are considered attractive for nature tourism. Furthermore, the therapeutic and educational value of the forest and landscape are highlighted (AT, PYR). Both sub-narratives address the need to economically value ecosystem services so that forest owners can value these "new" forest as income opportunity. Actors specifically mention the need for economic income for owners from touristic and recreational use (BCN, PYR, VAU; both sub-narratives) and economic incentives for carbon sequestration (AT, PYR; wilderness subnarrative).

Finally, both sub-narratives address the increased fire risk through NFR pointing to the need for an appropriate prevention management depending on the site conditions, even if the aim is a natural development of ecosystems (AT, BCN, PYR). Especially in the Barcelona case study, fire plays an important role, as the city and forests are interwoven. Nevertheless, under the nature narratives actors also emphasise the importance of the forest surrounding the city as a "green lung" of Barcelona.

2.3.2 Regional nuances

When comparing the narratives across the case studies (research question 2), we find each region highlights different topics related to NFR. Furthermore, the narratives are not equally present in all cases. Table 5 gives an overview of the regional nuances in each case study with the topics, which were highlighted under the respective narrative.

Table 5. Overview of regional nuances. The table shows the characteristics of each narrative between case studies. The labels "present", "present to some extent" and "absent" indicate how visible the narrative was in our data in the respective case studies. Present means that the narrative was a common view in our interviews; present to some extent means that a few actors raised this narrative; absent means no actor raised (parts of) this narrative.

Narratives	**Alto Tajo region**	**Barcelona Metropolitan Area**	**Catalan Pyrenees region**	**Luberon/Mt. Ventoux region**
Rural fatalism	Present Focus on hopelessness of the region and lack of any economic opportunity - NFR just on top of this as additional problem Focus on the disregard of the farmers work from outside	Absent	Present Focus on the problematic economic situation of rural farmers and landowners, and the disregard of their work from outside Conflicts through tourism highlighted	Present to some extent Focus on demographic trends and the loss of traditional land use, both in agriculture and forestry
Pro forest management	Present to some extent Special focus on the low importance of	Present Focus on recreational needs and fire management, but	Present Focus on the need to strengthen local wood markets and the	Present Focus on the importance of increasing added

	the wood market, on the centralised administration and lack of capacities for forest management	almost no use of wood products Pressure from urban surrounding and conflicts through tourism highlighted	economic valorisation of NTFPs Demand for a long-term vision in forest planning	value of wood products and local wood chains Focus on a diverse market for quality timber, not for biomass, which is seen as detrimental Increasing problems with "neo-rural" population and conflicts through tourism highlighted Focus on cooperation with the local nature NGOs regarding conservation issues
Pro nature	Present Focus on the potential of ecotourism Focus on the need to valorise and sustain cultural ecosystem services Critique towards centralised administrations	Present to some extent Focus on recreational needs and sustaining heterogenous landscape Pressure from urban surrounding is highlighted	Present Focus on preserving/ restoring old land uses (grazing, mosaic landscapes) Depending on the region, rewilding initiatives under way	Present Focus on ecotourism Focus on preserving/ restoring old land uses (grazing, mosaic landscapes) Focus on cooperation with the state forest agency regarding forest management

2.4 Discussion

2.4.1 Method reflection

A difficulty we faced in the data gathering and analysis process was the distinction between the different stages of abandoned land becoming a forest. In practice, interviewees did not separate between land abandonment and NFR. When asked about NFR, answers were often about land abandonment in general. Consequently, when developing the narratives based on the data, the decision was taken to integrate land abandonment and NFR, as both processes cannot be viewed separately from each other in the interview data. Additionally, NFR exists at very different stages even within a studies region; these differences may shape individual perceptions. In sum, however, we believe that our study based on 42 interviews delivers an insightful overview on how general opportunities and trade-offs of NFR as well as bigger questions related to this land use change are narrated and perceived by local actors. Yet, our dataset is not big enough for detailed further analysis, e.g. relating to different stages of a natural succession process. Further methods would need to be applied to fine-tune the analysis, e.g. also through studies with a long-term historic perspective.

2.4.2 Discussion of results

2.4.2.1 Perceptions of NFR

The starting point of this research is to contribute to a better understanding of the perceptions of involved groups about the trade-offs and opportunities of NFR. When comparing our results with previous research on land abandonment and NFR, some findings are confirmed and some new aspects arise. The three identified narratives partly mirror similar findings in other analyses of perceptions on land abandonment in Europe (Bauer et al., 2009; Elands & Wiersum, 2001; López-i-Gelats et al., 2009; Soliva, 2007; Soliva & Hunziker, 2009). With our research, we provide a detailed overview of perceptions of NFR resulting from land abandonment. Furthermore, we have gained some clarity about perceived trade-offs and synergies that develop between the narratives, and hence also between different actor groups involved in the management of the land, particularly agriculture, forestry and conservation actors.

Regarding problem perceptions, past research suggests that local people are very critical towards NFR on abandoned land (e.g. Hunziker et al., 2008). This negative perception of NFR is directly linked to local people's attachment to the landscape and its historical use (cf. Fernández-Giménez, 2015; van der Zanden et al., 2018). Such a perspective is also prominent in our case studies. Particularly under the rural fatalism narrative, NFR is perceived pessimistically, representing the perishing of marginalised rural regions. Our data further shows that farmers are mainly concerned with keeping agriculture alive, to not lose productive land, and forest managers are mainly concerned with strengthening forest management. Thus, trade-offs related to NFR are often seen in line with the involved land use, hence the actors' primary interest in the land.

Regarding perceived opportunities for NFR, we find these under the pro forest management and pro nature narrative. The rural fatalism narrative, in contrast, sees forest removal and the reinstallation of agriculture replacement as the best solution; however, it expresses little confidence that this is possible. Instead, it considers subsidies as the only possibility to keep agriculture alive. Fernández-Giménez (2015:29) shows for the Central Pyrenees "the necessity of subsidies if herding is to continue as a way of life, land use and occupation". This resonates well with our findings.

The potential of the new forests as a resource is highlighted especially under the pro forest management narrative. Our data suggests that NFR presents new resources for forestry, if managed in an economically feasible way. Furthermore, in Vaucluse and in the Pyrenees, foresters point to the potential importance of NFR to support the local wood market, instead of importing wood from elsewhere, and to support the local job market. Taking advantage of this, however, requires taking into account the socio-economic possibilities given in a region, as well as gaining the support of local people and policies. In comparison to research on land abandonment, such as by Soliva (2007) (see chapter 2.1.2) we therefore see a more positive picture of land abandonment connected to NFR, as actors can connect the decline of agriculture to a potential rise of forestry.

The potential of rewilding through land abandonment is stressed under the wilderness subnarrative. This is especially true for rewilding efforts promoting large carnivores in the Pyrenees and ecotourism intentions in the Alto Tajo region and the Pyrenees. The subnarrative resembles the positive perception of passive rewilding through NFR by conservation scholars (cf. Carver, 2019; H. M. Pereira & Navarro, 2015; Proença et al., 2012). However, conservation actors in our data frequently highlight the need for sustaining open landscape habitats and hence fighting NFR, at least to some extent. That is, actors under the landscape conservation subnarrative set a focus on the trade-off of losing the

heterogenous landscape through land abandonment. This indicates that while in academia the rewilding idea is becoming more prominent, at the local scale scepticism and critique by those directly involved in landscape management frequently outweigh the perceived potential, partly even in conservation. Considering the changing role of rural zones from being predominantly places of primary production towards (also) being places of recreation and tourism (Buijs et al., 2006), and current EU policy initiatives on forest restoration in Europe (European Commission, 2020), rewilding through NFR could become more acknowledged as an important management approach.

When comparing the compatibility of the three narratives, we find conflicting as well as compatible elements. For instance, the pro forest management, the rural fatalism narrative and the cultural landscape subnarrative aim for managing the land wherever possible. These three (sub)narratives share the perception that non-management is a problem but suggest different strategies of how to manage the land (focusing on agriculture, forestry or landscape conservation), which are partially conflicting with each other. They stand in contrast to the wilderness subnarrative, which is the only narrative that values the natural development of the naturally grown forests per se (cf. narratives on land abandonment in chapter 2.1.2). The fire risk and necessary prevention measures, however, are a unifying element in the Spanish cases, as it was addressed under all narratives, although to different extents. Furthermore, both the landscape conservation subnarrative and the rural fatalism narrative emphasise the importance of extensive small-scale agriculture for sustaining cultural landscapes, which is, however, not emphasised in the pro-forest and the wilderness narratives. These elements of consent and dissent connecting to problem perceptions and solution strategies across the narratives might be a basis for negotiating future land use and conservation strategies on the ground.

When it comes to regional differences, we see that some characteristics of the case studies particularly shape the perceptions of land abandonment by different actor groups. First, the importance of different land uses – especially agriculture, forestry and tourism – may shape whether actors perceive NFR positively. For instance, in the Alto Tajo region, the forest sector is described as being of low economic importance; consequently, actors barely talk about the potential to use the new forest resources. In contrast, in the Pyrenees and Vaucluse, where forestry is more important, the potential for this land use option is more frequently emphasised. In the Alto Tajo region, local people are frustrated about the overall poor socio-economic situation, and consider NFR to just be a visible sign of the overall rural decline. In the Barcelona case, NFR is connected to fire risk, but there is also a shared perception that the previous expansion is welcome as a "green lung" of the city that provides recreational area. These differences between urbanised Barcelona and rural Alto Tajo may indicate a larger pattern regarding perceptions being influenced by the degree of urbanisation. While in the urban Barcelona case the management of urban societal needs and demands are emphasised, namely recreation and fire prevention, in the rural cases perceptions of the local forest and agriculture sectors are more dominant. Moreover, interviewees in the Barcelona and Vaucluse case studies highlight that the urban population often rejects forest management, which is not the case for the rural areas.

It is not only socio-economic characteristics of a region that can influence perceptions of NFR, but also ecological and biophysical ones – e.g. the forest area, forest types and topography. In Vaucluse, Atlas Cedar is a welcome tree species for foresters; its natural expansion is widely viewed positively under the pro forest management narrative. In contrast, in the Alto Tajo Region, Spanish Juniper is not considered useful for any land use and hence its natural expansion is viewed negatively by farmers and foresters.

An interesting question that arises from our data is how perceptions of actors change over time. This relates to changing socio-economic patterns, landscape use and ecological characteristics of the landscape. For instance, interviewees mention that the younger generations are more familiar with the visual dimension of NFR and abandoned land and that fewer young people work in the primary sector. At the same time, as a naturally regrown forest becomes older, it might be seen as a "natural" forest landscape by future generations, without being a symbol of rural decline. These considerations go beyond the scope of our data.

Furthermore, our findings show that climate change is almost entirely excluded from the narratives. While some mention the potential of carbon sequestration through NFR, there is no further link made to climate change and land use under any of the narratives. Given the fact that climate change has huge impacts on land use in Southwestern Europe already today, for instance connected to fire risk (Rego et al., 2018), this is a striking omission.

2.4.2.2 Cultures of abandonment

As we have pointed out above, despite regional nuances, we have identified strikingly similar narrative patterns across all four cases. This raises the question in how far major cultural patterns of society–nature interrelations may underly the distinct social perceptions and related narratives of NFR. One interesting analogy can be made to the cultural biases suggested in the "Cultural Theory" as presented by Thompson et al. (1990). The Cultural Theory approach refers to four different "ways of life", which are assessed by "cultural biases" of actors – shared values and norms – and their "social relations". The four cultural biases – individualism, hierarchism, egalitarianism and fatalism – shape people's relation to nature and nature policy (ibid.). Elements of these are reflected in our findings. First, the rural fatalism narrative correlates well with the fatalist cultural bias. Fatalists are described as perceiving themselves as coerced and controlled by others, resulting in a passive attitude and overall pessimism. This bias has been connected to farmers in other cases as well, in relation to the loss of economic and political importance in land management decisions (Kim, 2003). Second, the pro forest management narrative largely resembles an individualist cultural bias. At the core is a belief that the new forest resources should be used, and that self-sustaining approaches need to be found to generate value with the new forests for society. Third, the wilderness sub-narrative relates to an egalitarian cultural bias, emphasizing the value of untouched nature that needs space to develop without human interference. Finally, elements of a hierarchism culture can be found in the landscape conservation subnarrative and the pro-forest management narrative relating to the necessity of proper management of landscapes and forests. Such elements are also found under the rural fatalism narrative regarding agricultural land uses. Nevertheless, this culture is less prominent in our data, being based on interviews at the local level. It would be interesting to resume the empirical analysis at the level of governmental bodies and bureaucracies, were presumably this narrative is most strongly rooted (Sotirov & Winkel, 2016) .

Summing up, in line with the Cultural Theory approach, the identified narratives may represent "cultures of abandonment" or "land use transition" that encompass different problem perceptions, distinct visions for how to deal with the problems, and different ideas on who is mainly responsible for solving these problems. Notably, the rural fatalist narrative largely fails to provide a solution strategy that goes beyond the status quo, while the pro forest management and pro nature narratives provide distinct solution strategies in line with their respective cultural biases.

This finding of our paper is of high relevance for dealing with the issue of land abandonment in policy and management. Acknowledging the presence of strikingly different narratives, and assuming they are connected to similarly different cultural "worldviews" of the land, means that policy and management approaches need to consider culturally rooted biases when dealing with future land management, including the trade-offs and diverging solution strategies that arise from these biases. In line with (Thompson, 2003), this may call for "clumsy institutions", i.e. institutions and policies that are responsive to and are able to incorporate elements from all narratives and cultural biases present in the landscape, instead of giving "elegant" preference to only one way of thinking. Such approaches may focus on potential compatibilities and shared perceptions across actor groups, as well as develop spatially diverging management and conservation strategies, finding different management objectives for different sites.

2.5 Conclusions

Land use patterns in Europe underly continuous change, as do socio-economic drivers determining land use options. This paper shows that NFR on abandoned land, which is widespread in some European regions, is a land use transition process that can mean different things to different societal groups. The different symbolic functions NFR can entail are striking, ranging from a symbol of rural decline to a sign of recovery of the land. Given the extent of land abandonment in France and Spain and beyond, people will need to live with these changes as many have been doing for decades already. Any assessment of specific opportunities and trade-offs needs to consider the local conditions and the different culturally biased perceptions expressed about NFR. Furthermore, future land use governance and management approaches need to acknowledge the presence of these distinct cultural beliefs without giving ex ante priority to only one vision, and need to consider different visions for NFR depending on the context.

Future research may investigate further how the narrative patterns found in our cases can be identified in other settings in Europe, as the reviewed literature indicates. Furthermore, it would be very interesting to address the mentioned temporal dimension land use change and related, presumably shifting, perceptions of land use change over time, including across generations (Soliva et al., 2010). Finally, connecting empirical social science research on perceptions with natural science research on NFR dynamics and implications might be promising. Inter- and transdisciplinary research approaches involving distinct stakeholder groups and citizens may focus on how different problem perceptions and solution strategies can be integrated at the local scale, and how integrated visions of landscape management can be developed.

3. Governing abandoned land: Storylines on natural forest regrowth in France and Spain

Published in Environmental Science and Policy

Full reference: Frei, T., Edou, K., Rodríguez Fernández-Blanco, C., & Winkel, G. (2022). Governing abandoned land: Storylines on natural forest regrowth in France and Spain. *Environmental Science & Policy*, *135*, 58–66. https://doi.org/10.1016/j.envsci.2022.04.022

ABSTRACT

Natural forest regrowth on abandoned land represents a major land use change in some regions of Europe. This is driven by various factors related to land abandonment, particularly changing socio-economic conditions for agriculture and rural depopulation. Little research exists about how the issue is addressed at the policy level. This paper looks into the policymaking related to natural forest regrowth in France and Spain, two countries where land abandonment and natural forest regrowth occur at significant scales. We conduct a policy discourse analysis building upon 27 interviews carried out between 2018 and 2020 with policy actors from various fields that connect with these topics. We find four competing storylines in both countries: extensive agriculture, forestry, landscape conservation, and wilderness. These storylines differ regarding the framing of natural forest regrowth as a problem or an opportunity, and the preferred policy solutions. While storylines rooted in extensive agriculture, landscape conservation and forestry tend to problematize the phenomenon, a wilderness storyline voices an opportunity perspective. In France, a few actors voice elements of an insignificance storyline. Given its spatial importance, natural forest regrowth will likely become more important for future policymaking in the EU. Engaging in further research across disciplines and policy fields is necessary to study the phenomenon and its possible management and governance options.

3.1 Introduction

Natural forest regrowth (NFR) on abandoned agricultural land is an important land use change in parts of Europe, particularly in Southern and Eastern Europe (Forest Europe, 2020; H. M. Pereira & Navarro, 2015). NFR – the expansion of forest through natural regeneration on land that was under a different use before (FAO, 2020; Palmero-Iniesta et al., 2021) – is mostly found in remote rural areas, but also in peri-urban areas where agriculture use is decreasing (Martín-Forés et al., 2020). This process has notable ecological and societal consequences (Rey Benayas, 2007) as well as significant symbolic meanings for the societies in the affected regions (Fernández-Giménez, 2015; Frei et al., 2020). NFR transforms cultural landscapes into forests with context-specific consequences. It may result in new trade-offs and benefits at the ecosystem level (Otero et al., 2015), leading to decreases and increases in biodiversity (Plieninger et al., 2014). At the societal scale, the abandonment of traditional agricultural practices – practices that have dominated European lands for centuries – has gradually changed the visual appearance of the landscape. NFR is often perceived, particularly by rural inhabitants, as symbolising rural decline (Frei et al., 2020; van der Zanden et al., 2018).

Although the potentials of NFR are debated in scholarly and policy circles, there is little literature available on how different actors consider this phenomenon at the policy level. Some publications

touch upon strategies to deal with drivers and consequences of abandonment and suggestions of how to address NFR at the policy level (MacDonald et al., 2000; Merckx & Pereira, 2015; H. M. Pereira & Navarro, 2015; Renwick et al., 2013; Terres et al., 2015), but rarely focus on studying the policy level itself. For instance, Varela et al. (2020) publish a set of policy proposals for dealing with NFR in the Mediterranean, pointing to the lack of (EU) funding for multifunctional landscape maintenance, including silvopastoral systems. Barnaud et al. (2021) study discourses on forest regeneration in three European countries, showing the importance of ecological and social factors for the construction of environmental discourses. Additionally, studies exist about the perceptions of land abandonment in different regions of Europe (Bieling, 2013; Frei et al., 2020; Ruskule et al., 2013; Soliva et al., 2008). Increasingly, research is discussing the potential of NFR for rewilding (Carver, 2019; García-Ruiz et al., 2020; H. M. Pereira & Navarro, 2015), understood here as the "long-term aim of maintaining, or increasing, biodiversity, while reducing the impact of present and past human interventions through the restoration of species and ecological processes" (Lorimer et al., 2015, p. 40). Similarly, there is growing research on the potential for carbon sequestration (Bell et al., 2020; Vilà-Cabrera et al., 2017).

Given the importance of NFR for European land use policy, this paper addresses a research gap by studying how the governance of NFR on abandoned agricultural land is conceived in policy discourses in France and Spain, two countries where this issue plays a major role in the landscape transition (Keenleyside & Tucker, 2010; Schnitzler & Génot, 2013). Governance, broadly understood as "the many ways in which public and private actors […] govern public issues at multiple scales" (Arts & Visseren-Hamakers, 2012, p. 242), is analysed through a discourse analysis lens. Specifically, we focus on the storylines – condensed narratives about problems and solutions on the issue – of the actors dealing with land management and policy, namely from forestry, extensive agriculture, conservation, administration and science.

First, we explore what storylines are voiced about NFR governance on abandoned land in France and Spain and focus particularly on how NFR on abandoned land is problematised, what the proposed policy solutions are, and which policies and policy instruments play a role in NFR governance. Second, we ask what can be learned from the discursive construction of NFR and the future governance of NFR and research. By focusing on NFR as a policy phenomenon in France and Spain with a policy discourse perspective, this paper contributes to a better understanding of related ongoing policy debates on biodiversity conservation, rewilding, (forest) restoration and rural development in the EU and beyond.

3.2 Methodological approach

3.2.1 Theoretical background

This research is based on qualitative social science, drawing on interviews and a qualitative analysis of words and their meanings (Yanow, 2007). We draw on the theoretical concept of discourse analysis, specifically Hajer's Argumentative Discourse Analysis (ADA) (Hajer, 1995), which is rooted in post-positivism (Durnova et al., 2016). Discourses are defined as "an ensemble of ideas, concepts, and categories through which meaning is given to social and physical phenomena, and which is produced and reproduced through an identifiable set of practices" (Hajer, 2005, p. 300). Discourse analysis assumes that "discourses enable and constrain how political entities and societies understand and act on certain social or physical phenomena that are negotiated in environmental policymaking" (Leipold et al., 2019, p. 447). The analytical interest lies in understanding the "fundamental dynamics of the social construction of political issues" (ibid., p. 446). An important element of ADA is storylines, "narratives on social reality through which elements from many different domains are combined and that provide actors with a set of symbolic references that suggest a common understanding" (Hajer,

1995, p. 62). Storylines consist of problematisations, solutions strategies and related responsibilities (Hajer, 1995).

We use the concept of storylines to implement a discourse study with an aim to understand how actors make sense of political issues and which practices they use to do so (Angermuller et al., 2014). The storylines give answers about what should or can be done about NFR on abandoned land (cf. van Hulst, 2012). Storylines are seen as "a medium of power" in environmental politics (Leipold et al., 2019, p. 447), showing how actors negotiate meaning and produce a certain truth (Angermuller et al., 2014; Leipold et al., 2019).

As researchers we are part of the research process and the discourse ourselves (Yanow, 2007), which can be called a "trialectic agency", comprised of the (analysed) individual discourse agent, the (discursive) structures, and the interpreting researcher (Leipold & Winkel, 2016a, p. 11). We carried out this study within a research project aimed at studying NFR as a potentially beneficial management option for abandoned land. This has inevitably shaped our specific focus and interest on NFR as a policy issue, rather than, say, intensive farming or plantation forestry related to land abandonment. Nevertheless, we followed the procedures of qualitative research with the intention to give voice to various storylines. Aiming for an open approach, we did not presuppose the phenomena to be positive or negative.

3.2.2 Case studies

The research was conducted as part of the European project SPONFOREST, which investigated the ecological, societal and political dimensions of NFR in France and Spain, two countries where it is predicted that by 2030 large areas of agricultural land will have been abandoned (Perpiña Castillo et al., 2018). Both countries show an increasing trend in forest cover related to NFR and afforestation (see Appendix B), resulting in the highest annual rate of forest expansion in the EU. In both countries roughly three-quarters of forest land is privately owned (Forest Europe, 2020).

In France, agriculture and forest policy falls under the competence of the Ministry of Agriculture, Agrifood, and Forestry; regional directorates are in charge of implementation. The Ministry for Ecological Transition and its regional directorates are in charge of biodiversity-related policies. While the central government sets the legal framework in France, in recent decades more power has been given to the regions in terms of land use planning (FAO, 2004).

In comparison, political power is more decentralised in Spain. Except for National Parks, autonomous regions are largely responsible for land planning and forest management (Montiel & Galiana, 2005). During the study period, agriculture and forest policy was under the competence of the Ministry of Agriculture, Fisheries and Food; forest policy is now with the Ministry for the Ecological Transition and the Demographic Challenge, forming part of the General Directorate of Biodiversity, Forests and Desertification (Gobierno de España, 2020).

3.2.3 Data gathering and analysis

Given a lack of specific policy documents or other text references with relevance to the issue, qualitative interviews were chosen as the main source of data. Interviews have proven to be a useful method for analysing actor's discursive practices (Leipold & Winkel, 2016c; Winkel, 2014). The study is based on in-depth, semi-structured interviews, carried out between December 2018 and March

2020. In total, we conducted 27 interviews in France (reference code FR) and Spain (ES) with governmental and non-governmental actors involved in or trying to influence policymaking at regional and/or national levels. Besides the policy involvement – e.g. representing a certain interest association or a governmental institution – the actor's field of work was decisive for the interview selection so as to cover a range of fields relevant for our study. We spoke to representatives from extensive agriculture (reference code A), conservation (E) and forestry (F), from the private and public/administrative sector (G) as well as scientists (S). Together these interviewees covered the most relevant policy aspects and institutions involved for the purpose of our study.

We started our search for relevant interview partners through existing contacts in the field, followed by snowball sampling, i.e. asking for further recommendations during the interviews. Appendix C shows an overview of all interviews including reference codes. Interviews were carried out via phone, except one in Spain that was conducted in person. Interviewees were informed beforehand about the purpose of the research and data use, and informed consent was obtained. The interviews lasted around 40 minutes on average. For all interviews, the questions followed the same open-ended, semi-structured questionnaire (see Appendix D). We asked about opportunities and problems related to NFR, necessary political measures and relevant policies, relevant policy actors and their political strategies related to NFR. All interviews were recorded and fully transcribed in the original languages, French or Spanish, and subsequently made pseudonymous for the analysis. Direct quotes used for the publication were translated into English by the authors.

The data analysis follows an interpretive methodology (Yanow, 2007). Almost 200 pages of transcribed text were coded. Relevant text passages were identified and categorised to inform the research in a well-structured way. Five main categories were set up deductively, following the structure of the questionnaire and based on the theoretical background: background information; problems related to NFR on abandoned land; solutions; actors and roles/responsibilities; policy programmes and initiatives. For each of these five codes, two levels down of subcodes were developed inductively while going through the text repeatedly (Creswell, 2003; Keller & Truschkat, 2013).

Against the theoretical background, the data was coded going back and forth in the text and adapting codes. The storylines were developed during this process, reviewing coded text passages on problems and solutions including roles/responsibilities to group the coded text elements and to link them to coherent storylines (Keller & Truschkat, 2013) and to the main actor types voicing these storylines. In another review of the coded relevant text passages, the text was explicitly searched for discursive patterns – for instance, metaphors and language-bound symbols frequently used under a certain storyline. To meet the challenges of the researcher's own positionality, the data gathering and analysis was critically reflected upon with the involved researchers (first three authors) and the main interpretations, particularly the storylines, were substantially discussed among the first and the last author. This way, conclusions were drawn cautiously.

3.3 Results – storylines on NFR on abandoned land

Table 6 gives an overview of the storylines voiced in our interviews.

Table 6. Overview of storylines voiced in our data.

	Extensive agriculture	**Forestry**	**Landscape conservation**	**Wilderness**	**Insignificance (France)**
Problema-tisations	Loss of extensive agricultural practices destroys rural economies Large-scale farming and CAP cause land abandonment and disadvantages for small-scale farming Lack of integration across policy fields to tackle the issue	Lack of forest management makes NFR economically uninteresting and increases (fire) risks No active forest policymaking on NFR Difficult financial situation of forestry Fragmentation of policy fields across sectors, and regions (Spain) Land tenure system as challenge for addressing NFR	NFR threatens biodiversity-rich, heterogenous landscapes Increased fire risk (Spain) Lack of NFR inventories NFR not a priority at policy level Financial support focus on classical conservation, such as Natura 2000	Too few feral landscapes in Europe Lack of political recognition of NFR rewilding potential Governmental bodies do not feel responsible, as NFR is out of their usual scope No funding for wilderness projects related to NFR Traditional land uses often too costly to sustain	NFR is of too little relevance for French land use policy to be dealt with at the policy level.
Solutions	Defend rural economies at all costs Keep landscapes alive through extensive agricultural practices Tackle land abandonment at political level, mainly through CAP measures Innovative agricultural practices can play a role	Active forest policymaking and initiatives addressing NFR Support forest management as a tool for sustainable/rural development, e.g. through more forest measures under the CAP Integration of agriculture and forest-related policies	Conservation of existing ecosystems and sustainable forest management Keep open landscapes through extensive agricultural practices and support them politically NFR mapping, e.g. to put a clear status in rural development plans	Rewilding through NFR as important element of rural development and as a cheap solution for regions where no other economic opportunity exists Active policy support of rewilding through NFR Develop a positive framing of NFR	No need to act on NFR, as land has been abandoned for good reasons and it only happens at small scale
Discursive patterns	"decline of rural livelihood" as scare scenario	"unstructured forest" as negative pattern connected to NFR	--	"artificialisation" of landscapes "let nature take its course" "libre evolution" (in French) "putting back the missing piece" into ecosystems	--
Main actors voicing the storyline	Extensive agriculture and	Forestry representatives	Environmental representatives	Environmental representatives	Some agriculture and forestry

rural development representatives Agriculture related governmental institutions Scientists Some environmental representatives	Agriculture/forestry related governmental institutions Scientists Some environmental representatives	Conservation related governmental institutions Scientists	Conservation related governmental institutions Scientists	representatives

3.3.1 Extensive agriculture: extensive agriculture is keeping landscapes alive – we need to sustain it!

This storyline is concerned with the abandonment of extensive, often small-scale agriculture and the dwindling number of regional farmers. Extensive agriculture – understood as an extensive land use system often practiced on marginal land with less yields than intense farming – is considered key for lively and functioning landscapes: "if there are no agricultural activities there will also be no one left to live [in rural areas]" (G-FR). Consequently, it is considered irresponsible to leave the land completely unmanaged; NFR on abandoned land is thereby claimed as something negative. In fire-prone regions, the increased fire risk of NFR is considered an additional challenge.

The ongoing socio-economic transition in agriculture is addressed here as a problem, posing challenges for extensive farming and leading to land abandonment. The interviewees argue that these challenges are not being sufficiently tackled at the policy level. The disadvantages small-scale farming has compared to large-scale farming is considered a problem in both countries. Farming is being intensified in favourable, arable regions, whereas marginal land is being abandoned, and the number of medium and small-scale farms is decreasing. Lobbying and power exerted from the large agricultural sector is described as one of the reasons for these developments. According to the interviewees, medium and small-scale farmers are experiencing drastically reduced income, yet at the same time have a key role to play in landscape conservation and related issues such as wildfire prevention. Connected to these challenges, the economic system is mentioned as a problematic driver by some, as it is considered to overlook aspects not directly related to profitability and is hence described as inadequate to guide policymaking. Related to that, the EU Common Agricultural Policy (CAP) is problematized. Interviewees highlight the huge negative impacts of the CAP subsidy system on extensive agriculture. As pointed out by one interviewee, the CAP determines how cattle breeders run their business, pushing it towards a more industrial model, structurally dis-advantaging small-scale agriculture.

Regarding solutions, this storyline underlines the necessity to keep the rural landscapes alive: "our priorities are to return to productive land use" (A-FR). Landscapes need to be managed and maintained through traditional agricultural activities, ensuring the multifunctionality of spaces in rural development, creating a mosaic landscape. Keeping or restoring cultural landscapes through extensive agricultural activities is one of the main political targets, as these ensure local livelihoods and bring valuable conservation benefits. The aim is to "[defend] a dynamic and vital agriculture in the rural

territories" (G-FR), even if this is less profitable in economic terms. Farmers and other land managers are described as essential for taking care of the land.

According to the interviewees this includes the need to better support extensive farming at the policy level. Land use practices need to include proper forest fire management in fire-prone regions, reducing fire risk through the mosaic of land uses. Actors sharing this storyline argue that the CAP subsidy system needs to be adapted to fit the local needs of farmers. Subsidies for agroforestry systems are considered important, especially in the Mediterranean area, to support silvopastoral systems. Some actors argue for an agroecology approach, demanding more innovative agricultural practices in the field. They highlight the need for new ways of doing agriculture, combining traditional local knowledge from small-scale farming and extensive shepherding with state-of-the- art research. In their view, this will lead to an economically more viable and sustainable way of managing the land. They also express the need to support and encourage the shift towards organic agriculture and regional products. The label of "Appellation d'Origine Control´ee" in France is considered as an example of marketing products from regions with extensive agriculture, helping to keep the land under such management.

Moreover, in response to an observed cross-sectoral division, this storyline underlines the need for more coherent policies and integration across policy fields. According to the actors, landscape management concerns various sectors and its artificial separation into agriculture and forestry needs to be overcome as this affects the governance of crosscutting issues such as NFR.

3.3.2 Forestry: the land is getting shrubbed – active forest policy and management is needed!

Under this storyline, NFR is first and foremost considered in terms of its potential to generate new resources, for the wood industry, for energy production and for regional employment. A lack of forest management is considered the main problem related to NFR: "the forest area has increased, but in an unstructured way. There wasn't any forest planning and management, which is what we usually do" (F-ES). This is connected to the increased of through NFR: "A natural forest is much more unstable and has a lot more risks [than a managed one]. Additionally, the natural forest does not generate that many services, nor is it that multifunctional" (G-ES). Professional forest use (i.e. wood production) of NFR is described as being difficult; it is therefore argued that it is "irresponsible" to let these forests evolve freely without "taking care of them" (F- ES). In particular, Mediterranean ecosystems are described as being more vulnerable to climate change; "[NFR] is one of the key issues to tackle in this new era of high-intensity fires" (E-ES).

Several actors mention other negative aspects of NFR from a forest management perspective, referring to it occurring mostly on poor soils, on difficult-to-access territory or relating to bad wood quality in view of future timber use. According to them, NFR happens on "marginal lands where the growing conditions are not optimal so it is not the best lands" (F-FR). Essentially, on these lands "it costs sometimes more to put it into production than to do nothing" (A-FR). Therefore, it is argued that NFR does not contribute to improve the economically problematic situation of forestry nor does it contribute to rural development. Stands regenerated through NFR are not considered valuable in an economic sense. Consequently, most foresters and landowners consider NFR to be a challenge rather than an opportunity.

This storyline argues that there is a need for active policymaking on NFR at the policy level in France

and Spain. The issues related to NFR are not addressed purposely at the political level: “NFR is not a forestry policy of the Ministry of Agriculture” (G-FR). Related to this, “renaturalization […] is not a political choice, if it is, it is a political choice which is not conscious“ (F-FR). Furthermore, interviewees state that there is a lack of attention, political will and capacities: "[NFR] is not a subject for which we have fully grasped the potential for public action, not by the state, nor by the regions, nor the departments, nor even really by professionals. It is a bit of a non-subject in fact, which gets attention through other topics such as forest fire. [We are] not at all able to act on a largescale on this subject” (F-FR4).

This storyline also highlights the policy fragmentation between policy sectors and between regions. In France, renewable energy policy versus biodiversity protection is mentioned. In Spain, actors point to the sectoral competition, namely between agriculture and environmental bodies who “don’t even talk to each other” (A-ES). Forest policy falls under the competence of the autonomous communities; according to some actors sharing this storyline, this makes coherent and long-term land use and forest management planning at a larger scale difficult. Moreover, actors describe that forest policy receives little support for multifunctional forest management under the CAP and other policies, in contrast to agricultural and environmental measures.

Finally, the land property structure is described as the “number one obstacle” (E-FR) for public action on NFR. As pointed out by interviewees, most of the abandoned land in both countries is on private land – in France, often fragmented, small land – which limits the possibilities to intervene in the management.

This storyline presents management as “the magic word” (F-ES) to deal with NFR. The aim here is to improve forest stands through multifunctional management to supply multiple (provisioning) ecosystem services – providing quality products to the wood and energy industries while also catering to the employment and economic development needs of local communities. The storyline also highlights the need to valorise other ecosystem services forests provide, particularly as a carbon sink and in relation to biodiversity.

While challenging, actors state that “we don’t want to change the land use [from NFR] back to agriculture. We want forests to become economically valuable so that [landowners] can live from the forest” (F-ES). Implementing this requires funding for forestry measures and active forest planning: “[NFR] is taking place today and it will do so even more in the future; a budget is needed, and [NFR] needs to be included more actively in policies; and I insist, included in the territorial policies and within the depopulation policies” (F-ES). In fire-prone regions, effective fire prevention though NFR management is highlighted.

The storyline underlines that the CAP and the rural development programmes should enable more financial support for investments in the sector, as all this pays back to society with forest benefits. In Spain, the storyline highlights the crucial role of forests in the new legislation on climate change and energy transition. This is connected to the need to better inventory abandoned land. NFR inventories are mentioned as a precondition to address NFR politically and to gain financial support for NFR as a carbon sink. Here, better policy sector coordination and coherence is considered essential; to avoid establishing “a border between all forest-related and agricultural-related aspects […] there needs to be policies that encompass and deal with both of these aspects” (F-ES).

While this storyline considers active forest policy to be a necessary solution pathway, the actors are

nevertheless sceptical to what degree this will happen: “I don’t see it [NFR] in future policies either; I don’t see it reflected as an issue as such, the increase of forest area versus agricultural land. I haven’t detected it, nor, until now, does anybody talk about it” (F-ES).

In this storyline, actors in Spain argue that forest policy needs more political support compared to agriculture, which has traditionally been treated as more important. They do mention, however, that in some cases NFR-related issues have entered the political debate: for instance, the issue how to deal with NFR and how to set related objectives was discussed during the revision process of the Spanish Forest Strategy (G-ES) and during an amendment process of the Valencian Forest legislation (F-ES).

Deviating from the understanding that NFR creates forests less suitable for forest management, two interviewees in Spain consider NFR an efficient tool for afforestation without any assistance or costs. One interviewee argues that instead of focussing on afforestation, as has been done in Spain for decades, “we need to direct [NFR on abandoned land] towards what we really want it to be or improve it as much as possible or even support it so that it happens more quickly. This is what we are really missing” (G-ES).

Rewilding approaches are criticised under this storyline: “we don’t perceive it positively to stop human interventions in these [abandoned] landscapes – not at all; for Spain, this would be a catastrophe because in the long run that’s a loss” (F-ES). The interviewee expresses that rewilding “scares us a little bit, because it tells you should not intervene, don’t enter […]. We intervene, and it is always to improve things and to take care of things” (F-ES).

3.3.3 Landscape conservation: cultural landscapes are precious – we need to sustain them!

Under this storyline, nature conservation through agricultural practices is considered important in the European landscapes. Such practices should be extensive, conserving and sustaining valuable habitats and species in open landscapes, for instance through silvopastoral practices. The storyline hence aligns with the extensive agriculture storyline in underlining the need for using extensive, often small-scale agriculture to tackle NFR and to keep heterogenous, traditional agricultural mosaics.

Conservation benefits and opportunities through NFR are generally not considered. In certain regions of France, however, an exception is made under this storyline regarding NFR as a strategy for the restoration of wetlands and water bodies. In Spain, there is an additional notion that NFR has expanded to such dimensions that there is no need for more forest land.

This storyline argues that while NFR is important as a topic, it is not treated as a priority at the policy level. In France, interviewees mention that the topic often receives little attention or investment: for instance, the Ministry of Ecological Transition “is not looking into NFR as a priority; […] finances are spent in priority on species and areas of Natura 2000 and on the existing national protected areas. This leaves little room, intellectually and financially, to treat the question of NFR” (E-FR). This situation makes it difficult to integrate NFR into conservation strategies at the political level.

Decreasing financial resources at the regional levels are described as further constraining elected officials and farmers from implementing projects to manage these abandoned lands, whether for agricultural or conservation purposes. Additionally, interviewees point out that there is a lack of data on NFR; inventories are required to provide data for addressing the topic at the policy level.

In Spain, the increased risk of fire though NFR is described as a problem, one that is not sufficiently

addressed at the political level. One interviewee, criticising the reforestation policies of Spanish politicians, describes them as “electoral strategies” to get votes of those people who are unaware of the real forest situation in Spain.

Regarding conservation practices, this storyline gives priority to conserve existing ecosystems, such as cultural landscapes, to manage corridors of biodiversity and protected areas and to foster sustainable forest management.

They partly join the solution strategies of the extensive agriculture storyline, supporting extensive farming systems and open landscapes. While NFR is generally considered a threat under this storyline, the potential opportunities are acknowledged as well, such as creating new forest ecosystems (France) or more habitats for big carnivores (Spain). In France, environmental actors also point out that NFR on abandoned land is not really debated politically. Young forests resulting from NFR are not considered to be as important for conservation as other ecosystems, hence they do not fall under the radar of classical conservation approaches: “[NFR] is not a theme that we work on, we look more at the opposite, that is to say ancient forests which have been maintained over time and have specific characteristics” (E-FR). It is the “in-between” phases or the “landscapes in transition” (E-FR) that are less accepted: “The environmental benefit of abandoned agricultural activities might only be visible in 30–40 years once there is a balance in the ecosystem but until then I believe the benefits are quite low” (G-FR). It is argued that to bring more attention to these areas it is necessary to identify abandoned areas and give them a clear status in rural development plans (E-FR).

Under this storyline in Spain, NFR is mainly addressed connected to increased wildfire risk and sustainable forest management. Fire prevention plans are seen as a way to deal with NFR. Furthermore, actors point to a clear land use strategy, referring to proper land use planning and “active policies” that are “needed to understand what happens in the territory“ (E-ES). Furthermore, it is pointed out that NFR is coming anyways, whether wanted or not, stating that “there is no need to favour it” (E-ES).

3.3.4 Wilderness: feral areas are missing – natural forest regrowth brings them back to us!

This storyline sees an intrinsic value of natural processes, arguing that ecosystems need to develop naturally. Therefore, rewilding is considered a key approach in dealing with landscapes to re-create more wilderness and biodiversity. Actors argue that too few feral landscapes exist, as most land is impacted by human use. This artificialisation of land in Europe through intense land use is described as a key problem to be addressed through rewilding approaches.

At the policy level, the lack of political recognition of the potential of NFR for rewilding is seen as a problem, combined with the general disregard for both NFR and rewilding: “currently, concrete actions on spontaneous forests are missing at the political level” (E-FR). One interviewee emphasises “we don’t see the politicians, we don’t see anyone showing up on the field” (E-FR) and adds that such political support is necessary to initialise (active) rewilding projects. Another interviewee mentions that the passively restored forested surface is not acknowledged and “not politically supported today in France, for psychological and social reasons” (E-FR). This interviewee points to the negative societal perceptions of NFR and the difficulties people have adapting to landscape changes due to their strong attachment to the former landscapes. Interviewees also describe how the respective governmental institutions are not taking responsibility for NFR, that the focus is on tackling land abandonment

(agricultural institutions) or classical biodiversity protection (environmental institutions): “the Ministry of Agriculture [was] not interested since [our project] goes against what they are promoting, while for the Ministry of Environment this is not a priority and they don’t have funds for us” (E-FR). At the Ministry of Agriculture, Agrifood and Forestry “the main discourse and motivation is to cut wood” and to maintain agricultural activities (E-FR). In France, this storyline also addresses the conflicting and sometimes contradictory policies at the political level. Additionally, actors state that local initiatives are geared towards keeping landscapes open and that they change only slowly.

NFR is considered an opportunity for rewilding, representing a counter-development to the artificialisation of landscapes: “These [freely evolving] areas represent hope today in France to be rich in the biodiversity that we have lost over time” (E-FR). It is argued that NFR should be used for active and passive rewilding, creating biodiverse ecosystems. In Spain, active rewilding through the reintroduction of big herbivores and carnivores is highlighted as an approach, “through which we can bring back missing pieces into these new ecosystems” (E-ES). Big carnivores are considered relevant for fire regulation, through the maintenance of natural interruption processes.

NFR is described here as an important tool for restoration: “the simplest, the most economic and least expensive option is to let nature take its course, to let the species control the threats and let regrowth regenerate” (E-FR). Rewilding is considered an opportunity in landscapes where small-scale agriculture is not viable anymore and no other economic opportunities exist: “these large natural areas, which had been heavily occupied by traditional uses and suddenly become abandoned areas, […] we can create in these areas a new economy based on nature, economic resources and opportunities for the local population” (E-ES). Climate benefits derived from carbon sequestration are also mentioned. Actors argue for more policy support that acknowledges the importance of wilderness in Europe.

The debate about the potential of NFR for (active) rewilding has only recently started in both countries. As one interviewee puts it, there is an emerging discussion about the “exceptionalism” (E-FR) of these abandoned and naturally evolving areas. In France, the discussion about natural succession was “re-ignited” (E-FR) when the European Parliament published a resolution in 2009 on wilderness and nature in Europe. Following this resolution, an NGO created a wilderness working group to explore these questions. Prior to this, NFR was merely framed and discussed within the context of establishing natural reserves and parks. In Spain, actors point out that rewilding has been happening passively since the 1960 s; however, only recently have there been discussions about active rewilding approaches. Interviewees argue for a pragmatic viewpoint: “the traditional agriculture, which was carried out for centuries, nobody want to do it anymore because nobody wants to return to the nineteenth, the twentieth century, when they were slaves of the land; therefore, we are going to invent a new thing” (E-ES).

While the land tenure system is described as challenging for landscape management, one interviewee points to the positive impact for wilderness development: “the fact that these spaces are private and fragmented, in terms of land property, means that they are areas that often protect themselves” (E-FR).

In both countries actors address the need for mapping abandoned land, for instance, to give these areas a clear status in rural developments plans and to identify them as having an ecological role to play in the landscape. Identifying conservation objectives for these abandoned lands would ensure

that they are protected in the long term.

This storyline argues that the societal perceptions towards NFR hamper beneficial policy initiatives. Especially in France, interviewees highlight the need for an active and more positive communication strategy on NFR. According to them, the terminology of NFR often carries negative connotations and hence impacts how NFR is talked about. For example, the French term friche, designating uncultivated land, represents a negative connotation of abandonment. Hence, libre evolution is used purposely instead by some rewilding actors to establish a more positively viewed term. As one interviewee expresses: "we need to find a wording that allows for a shift in paradigm" (E-FR).

3.3.5 Insignificance storyline: the impact of natural forest regrowth is negligible – it is not worth caring about!

In France, some actors from agriculture and forestry voice elements of an insignificance storyline. They argue that the land has been abandoned for good reasons, for instance for being marginal and linked to socio-economic challenges. Correspondingly, NFR on abandoned lands is described as an insignificant issue with regard to land use policy. One interviewee mentions that the phenomenon happens in fragmented areas and too gradually to be significant in land use planning. For the general public, the process of abandonment therefore happens in the nowhere and "it doesn't bother anyone, it is a hidden misery" (A-FR). Additionally, the phenomenon "does not occur at a sufficiently large enough scale for people to be shocked by it" (A-FR). One interviewee states that there is a sort of "myth in saying that there are thousands of hectares of abandoned land in France which needs to be repurposed for agricultural production" (A-FR). These actors argue there is no need for abandoned land to get re-cultivated at all costs, nor do they see any need for other action related to NFR.

This storyline is not comprehensive enough to embed it into a bigger picture of problematisations and solutions. Yet, it reflects the view of those actors from forestry and agriculture who consider NFR a minor issue and demand to focus on other, in their perspective more important, phenomena in land governance.

3.4 Discussion

3.4.1 Methodology

NFR plays a role in different policy fields and this was a challenge for our approach. As the results show, the storylines connect to different sectoral policies such as agriculture, conservation and forestry, with the respective land use approaches connected to them. Moreover, several interviewees did not work on NFR specifically. This was challenging for the analysis, but at the same time an interesting result confirming that NFR is considered as a "non-issue" by some actors and institutions. Given the limitations of the interview as method (van Hulst & Ybema, 2020), we can assume that other data could have enlightened broader perspectives on how NFR is constructed, e.g. with a longitudinal perspective. However, the qualitative interview method was very useful to gather different insights into the topic given the partly limited availability of other data. While there are some country-specific aspects in the results, overall the storylines are quite similar across both countries, supporting the argument that they may provide relevant insights for other regions with large areas of NFR in Europe.

3.4.2 Discussion of results

When comparing the storylines, we find four specific approaches on NFR: (1) finding ways to make

use of forest goods derived from NFR (forestry), (2) focussing on keeping/reverting to agriculture (extensive agriculture, landscape conservation), (3) strengthening wilderness development and restoration through NFR (wilderness), and (4) in France, to ignore NFR (insignificance). These management approaches show the variety of ways how actors create their meaning of this landscape transition, ranging from a definite need to tackle it, over ignoring it, to seeing benefits in this process. This sheds light not only on the specific meaning actors attribute to NFR via sharing certain storylines, but may also indicate underlying paradigms connected to discourses, intertwined with specific (socio-economic) interests policy actors hold towards NFR.

Comparing the results with previous research, the forestry storyline links to the classic multiple-use forestry paradigm, which considers timber the main good from forests and is concerned with a profitable forest sector. Under this paradigm, the proposed governance arrangement focusses on an efficient timber exploitation through planning (Winkel, 2014). The extensive agriculture storyline connects to elements of the new rural development paradigm, shifting towards a multifunctional approach of agriculture and responding to a general transition in European agriculture by exploring how extensive land uses can be sustained in the long run (Miranda et al., 2013). The two storylines dealing with conservation are separated according to the "opposition between anthropocentric nature and wilderness" (Schnitzler et al., 2008, p. 425). The landscape conservation storyline links to the eco-agriculture paradigm (Scherr & McNeely, 2008), in which conservation is an explicit goal of agriculture and rural development (Schnitzler et al., 2008). The wilderness storyline refers instead to the need for nature to develop freely, also described as a "decolonisation of nature" (Schnitzler et al., 2008, p. 426), and refers to abandoned land as an opportunity for this new wilderness.

When looking at discursive practices, actors voicing the wilderness storyline strategically adopt arguments to create a new vision for NFR to counter the traditional negative views (Frei et al., 2020), and connect it to rewilding discourses on European forests (Edwards et al., 2022). Visions of what NFR could potentially be, such as the "missing piece" for ecosystems to function again, are contrasted with exhausting, self-exploiting farming of the past (see Table 1). Additionally, a link is made to a European policy agenda on restoration (European Commission, 2020), making the wilderness storyline a discursive bridge for connecting NFR to the powerful but rather blurry restoration discourse. Yet, the wilderness storyline's actors compete with historically anchored storylines about extensive agriculture and landscape conservation that link highly emotional discursive patterns with NFR – the loss of land uses, livelihoods and connected local identities, and potential ecological threats, above all forest fire in the Mediterranean (Frei et al., 2020). These imaginations link to emotions such as fear and sadness (van der Zanden et al., 2018), increasing the discursive power of such arguments (Leipold & Winkel, 2016a). Additionally, our findings show that extensive agriculture and the related cultural landscapes as policy solutions are at least partly institutionalized in existing policies and institutions. However, wilderness actors in particular point to the difficulty of getting their ideas institutionalised in policies at national levels.

The forestry storyline theoretically welcomes increasing forest cover, which connects to central elements of forestry discourses to enlarge forests and avoid deforestation (Arts et al., 2010). Some interviewed actors show such signs of appreciating NFR in line with forestry interests. However, this storyline is rooted in a culture of forests as resources to be managed and used systematically (Sotirov & Winkel, 2016); it objects to the idea of forests as wild nature, and hence voices concerns about the attributes of NFR stands. This results in a rather ambivalent argumentation, showing varying discursive

practices connected to NFR and reflecting a rather reluctant perspective, making the storyline and its suggested solutions – i.e. policy support for managing NFR – potentially less powerful.

The insignificance storyline is only visible in France; it is the main regional difference compared to Spain. This may be related to the fact that in France land abandonment and NFR are more regionally confined, largely limited to the South and mountainous areas (H. M. Pereira & Navarro, 2015). In the insignificance storyline, these territories are described as too small – or too marginal – to be a concern for land use policy; as such, they are not seen as promising for policy objectives. Thus, the insignificance storyline could be connected to large-scale, production oriented discourses and policies that are fiercely objected to by the extensive agriculture and landscape conservation storylines (Potter & Tilzey, 2005).

In contrast to the insignificance storyline, NFR is considered an important topic in Spain (and parts of France). It is connected with fire management, which is strongly linked to forest management (Corona et al., 2015). Moreover, a rural exodus connected to land abandonment is an important topic of 'high politics' and prominent in public debates. The idea of an 'empty Spain', marked by abandoned rural areas, is omnipresent; such topics are often addressed in the media (e.g. Esparza, 2019). In this context it may be difficult to neglect the role of abandoned lands, though this does not mean insignificance storylines do not exist here.

3.5 Conclusions

European landscapes are shaped by many centuries of changing land use practices. Ways of knowing about and experiencing a changing material environment, i.e. discourses and related storylines, are intertwined with the evolving landscapes and its land use patterns. These discourses become powerful through the connection to policymaking. Land abandonment and NFR result from a variety of socio-economic, policy and other drivers; competing ideas exist on how to govern these lands, as this paper made clear.

Our paper suggests that for future research on NFR it would be interesting to specifically look into the tension of how current European policy level discourses on restoration and rewilding – partially mirrored and rooted in urban societies or academia – interact with discourses on extensive agriculture and landscape conservation – possibly more rooted in the affected landscapes themselves. Inter alia, it will be interesting to trace how far the "new" storyline on wilderness can gain ground in institutions and practices. National policy levels will be critical for analysing these interactions, with national discourses and storylines assumedly serving "as a bridge or a 'translator' of the politicised EU level debates" (de Koning et al., 2014, p. 8) and the local level. Additionally, the interplay of storylines and discourses with institutions and the larger governance arrangement, addressing processes such as discourse institutionalisation, will be of great interest for future work. It is at this interplay between discourses, institutions and changing (material) practices where the landscape of the future – even more, our interpretation of this landscape – will be formed. Science and research will continue to play different roles in such discursive policymaking, ranging from legitimising and reinforcing certain arguments through evidence making to tracing shifting discourses and paradigms.

4. Can natural forest expansion contribute to Europe's restoration policy agenda? An interdisciplinary assessment

Published in Ambio[1]

Full reference: Frei, T., Espelta, J. M., Górriz-Mifsud, E., Hampe, A., Lefevre, F., Martín-Forés, I., & Winkel, G. (2023). Can natural forest expansion contribute to Europe's restoration policy agenda? An interdisciplinary assessment. *Ambio*, 1–12. https://doi.org/10.1007/s13280-023-01924-2

ABSTRACT

Natural forest expansion (NFE), that is, the establishment of secondary forest on non-forested land through natural succession, has substantially contributed to the widespread expansion of forests in Europe over the last few decades. So far, EU policies have largely neglected the potential of NFE for meeting policy objectives on restoration. Synthesising recent interdisciplinary research, this paper assesses the challenges and opportunities of NFE in view of contributing to European forest and ecosystem restoration. Specifically, we discuss the potential for supporting climate change mitigation and adaptation, biodiversity conservation, and forestry and economic use, summarize the current knowledge about societal perceptions and the policymaking on NFE, and make policy recommendations to better use the potential of NFE. We conclude that NFE has the potential to contribute to the European restoration policy agenda if local contexts and possible trade-offs are properly considered.

4.1 Introduction

Europe has historically faced more habitat fragmentation than any other continent. The region has been the first to undergo a turnaround from diminishing to increasing forest area as a consequence of farmland abandonment. Several Western and Central European countries reached the turning point in the so-called 'forest transition' in the nineteenth century, others in Southern Europe during the first or second half of the twentieth century (Kauppi et al. 2018). Since 1950, Europe's forests have increased by [300 000 km2 (Fuchs et al. 2013). Since 1990, the annual forest area increase has averaged 0.3%, with the highest rates being found in South-West Europe (+ 0.78%) and South-East Europe (+ 0.38%) (Forest Europe 2020). Increasing forest areas has been favoured by European and national policies for a long time through subsidized active forest restoration under the Common Agriculture Policy (CAP). However, a significant share of these new forests were not planted but are the result of natural forest expansion (NFE), that is, the expansion of secondary forest through natural succession on non-forest land (thus implying a land cover change) (FAO 2020). NFE is typically an 'unintended' process caused by a variety of socioeconomic, political and environmental factors, often relating to a lack of profitable alternative land use practices resulting in land abandonment (Rey Benayas 2007).

This phenomenon is likely to continue in the coming decades; a recent study estimates that no less than 200 000 km2 of EU farmlands are under high probability of abandonment between 2015 and 2030 (Perpiña Castillo et al. 2018). Although its contribution to the forest area increase across Europe is very difficult to quantify precisely, diverse regional-scale estimates imply that secondary forests

[1] The thesis version submitted for review contained the preprint version of this manuscript.

formed by NFE cover today at least several tens of thousands of km2 (e.g. Schierhorn et al. 2013; Potapov et al. 2015; Buitenwerf et al. 2018; Palmero-Iniesta et al. 2021). Studies suggest that 2/3 of the forest on agricultural land in the EU has regenerated naturally (Perpiña Castillo et al. 2018).

Forests play a central role in several major EU policy initiatives, owing to their critical importance for addressing the twin crises of climate change and biodiversity loss. The European Green Deal considers forests crucial for mitigating climate change, particularly through carbon sequestration from the atmosphere (European Commission 2019). Forests are also a critical subject of climate change adaptation and play a key role in meeting targets under the EU Biodiversity Strategy 2030. The Biodiversity Strategy proposes a EU Nature Restoration Plan ''to increase the quantity, quality and resilience of its forests'' (European Commission 2020, p. 10). One target set by both the Biodiversity Strategy and the EU Forest Strategy 2030 is to plant 3 thousand million additional trees in the EU by 2030 ''in full respect of ecological principles'', and to secure the trees ''for several decades'' to increase the forest area by 2000–3000 km2 per year in addition to the current forest area projections that include NFE (European Commission 2022b, pp. 4 and 7). Thus, NFE is not considered as an instrument to achieve the additional 3 thousand million tree target but is implicitly accounted for under the business-as-usual scenario. The EU Forest Strategy does explicitly mention the significant role of NFE: ''Spontaneous forest regrowth through natural succession is the main force driving the increase of forested areas in the EU, mostly associated with abandonment of agriculture and rural areas'' (European Commission 2021, p. 15). Although no further details or guidance on NFE is given, it acknowledges the potential of NFE for a forest restoration policy agenda; to our knowledge, this is the first such acknowledgement in a EU policy document. Furthermore, the European Commission launched a proposal for a EU Nature Restoration Regulation in June 2022, which foresees restoration beyond the Natura 2000 Network habitats; if adapted as currently suggested, this would include NFE on abandoned land (European Commission 2022a).

Recent interdisciplinary research underlines the potential of NFE for creating multifunctional, self-sustaining ecosystems that can provide diverse ecosystem services (Cruz-Alonso et al. 2019; Chazdon et al. 2020; Martín-Forés et al. 2020). However, research also shows the potential risks of NFE – for instance, related to a loss of cultural open landscapes (MacDonald et al. 2000; Plieninger et al. 2014) or to wildfires (Ursino and Romano 2014). A systematic assessment of the potential of NFE to contribute to European forest restoration is lacking. This paper provides such an assessment, based on existing literature in relevant research disciplines. Specifically, we have been screening the relevant European literature on the phenomena from a variety of relevant disciplines, including ecology and forest management, climate science, sociology, political science, and economics, and explore based on that the main challenges and opportunities relating to NFE from different angles. Subsequently, we outline recommendations for policymakers to unfold opportunities and to deal with existing challenges regarding NFE.

Specifically, we ask:

What is known about the challenges and opportunities connected to NFE in relation to the EU's forest policy objectives?

What can be concluded for the policymaking on NFE in Europe?

4.2 Challenges and opportunities of NFE

4.2.1 Biodiversity

The establishment of secondary forests resulting from NFE (from now on 'secondary forests', if not stated differently) and associated succession processes generate a consistent increase in the area, biomass, vegetation structural complexity and species richness of woody habitats. New forests are typically colonised very quickly by common, mobile and generalist species (Espelta et al. 2020; Prach and Pysˇek 2001; Whytock et al. 2018; Valde´s-Correcher et al. 2019), especially when they are well connected to source habitats in the surrounding landscape matrix (Cruz-Alonso et al. 2021). Hence, secondary forests can quickly exhibit levels of taxonomic and functional diversity comparable to those observed in long-existing forests sharing the same structural characteristics (Espelta et al. 2020). However, the arrival of regionally rare, not very mobile and specialist species and the associated build-up of complex multi-species networks of biotic interactions can require many decades or centuries (Jacquemyn et al. 2001; De Frenne et al. 2011; Correia et al. 2021). Hence, even extensive secondary forests cannot compensate for the loss of old-growth forests with their unique biodiversity (including many highly specialized species), structure and functioning (Selva et al. 2020).

From a biodiversity conservation perspective, NFE can have a variety of positive and negative effects. NFE has significantly contributed to forest connectivity and defragmentation across Europe (Palmero-Iniesta et al. 2020). This process has favoured numerous forest-dwelling species including birds (Whytock et al. 2018), Lepidoptera (Ruiz-Carbayo et al. 2017) and Diptera (Fuller et al. 2018). New secondary forests can also serve as habitats and 'stepping stones' for the expansion of invasive species (With 2002). Moreover, NFE represents a major challenge for the conservation management of species-rich, seminatural open habitats formed by historical extensive livestock farming (WallisDeVries et al. 2002; Calaciura and Spinelli 2008), causing a rarefaction and local extinction of species living in such habitats, including butterflies, birds and plants (Plieninger et al. 2013; Melero et al. 2016; Regos et al. 2016). Nevertheless, NFE is not a primary driver of the widespread decrease of habitat diversity (i.e. landscape homogenisation) (Palmero-Iniesta et al. 2020), a trend mostly caused by agricultural intensification.

Overall, the effects of NFE on biodiversity and its conservation are highly context-specific. They usually depend on components such as (i) the type of habitats that new forests are replacing (e.g. arable lands, industrial wastelands, species-rich grasslands), (ii) the surrounding landscape matrix and its species pool (e.g. forest area, productivity, fragmentation level), (iii) the extent and spatial distribution of NFE processes (e.g. colonisation of little spots in the landscape vs. large continuous areas), and (iv) the time elapsed since the abandonment of former land uses. As a consequence, the challenge for landscape and conservation management consists in ensuring that the potential effects of NFE on biodiversity are addressed at a proper spatial (i.e. local and landscape) and temporal (i.e. long-term) scale (Whytock et al. 2018), weighing associated benefits and trade-offs in relation with other land uses.

4.2.2 Climate change mitigation

NFE bears extensive opportunities for climate change mitigation through carbon sequestration and regulation (Navarro and Pereira 2012). Regional and global studies have highlighted the great potential of regrowing secondary forests (planted or naturally grown) to act as carbon sinks (Vilá-Cabrera et al. 2017; Cook-Patton et al. 2020). The carbon sequestration potential of NFE is not merely an effect of increasing forest area but is also linked to some particularities of trees growing on former

croplands and pastures, mostly related to physicochemical soil legacies. Firstly, past agricultural land use often results in soils with higher nitrogen and phosphorus content (Compton and Boone 2000; Fraterrigo et al. 2005), which tends to enhance tree growth (Alfaro-Sánchez et al. 2019) and boost above-ground biomass productivity (Poorter et al. 2016). Secondly, former agricultural soils tend to be deeper but poorer in soil organic carbon than soils with long-existing forests (Clark and Johnson 2011; Wertebach et al. 2017). This provides the opportunity of storing a considerably larger amount of carbon in agricultural soils than in more saturated forest soils. Ultimately, as long as wildfire risk is managed, NFE growth would offset a significant amount of carbon emitted (e.g. 9% of the total emissions in Spain between 1986 and 2007; Vilá-Cabrera et al. 2017).

Notwithstanding the above-mentioned benefits, the future potential of NFE for climate change mitigation in the EU is subject to some challenges concerning: (i) a certain mismatch between areas of highest carbon sequestration potential and areas where land abandonment occurs (see Cook-Patton et al. 2020), and (ii) the resilience of secondary forests to climate change related disturbances. Although extensive farmland surfaces are projected to be abandoned in the EU by 2030 (Perpiña Castillo et al. 2018), this trend is predicted to occur mostly in areas with restricted plant growth potential (this being one of the reasons for agriculture cessation). This is the case for the Mediterranean region, where tree growth associated with NFE may benefit less from the biological and physicochemical legacies of abandoned agricultural soils owing to climatic constraints (Palmero-Iniesta et al. 2021), therefore limiting the mitigation potential of NFE. In addition, the higher growth rates observed in secondary forests in comparison to long-established ones may also come with increasing disturbance risks constraining the potential for climate change mitigation. This is the case if growth occurs at the expense of changes in functional traits (e.g. leaf area index, wood density, root morphology) that control tree resilience to disturbances (e.g. drought, insect pests, wildfires, storms). In line with this, Mausolf et al. (2018) observed that naturally regrown beech forests on former agricultural lands in Germany exhibited a greater growth reduction during adverse climatic conditions compared to long-existing forests, probably owing to the smaller root systems they developed in more fertile soils. Similarly, Alfaro-Sánchez et al. (2019, 2021) reported lower wood density and an overall higher sensitivity to climate-induced stress in naturally regrown forests in Spain. Besides functional attributes, the species composition of naturally regrown new forests may also condition their response to disturbances. For instance, these forests have exhibited more resistance to insect herbivory than long-existing forests (Espelta et al. 2020; Ruiz-Carbayo et al. 2020); yet they exhibited a lower resistance and regeneration ability after wildfire (Puerta-Piñero et al. 2012).

Summing up, NFE definitely holds significant potential for climate change mitigation in Europe and elsewhere. Risks from climate change and related disturbances need to be accounted for and specific management measures may be needed to increase the resilience of naturally regrown forests to such risks, particularly in Southern Europe.

4.2.3 Climate change adaptation

NFE can support climate change adaptation at two different scales: (i) ecological and evolutionary processes can help secondary forests to increase their own resilience, and ultimately persistence, in a changing environment; and (ii) secondary forests can contribute to the adaptation of wooded landscapes as a whole. For the first, naturally regrown forests tend to exhibit structural and ecophysiological characteristics that may confer on them a different resilience to climate change and associated disturbances (e.g. windstorms, drought, insect pests) compared to both tree plantations or long-existing forests. As for the comparison with tree plantations, the resistance of secondary forests to windthrow benefits from a heterogeneous canopy structure generated by the successive and

irregular tree recruitment that characterises them. Compared to long existing forests, the newly established forests benefit from a tendency of trees growing under high levels of solar radiation to invest more resources in radial increment and less in height growth which increases their resilience (Mitchell 2013). The tree recruitment under high solar radiation in secondary forests could also explain observations that trees from such forests tend to display a higher water use efficiency than those from long-existing stands, acquired through the development of a lower specific leaf area (Acuña Míguez et al. 2020; Guerrieri et al. 2021). On the other hand, trees resulting from NFE often tend to grow faster and to develop lower-density wood compared to long-existing forests, which potentially increases their susceptibility to drought stress (Alfaro-Sánchez et al. 2019; but see Espelta et al. 2020). Future studies have to elucidate which of the involved ecological and ecophysiological mechanisms will be determinants for the resilience of secondary forests to increasing drought and windthrow risks. In any case, extensive tree mortality following climatic extreme events tends to enhance the natural recruitment of young trees and to favour rapid vegetation recovery (Lloret et al. 2012), unless it occurs over large areas. From a long-term perspective, such enhanced recruitment can favour the spread of drought-resistant genotypes and ultimately the microevolutionary adaptation of such forests to novel climatic conditions, an effect that can only be observed in forests that regrow naturally (Petit and Hampe 2006; Saleh et al. 2022).

Secondary forests show not only extensive variation in tree height and density, but also a diverse composition (Basnou et al. 2016) and sometimes higher diversity of woody plant species than planted forests (Cruz-Alonso et al. 2019) or long-existing managed forests (Espelta et al. 2020). A higher number of tree species provides ecological insurance against different disturbances; increasing tree species diversity is considered one of the pillars in helping forest ecosystems cope with environmental disturbances (Jactel et al. 2017). In the particular case of insect pests, mixed-species forests resulting from NFE probably benefit from a low appearance of host trees for insect herbivores (Castagneyrol et al. 2013) as well as from a high variation in plant palatability, which helps reduce herbivore performance (Wetzel et al. 2016). Future studies have to address the relevance of this effect during pest outbreaks to better understand the resilience of secondary forests resulting from NFE to this particular type of climate change impact. On the landscape scale, NFE may help create more resilient forest landscapes by contributing to the development of functional complex networks (sensu Messier et al. 2019) of forest patches varying in tree species composition. As tree species composition of secondary forests patches stemming from NFE is more different among them than other types of forests (Espelta et al. 2020; Cruz-Alonso et al. 2021), they may serve as reservoirs for many woody plant species as well as other favourable biotic agents, which can then colonise surrounding forests. In cases of high wildfire risk, however, NFE—same as planted forests—may contribute to fuel networks; these negative aspects may require specific management measures. Further research is needed to provide empirical evidence of the role of NFE for the local adaptation of forests and wooded landscapes to climate change across different local contexts.

4.2.4 Forestry and economic use

NFE is increasing forest biomass substantially in some regions. This brings a potential for additional forest biomass use for forestry and a forest-based circular economy. Beyond woody biomass, the new forests can provide non wood forest products, as well as opportunities for other ecosystem services that can be economically valuable to local communities.

The wood usage potential of NFE depends on various factors. The forest composition and structure are important; for instance, some of the colonising species might not be marketable or they might be protected by law, such as some Juniperus spp. in Spain. The most immediate use for recently grown

trees is bioenergy (fuelwood, chips, pellets), as small diameter trees of almost any species can be used. While reactivating these lands for fuelwood production may be profitable only under certain accessibility and machinery circumstances (Elyakime et al. 2011), fuelwood usage is attractive as it has a relatively short rotation and a rather good market (Piussi and Pettenella 2000). Medium-sized diameters (>25 cm) of coniferous may well serve the demands of the pallet and cross-laminated timber industry – the latter having a considerably higher added value than the former. Yet, the forest industry is probably not present in many regions where NFE occurs to a large extent, although the forest industry is expected to expand in some regions related to the promotion of sustainable wood construction (Fraser 2017; Jonsson et al. 2021). Furthermore, the potential usage depends on the legal provisions restricting biomass harvesting, such as the administrative difficulty of changing the registered land use category from agriculture to forest land, or of fulfilling the requirements for forest management plans and harvest permits (Nichiforel et al. 2018). Additionally, the potential of NFE can depend on technological harvesting limitations as well as on the existing value chains in the demand area and on broader socioeconomic factors determining economic feasibility of forest management.

As well as firewood, NFE can provide a diversity of non-timber products such as fungi, fruits, herbs and game. The new forests can also provide shelter to various organisms, which might result in positive externalities for surrounding crops (e.g. pollinators, predators of agricultural pests; Rey Benayas and Bullock 2012), or in disservices (e.g. wild boar, roe deer). For example, fungi of economic interest will appear spontaneously if the mycelium spreads along with tree colonisation. Previous cereal parcels and successional shrublands are well suited to host (black) truffle mycorrhized oaks (Reyna Doménech et al. 2002; Taschen et al. 2015). Pine-dominated areas are adequate hosts of symbiotic mushroom species that are in high demand (de Aragón et al. 2007). Valuable edible nuts start developing relatively early – at stands of approximately 10 years for conifers (e.g. *Pinus*) and 20 years for broadleaved species (e.g. *Quercus*, *Castanea*). Some aromatic (e.g. *Thymus*, *Rosmarinus*), cosmetic (e.g. *Cistus ladanifer*) and medicinal (e.g. *Arctostaphylos avaursi*, *Glycyrrhiza glabra*) plants may be the first to colonise the new forests (Cristóbal et al. 2020). Pine resin can be harvested once the trees have reached a threshold diameter, which takes 50 years (Pinillos et al. 2009). Cork can be commercially harvested from cork oak (*Quercus suber*) once they are 20–30 years old. Furthermore, NFE offers possibilities of gathering forest materials for decorative uses, such as pinecones or heather (Lovric et al. 2020). Artisanal handcraft is also possible from shrubs colonising these NFE (e.g. *Buxus sempervirens*, *Salix fragilis*). Additionally, secondary forests can harbour animal-related economic activities, such as honey production, hunting or silvopastoralism (Gortázar et al. 2000).

Next to providing economic opportunities, related forest management interventions such as tree harvesting, pruning, species diversification and grazing introduction may provide co-benefits, such as reducing the fuel ladder structures to lower the risk of canopy fire, reducing tree density to increase water yields, or increasing human accessibility to improve recreational use. However, the socioeconomic factors that have triggered (agricultural) land abandonment will possibly hamper forest use options. This includes accessibility for mechanised harvesting, stand productivity, labour availability and regional demand for products (Frei et al. 2020). It remains an open question how far technological innovations (e.g. increasing harvesting robotization; Parker et al. 2016), will increase profitable forest use options, with future machinery potentially reaching previously inaccessible areas.

4.2.5 Societal perceptions

The transition of former agricultural land into forest is a significant land use change impacting people across Europe. There is a need to assess and consider the perspectives, needs and interests of those

owning and potentially working with the land, as well as the wider network of related societal groups, including visitors such as recreationists.

Societal perceptions related to land abandonment and NFE have been studied in different countries in Europe. These studies mostly focus on the early stages of NFE after land has been abandoned. While findings are clearly context-dependent, there are some shared patterns that can be made out at the local scale. Studies reveal opportunities related to environmental, forest, rural development and tourism, as actors consider benefits through new ecosystem services provided by NFE in the future. These are partly connected to the development of wilderness through naturally evolving ecosystems (Höchtl et al. 2005; Frei et al. 2020), to recreational opportunities especially when NFE occurs close to urban areas (Martín-Forés et al. 2020), as well as a potential increase in forest biodiversity and forest-related goods.

However, results largely show that local actors involved in land management (e.g. farmers, landowners) often have negative and defensive attitudes towards agricultural land abandonment and NFE. The main reasons for such negative perceptions are connected to the loss of cultural landscapes – long characterized by agricultural practices, often intertwined with local culture and traditions – and the related socio-economic consequences for (rural) livelihoods (Soliva et al. 2008; Frei et al. 2020). This adds 'emotional and cultural dimensions of change' to NFE (Fernández-Giménez 2015, p. 1). Groups attached to these former land use practices prefer cultivated landscapes, characterized by traditional agricultural mosaics, such as silvopastoral systems in the Mediterranean climate region. From an aesthetic viewpoint, which also plays a role for tourism, the traditional landscapes stand in contrast to unmanaged forests emerging from NFE; if land transition occurs on a large scale, this can affect the scenery (e.g. Bieling 2013). The attachment to cultivated landscapes with a mixture of open and forested land has been documented for many European regions (see for instance Soliva et al. 2008; Bieling 2013; Ruskule et al. 2013; van der Zanden et al. 2018; Zagaria et al. 2018). Furthermore, the initial stages of NFE and a lack of management tends to be problematized by land use managers and owners, connected to the perceived need for 'regular' forest management (Frei et al. 2020). In relation to this, new forests are associated with increased risks, such as forest wildfires (Soliva et al. 2008; Frei et al. 2020).

Conflicting perceptions relate to different socioeconomic interests, ways of life and worldviews, connected to farming, forestry, recreation or conservation (Soliva and Hunziker 2009; Martín-Forés et al. 2020). Additionally, the generational, educational and geographical context can play a role; the younger generation or urban actors may value the nature and leisure aspect of NFE more than others (Ruskule et al. 2013; Martín-Forés et al. 2020; Zoderer and Tasser 2021). This indicates some potential conflict regarding the spatial distribution of NFE: while if often (although not only) occurs in sparsely populated regions with marginal lands, the strongest demand for recreational landscapes and forests as green spaces occurs in peri-urban areas (Frei et al. 2020; Barnaud et al. 2021).

In summary, there is a need to balance expectations and demands originating from different actors and scales of policymaking, particularly between the local and European levels. Adequate management options for NFE need to be based on the local contexts.

4.2.6 Policymaking

NFE has now been recognized in the EU Forest Strategy as an important driver of forest area increase and may play a bigger role under a new EU restoration law. Yet it is still not explicitly addressed in most EU policies. An implicit focus on the phenomenon is connected to land abandonment in agriculture and rural development policy. Here, NFE has mainly been considered from the viewpoint

of avoiding agricultural land abandonment; CAP measures have aimed to keep the agricultural system running, including agricultural re-use with respective measures under the CAP (Varela et al. 2020; Fayet et al. 2022), while at the same time active reforestation was supported. This political neglect of NFE is remarkable as the process offers cost-effective opportunities from a policy perspective. Since NFE occurs naturally, no budget, resources, people nor programmes are needed for forests to grow, making it less costly than active restoration measures.

Investigating the existing literature, some challenges become apparent that help to explain why NFE has been neglected as a policy issue at the European scale. NFE on abandoned agricultural land is a topic that spans different policy sectors with diverging interests and perspectives on the issue, above all agriculture, forestry and conservation (Varela et al. 2020; Frei et al. 2022). Different policy objectives for forests in these sectors and a lack of policy integration at the EU level (Winkel and Sotirov 2016; Sotirov et al. 2021) make it challenging to take coordinated policy action regarding NFE (Varela et al. 2020; Frei et al. 2022).

Furthermore, NFE is an ecological process that occurs without any need of active policymaking. This may go against the usual bureaucratic and sectoral interests, which favour 'active' policymaking and giving mandates and resources to public agencies (Krott 2005). Active processes such as afforestation or subsidizing agricultural use align better with this logic; passive ecological processes may be considered less politically 'capable'. Additionally, potentially useful management trajectories are highly context-dependent, related to, for instance, the ecological, socioeconomic and/or land-tenure situation (Frei et al. 2020). These aspects may make NFE less suitable for policymaking at higher (EU) levels.

Lastly, there is a lack of political will to act on NFE. There are only a few policy actors with an explicit interest in NFE (Fayet et al. 2022; Frei et al. 2022). In a study in France and Spain, NFE was shown to be incompatible with traditional policy narratives of the affected policy sectors. Conservation actors tend to focus on old-growth forests with their specific biodiversity, or on traditional, extensively used mosaic landscapes, which are seen as being threatened by NFE. Forestry actors focus on the management of existing forests and plantations rather than on the comparatively young successional forests, which are of only limited economic interest in the early stage of NFE. Agricultural actors tend to focus either on agricultural boom regions, where NFE does not occur, or they see NFE as a process to be stopped or even reversed by subsidizing agriculture (Frei et al. 2022). For a few years now, some non-governmental actors such as the NGO Rewilding Europe have been actively promoting rewilding and wildlife comeback on abandoned land, highlighting its benefits through a ''nature-based economy'' (Rewilding Europe 2022), a concept that can also be found in the academic literature (Bassi et al. 2022). Thus, new narratives connected to land abandonment may be emerging (Frei et al. 2022). Although still largely missing at a European scale, some studies have found specific policymaking connected to NFE at the local level, directly connected to management and land use planning (e.g. in Scotland, see Barnaud et al. 2021).

In sum, the potential of NFE to contribute to restoration policy objectives has, at least in the past, hardly been considered in European level policymaking. This may change slightly in the near future due to a stronger focus on forest restoration at the EU level, but policy-related challenges continue to exist.

4.2.7 Summary

Table 7. Overview of the main opportunities and challenges of NFE. summarizes the main challenges and opportunities of NFE for each topic discussed.

Table 7. Overview of the main opportunities and challenges of NFE.

Topic	Opportunities	Challenges
Biodiversity	• Increase in forest habitat area, structural complexity and species richness, especially in the long-term • Increase of landscape heterogeneity, forest connectivity and defragmentation depending on the distribution of forest regrowth across the landscape (mosaic structure) • Habitats for agricultural auxiliars (e.g. pollinators, predators of agricultural pests)	• Rarefaction and local extinction of open landscapes and species depending on them • Habitats and connectivity may also favour invasive species
Climate change mitigation	• Effective carbon sequestration connected to carbon accumulation potential of young forests • Additional carbon mitigation potential rooted in agricultural soil legacies that can lead to enhanced tree growth and carbon capture	• Areas of highest carbon sequestration potential not matching areas with land abandonment at present • Increasing risk of climate change disturbances may negatively affect long-term mitigation potential of forests
Climate change adaptation	• Naturally regenerated stands with heterogeneous structure increasing resistance and resilience to disturbances • NFE growth conditions favouring acclimation and selection for drought resistance • Increase in functional diversity supporting resilience of new forests and of the whole wooded landscapes	• NFE species composition constrained by local resources • In some situations, NFE requires specific risk management measures (e.g. wildfire)
Forestry and Economic Use	• Wood usage potential, depending on forest composition, management and socio-economic feasibility • Provision of non-wood forest products, such as mushrooms, nuts, and resin • Supply of other (non-provisioning) ecosystem services, such as accessibility for recreation or erosion control	• Context-specific socio-economic factors preventing forest use, such as labour availability, regional demand for products, accessibility for mechanisation, and productivity • NFE providing habitat to species that cause damages in surrounding agricultural areas, such as wild boar, roe deer or wild goats
Societal perceptions	• NFE providing new land use options, for instance, to tourism, recreation and forest-related goods,	• Negative attitude towards NFE scenery, as a symbol of the decline of rural livelihood and the loss of cultural landscapes and aesthetic values

	potentially supporting a positive attitude towards NFE • Positive attitude towards NFE as wilderness and recreational area	• Conflicting perceptions related to different socio-economic interests
Policymaking	• Naturally occurring restoration of forest and forest area increase, supporting respective EU and national policy objectives • Cost-effective process taking place without additional funding needed depending on future land use objectives	• NFE as intersectoral topic leading to conflicts where sectors have fundamentally different objectives for these lands • Neglect of NFE at EU policymaking level and currently a lack of specific policy strategies regarding NFE as a tool for restoration

4.3 Policy recommendations

(1) Integrate NFE as a tool for European forest restoration policy

As shown above, NFE can contribute significantly to the objectives of European land use, forest and environmental policies. So far, EU policies have hardly explored this potential, mostly ignoring the process. Hence, a first recommendation is to explicitly consider NFE as an important process of forest restoration and to develop explicit policies to support and manage the process. The current discussion about EU-level restoration legislation includes ideas about requesting Member States to develop national restoration plans and considering habitats beyond the Natura 2000 Network. This discussion could be a good starting point for explicitly addressing NFE.

Nevertheless, NFE is not a silver bullet. While the process has happened and is happening at significant scales, an active consideration of different management and conservation options may be needed to best exploit its potential for nature and society, at least under past and current socioeconomic conditions of land management. As the above discussion has shown, governance and management concepts need to be connected to:

- The respective main objectives for the new forests, spanning climate change mitigation and adaptation, biodiversity conservation, as well as different types of forest use;
- The socioeconomic settings in which NFE occurs that enable or constrain management options;
- The societal interests and perceptions towards these forests that enable or prevent different management approaches.

This paper illustrates that NFE can be evaluated quite differently. Thus, NFE needs to be considered from different angles, not only from the perspective of climate change mitigation and biodiversity conservation, but also considering different forestry uses and the socioeconomic contributions of forests to rural development, ranging from woody biomass to non-wood forest products and multiple locally valuable forest ecosystem services. Involving different sectoral and societal views calls for policy integration; this requires processes to integrate different concerns in conservation and management planning, and necessitates addressing trade-offs. Finally, and possibly most importantly, the highly imbalanced geographical distribution of NFE poses a significant challenge. It rarely occurs

in fertile landscapes characterized by intense agricultural use, nor areas with little forest area—i.e. the areas where natural reforestation could bring the highest benefits from a biodiversity or recreational perspective. Along with making better use of an ongoing process caused by changing socioeconomic conditions in the periphery of Europe's agriculture, NFE could be actively encouraged in regions where it will not occur without intervention but where it may have the highest benefits for biodiversity and people. These latter regions require consideration of the likely much higher costs and trade-offs with agricultural production or infrastructural development.

(2) Develop regional strategies that place restoration management into the context of local needs

There are different options for managing NFE on abandoned land. First, abandoned land can be afforested to create new forests. Second, abandonment can be tackled and reverted resulting in a re-use of agriculture—most likely with extensive agriculture, but intensification is also possible. To keep extensive agriculture running, or to revert to it, requires finding a sustainable socioeconomic basis, for instance in combination with tourism and landscape subsidies (Varela et al. 2020). Lastly, NFE is often the 'natural trajectory' on abandoned land, making it potentially useful for forestry; it may also be useful for non/low-intervention conservation approach, by implementing active or passive rewilding.

Deciding where a given scenario can occur and if it is suitable requires support from policymaking and land planning. As precondition for any of the mentioned management options, regional inclusive governance processes are needed to identify concepts for how to manage NFE, including the option of non-intervention approaches. Restoration objectives may determine the value and potential of NFE. Local needs and visions need to be balanced against national and bigger European policy objectives. Different perceptions and land use 'ideologies' and interests connected to NFE need to be kept in mind; space should be given to elaborate multiple viewpoints so as to develop shared land use scenarios. Trade-offs are necessarily part of decisions about what direction to take, at least at the local scale. This calls for regional restoration assessments reflecting on the potential of NFE as a tool to reach restoration goals. If the EU implements a restoration legislation in the future, NFE can and should be included as one tool to increase forest area. NFE can support some of the forest restoration indicators that were discussed in a recent proposal by the Commission, namely forest connectivity, common forest bird index and organic carbon stock (European Commission 2022a).

(3) Support interdisciplinary research and monitoring on NFE

Our assessment has demonstrated the importance of considering multiple perspectives in the assessment of NFE; hence, more interdisciplinary research is needed to explore different facets of NFE comprehensively. Improved knowledge and data are required to answer important questions at the European scale, about where NFE occurs and in what contexts, including the elaboration of future development trajectories. This needs to involve both ecological and socioeconomic dimensions (Barnaud et al. 2021; Frei et al. 2022). On the natural science side, a better understanding of the quantity and distribution of NFE is key, but also the 'quality' of NFE (i.e. analysing the composition and dynamics of the new forests). Regarding biodiversity, while there is rich data for habitats under the Natura 2000 Network, sound data for habitats beyond the network is often missing and is much needed (Costa Domingo et al. 2022). From a social science perspective, there is a need to better understand the existing policymaking and broader governance scheme of NFE at regional/local levels, and how suitable policy strategies could act as role model for the national restoration plans as required under the Nature Restoration Regulation. In any case, research on NFE should enable opening up perspectives about potential risks and benefits, without being overly supportive for only one trajectory of land abandonment, as has often happened in the past (Dolton- Thornton 2021).

4.4 Conclusions

This paper assesses the challenges and opportunities of NFE for the current forest restoration agenda in Europe. Specifically, we discuss NFE against the background of existing research connected to biodiversity, climate change adaptation and mitigation, forestry and economic use, societal perceptions and policymaking. Thereby, we find opportunities and challenges connected to NFE as a forest type and as a new forest area on former agricultural land. We argue that opportunities connected to NFE exist, if the ecological and socioeconomic context allows and if respective management measures are taken up to deal with trade-offs and associated risks. Up to now, however, NFE has hardly been considered as a tool for restoration at European scale. We suggest taking NFE into account as a tool under EU restoration policies and beyond, while not losing sight of associated challenges and trade-offs with other policy objectives.

5. Overall discussion and conclusions

5.1 How NFR is constructed discursively

The starting point of this thesis was to understand how actors make sense of NFR and how NFR is discursively constructed. Particularly at the local level, the results show that NFR is often narrated as a threat for open landscape biodiversity and traditional landscapes, representing a symbol for rural decline and forest fires. The narrative about NFR as an opportunity for wilderness creation or the provision of new forest resources is shared less at the local level than at the regional/national policy level. Additionally, we find elements of an insignificance narrative in France that does not consider NFR of any importance. These findings are presented in-depth in chapters 2 and 3.

From an analytical viewpoint, a relevant aspect arising from the findings of this thesis is the relationship between discourse creation and ecological and socio-economic reality. As introduced in the beginning, discourses are produced and reproduced ideas "through which meaning is given to physical and social realities" (Hajer, 2009, p. 60). The question of how a discourse (constituted by narratives) interacts with these realities (e.g., the biophysical reality in landscape and ecological objects) and practices within which they occur (e.g., social traditions) is discussed by different scholars in the literature (see e.g. Barnaud et al., 2021; Behagel et al., 2019; Leipold et al., 2019; Turnhout et al., 2013). Barnaud et al. (2021) discuss the role of ecological processes in discourse creation, using the example of forest regeneration in European mountain areas. Therefore, they apply a framework of discourse creation that is particularly interested in "the social and ecological factors underlying the construction of discourses on an environmental issue" and explicitly call for a consideration of the ecological dimension in discourse creation. As Barnaud et al. (2021, p. 64) argue, "ecological materiality *does* matter in the emergence of discourses, especially in the use of ecological arguments". This is interesting, as discourse analysis usually rather focuses on making sense of the reality, focusing on values, ideas and interests, but puts less importance to for instance the ecological materiality as such. For instance, Hajer and Versteeg (2005, p. 176) write that "for interpretive environmental policy research, it is not an environmental phenomenon in itself that is important, but the way in which society makes sense of this phenomenon". However, additional insights can be explored when also considering the role of the environmental phenomenon in discourse creation. NFR is a good example, as it primarily represents an ecological process and is often addressed as such in the (natural science) literature. Therefore, the question is how NFR as an ecological object (i.e., the successional forest regrowing on abandoned land) interacts with the meaning that is attached to NFR by different actors. The ecological contexts in which NFR occurs vary, and this variety can play a role in whether a certain narrative is being voiced and heard or not. For instance, the pro-forest management narrative is prominent in the case of secondary forests of Atlas Cedar in Southeast France (chapter 2). In this case, Atlas Cedar is positively perceived for being aesthetically pleasing and economically interesting for forestry (Derks, 2017). On the contrary, the same narrative is minimally voiced and heard in the Alto Tajo region in Spain, where NFR with Spanish Juniper is negatively perceived and does not have any economic use (chapter 2). Therefore, while values, ideas and interests are essential for discourse creation, ecological contexts can play a role as well.

Consequently, it can be asked how the discourses interact with environmental changes, as ecological (and socio-economic) reality changes over time. In the case of land abandonment and NFR, physical and social realities in the landscape and society are continuously changing. This means that the

narratives on NFR will change at one point if realities are changing. Therefore, we can discussed how and when narratives are changing. As Winkel (2013) asks: when does the "discursive rupture" (translated by the author) occur, as narratives do not fit anymore to existing realities, and tensions between physical/social realities and narratives become too strong? Do big "ruptures" occur or do discourses evolve gradually?

Discourse literature gives insights into other environmental changes that interact with discourses (see e.g., Bäckstrand & Lövbrand, 2006; Edwards et al., 2022). Climate change is an example of how a human-made environmental change developed into its own meta discourse and thus interacted with existing discourses. This has resulted in various forest related discourses that included climate change as new element or adapted due to climate change. With the emergence of climate change discourses, the role of forests for carbon sequestration became important especially related to carbon sequestration, which quickly climbed to the top of the political agenda as a key function of forests (Arts et al., 2010; Bäckstrand & Lövbrand, 2006). Linking climate change with NFR provides a strong argument for supporting NFR politically, given the potential for additional carbon sequestration and NFR as driver of forest area increase. These potentials are in line with the EU policy agenda on forest restoration that calls for increasing forest area in Europe to deal with climate change and halt biodiversity loss (European Commission, 2022b). Additionally, the increase of forest area might become even more important in future, due to the loss of forests through climate driven environmental damages in Europe (Seidl et al., 2014), which may lead to a strengthening of narratives that favour NFR. We discuss these potentials in-depth in chapter 4.

Linked to climate change, we find that the issue of forest fires is of increasing importance in Europe. In fact, it is one of the topics which more visibly connects climate change effects with land use changes (Pausas & Keeley, 2021). In some narratives, NFR is portrayed as a major threat of forest fires, as NFR in the Mediterranean is often unmanaged (especially in the initial stage) and can accumulate dense biomass. Such forest fires release sequestered carbon and NFR then becomes a potential source of carbon emissions. Combined with NFR being a strong symbol for rural decline, narratives voicing more positive scenarios about NFR, such as wilderness creation, are not heard and are even invisible at the local level (see the case study by Barnaud & Couix, 2020 in the French Pyrenees). This focus on the risk of forest fire connected to NFR may be reinforced due to the increased frequency and intensity of wildfires due to climate change (Keeley et al., 2011). Therefore, climate change meta discourse could potentially result in a higher visibility of the narratives favourable to NFR. However, it remains to be seen in the long run whether they will indeed gain ground at the local or policy level, particularly in fire-prone areas that have experienced the effects of extreme wildfire events.

Additionally, we found that climate change and carbon sequestration were seldomly addressed in the narratives, particularly at the local level. Other studies made similar observation of forest management and conservation, where several interviewees at the local level did not address the topic themselves (Konczal et al., 2023), or did not consider the topic of major importance (de Koning et al., 2014). This shows that the issue of climate change and its linkages to NFR were not relevant to the interview partners. Instead, we can assume that other related topics were more pressing in the case of Southwest Europe, especially forest fires and land use changes. Summing up, this raises the question even more of how strongly climate change will affect the framing of NFR at the local level.

Another relevant environmental change is global biodiversity loss (Le Provost et al., 2022). In Europe, existing discourses about biodiversity conservation are value-laden. Some advocate for landscape

conservation and traditional extensive uses, while some others put forward ideas of rewilding and wilderness development. These resemble the 'old' battles of European nature conservation about land sparing versus land sharing, how much human influence is needed to "protect" nature and which "nature" should be conserved (Fischer et al., 2014; Schnitzler et al., 2008). The landscape conservation narrative links to the dominant conservation approaches in Europe, focusing on static habitats and single species protection, which is challenged today by a changing climate and migrating species (Buscher & Fletcher, 2020; de Koning et al., 2014). Some scholars argue that the rapidly changing environmental conditions will affect these existing dominant conservation approaches and combine them with new, more integrated and landscape-focused approaches for conservation (Buscher & Fletcher, 2020). As conservation discourses change in Europe, so do conservation objectives. An example could be an increased focus on habitat restoration beyond the Nature 2000 network (European Commission, 2022a). This shows how changing conservation discourses could affect what narratives are told on NFR and the role of NFR in conservation strategies, for example, to award greater importance to NFR as a tool for habitat restoration in the future.

Summing up, there are visible interactions between narratives and ecological and socio-economic realities, which deserve attention and thinking also from an environmental discourse/perspective. Interactions with larger environmental changes could lead to a strengthening of critical narratives on NFR especially at the local level, which could support negative perceptions and attitudes towards NFR. However, such an interplay could also strengthen narratives, which focus more on the opportunities that NFR offers, which are especially supported from the higher policy level. Whether discursive ruptures occur, and when, remains to be discussed. In the case of NFR, it can be asked if they happen at all in landscape change related narratives, which are embedded in long-term processes and cultural development. Therefore, discursive change could be acknowledged as happening gradually and over time instead of a specific moment in time when a rupture occurs.

5.2 Rewilding, reverting or restoring? Governance pathways for NFR

Trade-offs and opportunities resulting from NFR are diverse and context specific, as shown in chapter 4. However, especially opportunities of NFR have been remarkably overlooked by policymakers, not only at the EU level, but also at national levels. This is particularly interesting, considering the potential that NFR offers in relation to the existing climate change and biodiversity policy agendas. Given the global political agenda to increase forest area worldwide and the ecological relevance of NFR as a contribution to this increase (Palmero Iniesta, 2021), the little attention that NFR receives at the policy level in Europe is even more suprising. We find different reasons for this omission, presented in detail in chapter 3 and chapter 4 (especially chapter 4.2.6). At the regional/national policy level in France and Spain, we find a lack of integration of the involved policy fields and a lack of political will to deal with NFR, a topic that is often incompatible with traditional sectoral narratives of actor groups. Additionally, NFR as a passive ecological process does not fit well with policy agendas that follow the logic of active policy measures with measurable outputs. Similarly, Fayet et al. (2022a) find that land abandonment is poorly represented in EU Green Deal policies. They point to the challenge of land tenure and the lack of planning tools in place to map abandoned land and respective reutilisation path, which also applies to NFR (see also chapter 3). Another potential reason for the omission of land abandonment and NFR is the existing gaps between policymaking levels at the local, national and European scale, which often hold conflicting policy agendas and interests (Fayet et al., 2022a). While at EU level (and partly regional/national level) the call for forest restoration is growing and rewilding

is becoming a more prominent idea, we find strong opposing narratives of NFR at the local level, such as the rural fatalism narrative which objects any land use scenario including NFR. At the policy level, we found more strategic elements in the narratives linking to larger EU policy discourses, while the local level is potentially more rooted in ecological, socio-economic and cultural contexts. The narratives can vary across Europe and are potentially more favourable towards NFR in other regions of Europe (see e.g. the Scottish case in Barnaud et al., 2021). It must be noted that the mentioned obstacles and challenges to address NFR politically are not necessarily specific to NFR, as conflicting sectoral policies and local versus EU level interests are common conflicts in land use policy. Specific to NFR may be the characteristic of a value-laden land use change that is deeply connected to identity and culture, and that brings something 'unknown' for local people and therefore the changes might require new ways to deal with it. If NFR becomes more prominent in policymaking, the crucial question would then be how to balance out a potentially top-down driven restoration policy agenda with local needs and values.

These conditions at the policy levels result in a situation where NFR is considered an important land use change by actors in the field, but it is not treated as a political issue on its own. Instead, actor groups from extensive agriculture, conservation, and forestry lack concrete policy strategies on NFR. NFR is embedded into a 'business as usual' approach which is in line with their sectoral strategies, and into other topics, such as forest fires. This seems logical for an extensive agriculture pathway with the main aim to bring back abandoned land into agricultural use, but less logical for the forestry and rewilding pathway.

More recently, NFR has become slightly more important, which is connected to a stronger focus of the EU policies on forest area increase and as an asset for carbon sequestration (European Commission, 2021, 2022b). In addressing NFR more explicitly within land use policies, the identified narratives at the local and regional/national policy level show three main management and policy pathways for NFR in abandoned land: 1) reverting the land back to a re-use of extensive agricultural and cultural landscape conservation, 2) restoring the land for forestry uses, or 3) restoring the land for rewilding purposes.

In regards to the extensive agriculture pathway, the crucial question is how extensive, small-scale agriculture can be revitalised through sustainable, long-term transition, especially in rural territories. Sanz-Hernández et al. (2022) carry out a discourse analysis on social innovations (such as initiatives on direct sales or local organising), which aim to address the re-utilisation of abandoned land to enable sustainable transitions in rural areas in Spain. Their study suggests that once functioning innovative initiatives are set up, the 'discourses of the possible', which see more potential for innovative future scenarios for the abandoned land, appear to be voiced and heard more, while the 'denialists discourses' of such scenarios appear to be less important. Their denialist discourses resemble our rural fatalism narrative at the local level. Therefore, their findings show the importance of experiencing what reutilisation of abandoned land can be like for people to become confident (again) in future scenarios. Their findings also show the role that younger people play here, moving (back) to rural areas to set up new initiatives (ibid.), pointing to the relevance of generational change as well (Soliva et al., 2010).

A crucial aspect for the extensive agriculture and the forestry pathway is that they are both potentially affected by consequences of the abandoned, depopulated areas. Even if innovative ideas exist, where are the people to implement them? What about economic resources and existing infrastructure? The

forestry actors rather problematise NFR as being young, mostly unmanaged stands, and only partially support a forestry pathway for NFR (chapter 1 and 2). Further, fire management plays an important role in fire-prone regions, as an increase in forest area does not constitute a gain for them in the case that it burns in a wildfire. However, speaking in strategic terms, NFR drives the expansion of the forestry sector's land area and thus also its power in a political sense, in the case that forestry plays an economically relevant role in the region (Selby et al., 2007). Depending the ecological and socio-economic context, we can therefore assume that the forestry pathway is much more strongly supported in other areas of Europe (see e.g. Barnaud et al., 2021; Derks, 2017).

The rewilding pathway needs to be distinguished into active and passive rewilding, depending on the grade of human intervention (Sandom et al., 2018). While some proponents of rewilding favour passive approaches, seeing the intrinsic value of nature developing without human influence (Schnitzler & Génot, 2013, 2022), others favour active approaches with the reintroduction of mammals and stronger management interventions (Palau Puigvert, 2022). From a policymaking perspective, it could be asked if passive rewilding needs any active political support or strategy at all, as it is happening anyway once land is abandoned. Ironically, the insignificance narratives identified in France (chapter 3) indirectly favour passive rewilding in the end, as it suggests ignoring this process completely to focus on other (more productive) sites. Passive rewilding without any specific policy strategy attached could make sense in regions where fire occurrence is not too high or is kept within socially acceptable levels. However, our research shows that NFR often represents a challenge to the local people both in practical and cultural terms, as it clashes with their existing identity and represents a change in the landscape they hold dear. Against this backdrop, an important question emerges: how can local people connect to the 'new wilderness' landscapes? We argue that this is a matter of how quickly people must adapt to the new scenery. Local initiatives supporting such local adaptation processes could be useful, e.g. for finding a new local identity (Bassi et al., 2022; Rewilding Europe, 2022; Sanz-Hernández et al., 2022), but need an active civil society or political and institutional support. Therefore, active policymaking is not needed for passive rewilding to occur in Europe, but active governance at the local/regional scale should support the societal transitions that go along with the ecological process. From the active rewilding community, there are attempts to connect rewilding with economic strategies for building new identities in areas with high rates of rural depopulation (Rewilding Europe, 2022). This is an approach certainly more in line with societal and economic needs and demands of rural territories (Bassi et al., 2022). Additionally, active rewilding can be an option for fire-prone regions through grazing interventions (Palau Puigvert, 2022). In future, the demand for wilderness projects and green spaces for recreation can become even stronger from a local, touristic perspective in light of changes in European rural landscapes from being major places of primary production to becoming increasingly demanded for recreational and leisure uses (Buijs et al., 2006). Furthermore, NFR in peri-urban areas can support the creation of green spaces for recreational users under the rewilding pathway (Barnaud et al., 2021; Martín-Forés et al., 2020).

The discussed pathways show that NFR is only one option among others in land use policy, especially in Mediterranean areas where NFR can only be one puzzle piece in a larger, mosaic landscape. Additionally, in reality, the pathways can be intertwined and combined in the same region, especially in a Mediterranean, mosaic landscape with small-scale uses. If political decisions about different pathways are to be taken, an explicit policy problematisation of NFR is needed to delineate and decide which pathways should be favoured on which specific sites. This also needs respective land use planning at the local and regional scale. As NFR is a process embedded in complex, long lasting changes

associated with socio-economic, ecological and political questions (e.g., of local livelihoods and sustainable rural transitions), policymaking around NFR needs to make decisions that fit into the bigger picture of a region and consider trade-offs and opportunities. Therefore, the land use strategies must be developed using a participatory and collaborative governance approaches to deal with different needs and policy agendas at the local, regional/national and European scale. Especially for the transition process of NFR, the governance of such land transitions needs to provide space for the diverse actors that are involved and have an interest in the land management (e.g. Loorbach et al., 2017; Pereira et al., 2015; Sarkki et al., 2019). Spaces needs to be created for societal interactions and collaborative dialogue, also to empower local communities to develop their own visions of how the land should develop. Otherwise, conflicts arise that are difficult to solve, as shown by the struggles associated with wind energy: the implementation of the energy transition, driven by important environmental objectives at the larger policy level, leads to local struggles with actors based on an opposing ecological agenda and interests (Arifi & Winkel, 2021). Similar conflicts can arise when NFR is used as a tool for forest restoration from a top-down driven EU policy agenda. Therefore, the question of power and legitimacy plays a crucial role and needs consideration as well. Who is legitimate enough to make decisions of what should happen with the abandoned land? And at what scale are the decisions taken? (see e.g. Giraldo, 2019; Mancheva, 2021; Vainio et al., 2021).

In European research, land abandonment is still mostly addressed as a threat to biodiversity which needs to be tackled (see e.g. Gelabert Vadillo et al., 2022). However, at a global scale, land abandonment and NFR are rather conceived as an opportunity for carbon sequestration, habitat restoration and biodiversity conservation (Crawford et al., 2022; Crouzeilles et al., 2020; Rudel et al., 2020). Crawford et al. (2022) for instance suggest supporting long-term scenarios for land abandonment with active policies to secure “untapped” opportunities for climate and biodiversity. While in some regions in Europe long-term abandonment exists, such as in Spain, in other parts land abandonment may be less stable and also depends on recent developments such as land prices and food markets. This calls for political strategies on reutilisation or restoration use of abandoned land also in Europe.

Overall, there are many situations which lead to transitions in landscapes in Europe, for instance, when dominant industries are shut down that constitute local identities (e.g., in mining regions). We can expect transitions to become more frequent and more intense in the future, considering the climate change and the rapid global environmental changes that we are experiencing. From a research and a societal viewpoint, the transition processes in regions where NFR occurs raise relevant questions for the future in a changing world: what is identity for societies, how important is identity and (how) can identity change over time through new discourses? Further, how people make sense of the interlinked ecological and socio-economic changes and the role of human-nature relationships in such transitions is crucial. This thesis is a starting point for these questions in connection to landscapes where NFR occurs.

5.3 Recommendations to policy makers and the wider public

Building upon the findings of this thesis, a range of recommendations for policy makers and interested citizens arise. First, there is a need to place the trade-offs and especially opportunities of land abandonment and NFR higher up on the political agenda, given the socio-political relevance of this land use change in different regions. This research shows opportunities and trade-offs of NFR across

Europe from the perspectives of different actor groups. If opportunities should be realised in some areas of Europe, different actors in land use governance need to decide which pathway of NFR is to be taken on different sites. Here, land use planning and tools that consider the 'land in transition' are key to enable active decision making in NFR pathways, even if the decision is to just let the forest grow. If NFR is not dealt with, NFR will continue to expand, but the trade-offs that might need political guidance will not be managed.

Second, the research shows that the NFR pathways should be placed within the local contexts and needs to see which pathways are supported and make sense, and which do not. Trade-offs for local actor groups, open landscape biodiversity, or cultural identity need to be considered (Bull et al., 2018). Additionally, the governance of NFR needs to pay attention to rural development dynamics, climate change driven environmental changes, and cultural changes linked to land use and the rural areas. This means that designing NFR related policies makes it necessary to consider the underlying causes that led to land abandonment, and clearly envision future scenarios if they are to be effective in the long run.

Third, from a forest restoration policy perspective, NFR should be more actively integrated at the regional, national and EU scale into existing forest related policies. In that regard, NFR can contribute to the restoration agenda with climate change and biodiversity targets, such as carbon sequestration and forest area increase, or reduction of landscape fragmentation. NFR can also contribute for forest and economic uses. Additionally, developing regional restoration strategies could help to map NFR potentials and identify suitable pathways for different regions. New pathways on NFR use should be accompanied by appropriate communication strategies to facilitate societal dialogue between local and higher policy levels, and the opportunities that may arise as a result. Only through communication and interaction with local people can another meaning be found and attached to NFR, if the aim is to keep the new forests. Additionally, the need for better communication and integration across policy sectors is important, mainly in the fields of agriculture, forestry and conservation. As NFR is land changing from agricultural to forested land, it is not possible to address it politically if policy fields are fragmented and disconnected.

Lastly, interdisciplinary research and monitoring of NFR needs to be expanded to deliver to develop land use scenarios and enable an informed decision-making on NFR. Given the social and ecological nature of NFR, interdisciplinary research approaches are needed to understand NFR processes in all their complexity, including an in depth understanding of context specific trade-offs and opportunities.

5.4 Future research

Future research on NFR should focus on different aspects. Social science research can support research on land transitions and related governance by further linking the topic of NFR to other fields such as rural development, innovation, and transitions in extensive agriculture and forestry (e.g. Biggs et al., 2010; Castro-Arce & Vanclay, 2020; Roura-Pascual et al., 2005; Walker et al., 2004). At the policy level, the existing pathways of NFR in Europe today should be further researched in depth in different contexts across Europe. This means a further analysis of different policy settings as well as ecological and socio-economic contexts under which the pathways can be considered or can potentially go hand in hand on different sites. Especially regarding the forestry and rewilding pathway, there are still many open questions, including what policy support is needed (if any), what is needed for the local communities to adapt to such transitions in the land uses, what are obstacles at the regional/local

level to implement such pathways and how can they be dealt with. It would be particularly interesting to do a comparative study in different regions across Europe at the local/regional level where NFR occurs showing different pathways. This has not been done before for land abandonment and NFR. Co-designing the research with collaborative and participatory research methods, such as participatory mapping (Brown & Raymond, 2014) and scenario building (Reed et al., 2013), could also be an interesting approach, as it could directly involve actors from the practice in the research design. This could be valuable for NFR, as it is a topic that is so closely linked with cultural and management questions. Such a research approach has not been implemented before in a transdisciplinary research approach and it would allow for explicit findings on NFR and could give valuable insights for land use governance across Europe.

From a theoretical viewpoint, discourse theory can benefit from further expanding its understanding of the interaction between environmental discourses with ecological and socio-economic changes. For this topic, the temporal dimensions of transitions should play a specific role. Like that, discourses and narratives can be linked to changing environmental conditions over time. For instance, how will the narratives have changed if we did the interviews in our case studies again in 15 years? In the end, NFR on abandoned land is just one example of land in transition today. In the future, we will be confronted with potentially more abrupt and rapidly changing landscapes due to climate driven environmental changes (IPCC, 2014). How do societies and identities adapt to these changes? NFR on abandoned land can serve as example in the social sciences to better understand the societal, cultural and political challenges that go along with such a transition. Additionally, it can serve as inspiration and learning field for strategies on how to deal with landscape transitions in future. With this in mind, linking NFR more strongly with literature on transformation would be a valuable contribution at theoretical as well as practical scale (e.g. Becker & Jahn, 2000; Brand, 2020; Brand & Schickert, 2019; Görg et al., 2017; Linnér & Wibeck, 2020).

From an interdisciplinary research perspective, more in-depth research is needed to better understand trade-offs and opportunities of NFR of different pathways. In chapter 4 we started this discussion, but many questions remain open or need a more in-depth study of different cases of NFR, for example biodiversity increases or decreases associated with NFR. Additionally, there is still a lack of knowledge in the natural sciences on where exactly NFR occurs and to which extent. Such data is, however, key to support practice and policy actors for decision-making processes.

List of publication and declaration of authorship

Manuscript 1: Narrating abandoned land: Perceptions of natural forest regrowth in Southwestern Europe

Full reference:

Frei, T., Derks, J., Rodríguez Fernández-Blanco, C., & Winkel, G. (2020). Narrating abandoned land: Perceptions of natural forest regrowth in Southwestern Europe. *Land Use Policy*, *99*, 105034. https://doi.org/10.1016/j.landusepol.2020.105034

The idea for this manuscript including the research questions were developed jointly by Theresa Frei and Georg Winkel. Theresa Frei, Jakob Derks and Carmen Rodríguez Fernández-Blanco collected the empirical interview data. The main analysis of the data was implemented by Theresa Frei, supported by Carmen Rodríguez Fernández-Blanco and Jakob Derks. The first draft of the manuscript was written by Theresa Frei. Georg Winkel supported the writing of the manuscript. The other co-authors commented and revised the manuscript.

Manuscript 2: Governing abandoned land: Storylines on natural forest regrowth in France and Spain.

Full reference:

Frei, T., Edou, K., Rodríguez Fernández-Blanco, C., & Winkel, G. (2022). Governing abandoned land: Storylines on natural forest regrowth in France and Spain. *Environmental Science & Policy*, *135*, 58–66. https://doi.org/10.1016/j.envsci.2022.04.022

The idea for the manuscript including the research questions were developed by Theresa Frei supported by Georg Winkel. Theresa Frei, Kim Edou and Carmen Rodríguez Fernández-Blanco collected the empirical interview data. The analysis of the data for Spain was implemented by Theresa Frei, for France by Kim Edou, and the subsequent overall analysis was carried out by Theresa Frei. The first draft of the manuscript was written by Theresa Frei. Georg Winkel supported the writing of the manuscript. The other co-authors commented on the manuscript.

Manuscript 3: Can natural forest expansion contribute to Europe's restoration policy agenda? An interdisciplinary assessment

Full reference:

Frei, T., Espelta, J. M., Górriz-Mifsud, E., Hampe, A., Lefevre, F., Martín-Forés, I., & Winkel, G. (2023). Can natural forest expansion contribute to Europe's restoration policy agenda? An interdisciplinary assessment. *Ambio*, 1–12. https://doi.org/10.1007/s13280-023-01924-2

The idea of the paper was developed jointly by Theresa Frei and Georg Winkel, supported by Arndt Hampe and Josep Maria Espelta. Theresa Frei wrote the first draft of the introduction (chapter 4.1), the societal perception (chapter 4.2.5), policymaking (chapter 4.2.6) and conclusion (chapter 4.4) sections. Arndt Hampe wrote the first draft of the biodiversity section (chapter 4.2.1). Josep Maria Espelta wrote the first draft of the climate change mitigation section (chapter 4.2.2). Irene Martín-Forés, Arndt Hampe and Josep Maria Espelta wrote the first draft of the climate change adaptation

section (chapter 4.2.3). Elena Górriz-Misfud wrote the first draft of the forestry and economic use section (chapter 4.2.4). Theresa Frei and Georg Winkel developed and drafted the policy recommendations (chapter 4.3) and took the lead on writing, revising, and commenting on the other sections. All co-authors contributed to the whole manuscript with comments and revisions throughout the writing process.

References

Acuña-Míguez, B., Valladares, F., & Martín-Forés, I. (2020). Both mature patches and expanding areas of Juniperus thurifera forests are vulnerable to climate change but for different reasons. *Forests*, *11*(9), 960.

Alfaro-Sánchez, R., Espelta, J. M., Valladares, F., Acuña-Míguez, B., & Martín-Forés, I. (2021). Disentangling the role of sex dimorphism and forest structure as drivers of growth and wood density in expanding Juniperus thurifera L. woodlands. *Annals of Forest Science*, *78*(4), 1–19.

Alfaro-Sánchez, R., Jump, A. S., Pino, J., Díez-Nogales, O., & Espelta, J. M. (2019). Land use legacies drive higher growth, lower wood density and enhanced climatic sensitivity in recently established forests. *Agricultural and Forest Meteorology*, *276–277*, 107630. https://doi.org/10.1016/j.agrformet.2019.107630

Angermuller, J., Maingueneau, D., & Wodak, R. (2014). The Discourse Studies Reader. An Introduction. In J. Angermuller, D. Maingueneau, & R. Wodak (Eds.), *The Discourse Studies Reader: Main currents in theory and analysis* (pp. 1–426). John Benjamins.

Aretano, R., Petrosillo, I., Zaccarelli, N., Semeraro, T., & Zurlini, G. (2013). People perception of landscape change effects on ecosystem services in small Mediterranean islands: A combination of subjective and objective assessments. *Landscape and Urban Planning*, *112*, 63–73. https://doi.org/10.1016/j.landurbplan.2012.12.010

Arifi, B., & Winkel, G. (2021). Wind energy counter-conducts in Germany: Understanding a new wave of socio-environmental grassroots protest. *Environmental Politics*, *30*(5), 811–832.

Arts, B. (2021). *Forest Governance: Hydra or Chloris?* Cambridge University Press.

Arts, B., Appelstrand, M., Kleinschmit, D., Pülzl, H., Visseren-Hamakers, I., Atyi, R. E., Enters, T., McGinley, K., & Yasmi, Y. (2010). Discourses, actors and instruments in international forest governance. In J. Rayner, A. Buck, & P. Katila (Eds.), *Embracing complexity: Meeting the challenges of international forest governance. IUFRO* (Issue 28, pp. 57–74). International Union of Forest Research Organizations (IUFRO).

Arts, B., & Buizer, M. (2009). Forests, discourses, institutions. *Forest Policy and Economics*, *11*(5–6), 340–347. https://doi.org/10.1016/j.forpol.2008.10.004

Arts, B., & Visseren-Hamakers, I. (2012). Forest governance: A state of the art review. In B. Arts, S. van Bommel, M. Ros-Tonen, & G. Verschoor (Eds.), *Forest-people interfaces* (pp. 241–257). Wageningen Academic Publishers. https://doi.org/10.3920/978-90-8686-749-3_15

Bäckstrand, K., & Lövbrand, E. (2006). Planting trees to mitigate climate change: Contested discourses of ecological modernization, green governmentality and civic environmentalism. *Global Environmental Politics*, *6*(1), 50–75.

Barnaud, C., & Couix, N. (2020). The multifunctionality of mountain farming: Social constructions and local negotiations behind an apparent consensus. *Journal of Rural Studies*, *73*, 34–45.

Barnaud, C., Fischer, A., Staddon, S., Blackstock, K., Moreau, C., Corbera, E., Hester, A., Mathevet, R., McKee, A., Reyes, J., Sirami, C., & Eastwood, A. (2021). Is forest regeneration good for biodiversity? Exploring the social dimensions of an apparently ecological debate. *Environmental Science & Policy*, *120*, 63–72. https://doi.org/10.1016/j.envsci.2021.02.012

Basnou, C., Vicente, P., Espelta, J. M., & Pino, J. (2016). Of niche differentiation, dispersal ability and historical legacies: What drives woody community assembly in recent Mediterranean forests? *Oikos*, *125*(1), 107–116. https://doi.org/10.1111/oik.02534

Bassi, I., Carzedda, M., & Iseppi, L. (2022). Innovative Local Development Initiatives in the Eastern Alps: Forest Therapy, Land Consolidation Associations and Mountaineering Villages. *Land*, *11*(6), 874.

Bauer, N., Wallner, A., & Hunziker, M. (2009). The change of European landscapes: Human-nature relationships, public attitudes towards rewilding, and the implications for landscape management in Switzerland. *Journal of Environmental Management*, *90*(9), 2910–2920. https://doi.org/10.1016/j.jenvman.2008.01.021

Becker, E., & Jahn, T. (2000). Sozial-ökologische Transformationen. Theoretische und methodische Probleme transdisziplinärer Nachhaltigkeitsforschung. *Nachhaltige Entwicklung Und Transdisziplinarität: Besonderheiten, Probleme Und Erfordernisse Der Nachhaltigkeitsforschung, Berlin, Analytica*. Diskussionsbeitrag.

Behagel, J. H., Arts, B., & Turnhout, E. (2019). Beyond argumentation: A practice-based approach to environmental policy. *Journal of Environmental Policy & Planning*, *21*(5), 479–491.

Bell, S. M., Barriocanal, C., Terrer, C., & Rosell-Melé, A. (2020). Management opportunities for soil carbon sequestration following agricultural land abandonment. *Environmental Science & Policy*, *108*, 104–111. https://doi.org/10.1016/j.envsci.2020.03.018

Bieling, C. (2013). Perceiving and Responding to Gradual Landscape Change at the Community Level: Insights from a Case Study on Agricultural Abandonment in the Black Forest, Germany. *Ecology and Society*, *18*(2). https://doi.org/10.5751/ES-05590-180236

Biggs, R., Westley, F. R., & Carpenter, S. R. (2010). Navigating the back loop: Fostering social innovation and transformation in ecosystem management. *Ecology and Society*, *15*(2).

Bouwma, I. (2017). *Wilderness Protection in Europe: The Role of International, European and National Law*. Cambridge University Press.

Brand, U. (2020). Sozial-Ökologische Transformation Konkret Die Solidarische Postwachstumsstadt Als Projekt Gegen Die Imperiale Lebensweise. *Postwachstumsstadt*, 30.

Brand, U., & Schickert, C. (2019). *Ökosozialistische Strategien für eine sozial-ökologische Transformation*. In K. Dörre & C. Schickert (Eds.), *Neosozialismus. Solidarität, Demokratie und Ökologie vs. Kapitalismus.* Oekom Verlag.

Brown, G., & Raymond, C. M. (2014). Methods for identifying land use conflict potential using participatory mapping. *Landscape and Urban Planning*, *122*, 196–208.

Buijs, A. E., Pedroli, B., & Luginbühl, Y. (2006). From Hiking Through Farmland to Farming in a Leisure Landscape: Changing Social Perceptions of the European Landscape. *Landscape Ecology*, *21*(3), 375–389. https://doi.org/10.1007/s10980-005-5223-2

Buitenwerf, R., Sandel, B., Normand, S., Mimet, A., & Svenning, J.-C. (2018). Land surface greening suggests vigorous woody regrowth throughout European semi-natural vegetation. *Global Change Biology*, *24*(12), 5789–5801.

Buizer, M., & Kurz, T. (2016). Too hot to handle: Depoliticisation and the discourse of ecological modernisation in fire management debates. *Geoforum*, *68*, 48–56.

Bull, G. Q., Boedhihartono, A. K., Bueno, G., Cashore, B., Elliott, C., Langston, J. D., Riggs, R. A., & Sayer, J. (2018). Global forest discourses must connect with local forest realities. *International Forestry Review*, *20*(2), 160–166.

Buscher, B., & Fletcher, R. (2020). *The conservation revolution: Radical ideas for saving nature beyond the Anthropocene*. Verso Books.

Calaciura, B., & Spinelli, O. (2008). *Management of Natura 2000 habitats. 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites).* European Commission, Brussels.

Carson, R. (1962). *Silent spring*. Penguin books.

Carver, S. (2019). Rewilding through land abandonment. In N. Pettorelli, S. M. Durant, & J. T. du Toit (Eds.), *Rewilding* (pp. 99–122). Cambridge University Press, Cambridge.

Castagneyrol, B., Giffard, B., Péré, C., & Jactel, H. (2013). Plant apparency, an overlooked driver of associational resistance to insect herbivory. *Journal of Ecology*, *101*(2), 418–429.

Castro-Arce, K., & Vanclay, F. (2020). Transformative social innovation for sustainable rural development: An analytical framework to assist community-based initiatives. *Journal of Rural Studies*, *74*, 45–54.

Cervera, T., Pino, J., Marull, J., Padró, R., & Tello, E. (2019). Understanding the long-term dynamics of forest transition: From deforestation to afforestation in a Mediterranean landscape (Catalonia, 1868–2005). *Land Use Policy*, *80*, 318–331. https://doi.org/10.1016/j.landusepol.2016.10.006

Champ, J. G., Williams, D. R., & Knotek, K. (2009). Wildland fire and organic discourse: Negotiating place and leisure identity in a changing wildland urban interface. *Leisure Sciences*, *31*(3), 237–254.

Chazdon, R. L., Lindenmayer, D., Guariguata, M. R., Crouzeilles, R., Rey Benayas, J. M., & Lazos Chavero, E. (2020). Fostering natural forest regeneration on former agricultural land through economic and policy interventions. *Environmental Research Letters*, *15*(4), 043002. https://doi.org/10.1088/1748-9326/ab79e6

Clark, J. D., & Johnson, A. H. (2011). Carbon and nitrogen accumulation in post-agricultural forest soils of western New England. *Soil Science Society of America Journal*, *75*(4), 1530–1542.

Compton, J. E., & Boone, R. D. (2000). Long-term impacts of agriculture on soil carbon and nitrogen in New England forests. *Ecology*, *81*(8), 2314–2330.

Cook-Patton, S. C., Leavitt, S. M., Gibbs, D., Harris, N. L., Lister, K., Anderson-Teixeira, K. J., Briggs, R. D., Chazdon, R. L., Crowther, T. W., Ellis, P. W., Griscom, H. P., Herrmann, V., Holl, K. D., Houghton, R. A., Larrosa, C., Lomax, G., Lucas, R., Madsen, P., Malhi, Y., … Griscom, B. W. (2020). Mapping carbon accumulation potential from global natural forest regrowth. *Nature*, *585*(7826), 545–550. https://doi.org/10.1038/s41586-020-2686-x

Corona, P., Ascoli, D., Barbati, A., Bovio, G., Colangelo, G., Elia, M., Garfì, V., Iovino, F., Lafortezza, R., Leone, V., Lovreglio, R., Marchetti, M., Marchi, E., Menguzzato, G., Nocentini, S., Picchio, R., Portoghesi, L., Puletti, N., Sanesi, G., & Chianucci, F. (2015). *Integrated forest management to prevent wildfires under Mediterranean environments*. *39*(1), 1–22. https://doi.org/10.12899/ASR-946

Correia, M., Espelta, J. M., Morillo, J. A., Pino, J., & Rodríguez-Echeverría, S. (2021). Land-use history alters the diversity, community composition and interaction networks of ectomycorrhizal fungi in beech forests. *Journal of Ecology*, *109*(8), 2856–2870.

Costa Domingo, G., Underwood, E., Aubert, G., & Baroni, L. (2022). *The proposed EU Nature Restoration Regulation: The path to nature's recovery IEEP's first impressions of the Commission's proposal for an EU Regulation on Nature Restoration.* Institute for European Environmental Policy Brief.

Crawford, C. L., Yin, H., Radeloff, V. C., & Wilcove, D. S. (2022). Rural land abandonment is too ephemeral to provide major benefits for biodiversity and climate. *Science Advances*, *8*(21), eabm8999.

Creswell, J. W. (2003). *Research design. Qualitative, quantitative and mixed methods approaches.: Vol. 2nd ed.* Sage Publications.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches. Third edition.* Sage Publications.

Cristóbal, R., Albert, F. J., Blanco, J., Casquero, P., González, O., Herráiz, D., Laguna, E., Rigueiro, A., Romero, R., & Vázquez, F. (2020). Plantas Aromáticas y Medicinales. In M. Sánchez González, R. Calama Sainz, & J. A. Bonet Lledós (Eds.), *Los productos forestales no madereros en España: Del monte a la industria* (pp. 181–208). INIA, Ministerio de Ciencia e Innovación, Gobierno de España.

Crouzeilles, R., Beyer, H. L., Monteiro, L. M., Feltran-Barbieri, R., Pessôa, A. C., Barros, F. S., Lindenmayer, D. B., Lino, E. D., Grelle, C. E., & Chazdon, R. L. (2020). Achieving cost-effective landscape-scale forest restoration through targeted natural regeneration. *Conservation Letters*, e12709.

Cruz-Alonso, V., Espelta, J. M., & Pino, J. (2021). Woody species richness and turnover in expanding Mediterranean forests: A story of landscape legacies influenced by climatic aridity. *Landscape Ecology*, *36*(6), 1787–1800.

Cruz-Alonso, V., Ruiz-Benito, P., Villar-Salvador, P., & Rey-Benayas, J. M. (2019). Long-term recovery of multifunctionality in Mediterranean forests depends on restoration strategy and forest type. *Journal of Applied Ecology*, *56*(3), 745–757.

de Aragón, J. M., Bonet, J. A., Fischer, C. R., & Colinas, C. (2007). Productivity of ectomycorrhizal and selected edible saprotrophic fungi in pine forests of the pre-Pyrenees mountains, Spain: Predictive equations for forest management of mycological resources. *Forest Ecology and Management*, *252*(1–3), 239–256.

De Frenne, P., Baeten, L., Graae, B. J., Brunet, J., Wulf, M., Orczewska, A., Kolb, A., Jansen, I., Jamoneau, A., & Jacquemyn, H. (2011). Interregional variation in the floristic recovery of post-agricultural forests. *Journal of Ecology*, *99*(2), 600–609.

de Koning, J., Winkel, G., Sotirov, M., Blondet, M., Borras, L., Ferranti, F., & Geitzenauer, M. (2014). Natura 2000 and climate change—Polarisation, uncertainty, and pragmatism in discourses on forest conservation and management in Europe. *Environmental Science & Policy*, *39*, 129–138. https://doi.org/10.1016/j.envsci.2013.08.010

Derks, J. (2017). Form over function? Stakeholder perception of Atlas cedar in France and Douglas fir in Germany. *Masters thesis, University of Eastern Finland.*

Dolton-Thornton, N. (2021). Viewpoint: How should policy respond to land abandonment in Europe? *Land Use Policy*, *102*, 105269. https://doi.org/10.1016/j.landusepol.2020.105269

Durnova, A., Fischer, F., & Zittoun, P. (2016). Discursive Approaches to Public Policy: Politics, Argumentation, and Deliberation. In B. G. Peters & P. Zittoun (Eds.), *Contemporary Approaches to Public Policy* (pp. 35–56). Palgrave Macmillan UK. http://link.springer.com/10.1057/978-1-137-50494-4_3

Edwards, P., Brukas, V., Brukas, A., Hoogstra-Klein, M., Secco, L., & Kleinschmit, D. (2022). Development of forest discourses across Europe: A longitudinal perspective. *Forest Policy and Economics*, *135*, 102641. https://doi.org/10.1016/j.forpol.2021.102641

Elands, B. H. M., O'Leary, T. N., Boerwinkel, H. W. J., & Freerk Wiersum, K. (2004). Forests as a mirror of rural conditions; local views on the role of forests across Europe. *Forest Policy and Economics*, *6*(5), 469–482. https://doi.org/10.1016/j.forpol.2004.01.003

Elands, B. H. M., & Wiersum, K. F. (2001). Forestry and rural development in Europe: An exploration of socio-political discourses. *Forest Policy and Economics*, *3*(1–2), 5–16. https://doi.org/10.1016/S1389-9341(00)00027-7

Elands, B. H. M., & Wiersum, K. F. (2003). *Forestry and rural development in Europe. Research results and policy implications of a comparative European study*. Wageningen Universiteit, Leerstoelgroep Bos-en Natuurbeleid.

Elyakime, B., Larrieu, L., Cabanettes, A., & Burnel, L. (2011). Spontaneous ash tree reforestation in the Central Pyrenees: A future local energy source? *Journal of Alpine Research| Revue de Géographie Alpine*, *99–3*.

Esparza, P. (2019). *¿Qué es la España vacía (y por qué es decisiva en estas elecciones)?* https://www.bbc.com/mundo/noticias-internacional-48054125 (accessed 01/03/2022?

Espelta, J. M., Cruz-Alonso, V., Alfaro-Sánchez, R., Hampe, A., Messier, C., & Pino, J. (2020). Functional diversity enhances tree growth and reduces herbivory damage in secondary broadleaf forests, but does not influence resilience to drought. *Journal of Applied Ecology*, *57*(12), 2362–2372.

Estel, S., Kuemmerle, T., Alcántara, C., Levers, C., Prishchepov, A., & Hostert, P. (2015). Mapping farmland abandonment and recultivation across Europe using MODIS NDVI time series. *Remote Sensing of Environment*, *163*, 312–325. https://doi.org/10.1016/j.rse.2015.03.028

European Commission. (2019). *The European Green Deal. Brussels, 11.12.2019 COM(2019) 640 final*.

European Commission. (2020). *EU Biodiversity Strategy for 2030. Bringing nature back into our lives. COM(2020) 380 final.*

European Commission. (2021). *New EU Forest Strategy for 2030. COM(2021) 572 final.*

European Commission. (2022a). *Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on nature restoration. COM(2022) 304 final.*

European Commission. (2022b). *The #3BillionTrees Pledge—European Commission*. https://environment.ec.europa.eu/3-billion-trees_en (accessed 05/12/2022)

FAO. (2004). *Forestry policies, institutions and programmes: France*. http://www.fao.org/forestry/country/57479/en/fra/ (accessed 05/12/2022)

FAO. (2020). *Global Forest Resources Assessment 2020: Main report*. FAO, Rome. https://doi.org/10.4060/ca9825en

Fayet, C. M. J., Reilly, K. H., Ham, C. V., & Verburg, P. H. (2022a). The potential of European abandoned agricultural lands to contribute to the Green Deal objectives: Policy perspectives. *Environmental Science & Policy*, *133*, 44–53. https://doi.org/10.1016/j.envsci.2022.03.007

Fayet, C. M. J., Reilly, K. H., Ham, C. V., & Verburg, P. H. (2022b). What is the future of abandoned agricultural lands? A systematic review of alternative trajectories in Europe. *Land Use Policy*, *112*, 105833. https://doi.org/10.1016/j.landusepol.2021.105833

Fernández-Giménez, M. E. (2015). 'A shepherd has to invent': Poetic analysis of social-ecological change in the cultural landscape of the central Spanish Pyrenees. *Ecology and Society*, *20*(4), art29. https://doi.org/10.5751/ES-08054-200429

Ferranti, F., Vericat, P., & de Koning, J. (2017). Discourses on sustainable forest management and effects of Natura 2000: A case study of Catalonia, NE Spain. *Journal of Environmental Planning and Management*, *60*(12), 2085–2102.

Fischer, F., & Forester, J. (1993). *The Argumentative turn in policy analysis and planning*. Duke University Press. http://www.tandfebooks.com/isbn/9780203499467

Fischer, J., Abson, D. J., Butsic, V., Chappell, M. J., Ekroos, J., Hanspach, J., Kuemmerle, T., Smith, H. G., & von Wehrden, H. (2014). Land sparing versus land sharing: Moving forward. *Conservation Letters*, *7*(3), 149–157.

Flick, U. (2015). *Introducing research methodology: A beginner's guide to doing a research project*. Sage Publications.

Forest Europe. (2015). *State of Europe's Forests 2015 Report.*

Forest Europe. (2020). *State of Europe's Forests 2020 Report*.

Fraser, J. (2017). Knock on (Engineered) Wood: Pathways to Increased Deployment of Cross-Laminated Timber. *IIIEE Masters Thesis*.

Fraterrigo, J. M., Turner, M. G., Pearson, S. M., & Dixon, P. (2005). Effects of past land use on spatial heterogeneity of soil nutrients in southern Appalachian forests. *Ecological Monographs*, *75*(2), 215–230.

Frei, T., Derks, J., Rodríguez Fernández-Blanco, C., & Winkel, G. (2020). Narrating abandoned land: Perceptions of natural forest regrowth in Southwestern Europe. *Land Use Policy*, *99*, 105034. https://doi.org/10.1016/j.landusepol.2020.105034

Frei, T., Edou, K., Rodríguez Fernández-Blanco, C., & Winkel, G. (2022). Governing abandoned land: Storylines on natural forest regrowth in France and Spain. *Environmental Science & Policy*, *135*, 58–66. https://doi.org/10.1016/j.envsci.2022.04.022

Fuchs, R., Herold, M., Verburg, P. H., & Clevers, J. G. (2013). A high-resolution and harmonized model approach for reconstructing and analysing historic land changes in Europe. *Biogeosciences*, *10*(3), 1543–1559.

Fuller, L., Fuentes-Montemayor, E., Watts, K., Macgregor, N. A., Bitenc, K., & Park, K. J. (2018). Local-scale attributes determine the suitability of woodland creation sites for Diptera. *Journal of Applied Ecology*, *55*(3), 1173–1184.

García-Ruiz, J. M., Lasanta, T., Nadal-Romero, E., Lana-Renault, N., & Álvarez-Farizo, B. (2020). Rewilding and restoring cultural landscapes in Mediterranean mountains: Opportunities and challenges. *Land Use Policy*, *99*, 104850.

Gelabert Vadillo, P. J., Rodrigues Mimbrero, M., Vidal-Macua, J. J., Améztegui González, A., & Vega García, C. (2022). Spatially explicit modeling of the probability of land abandonment in the Spanish Pyrenees. *Landscape and Urban Planning, 2022, Vol. 226, Núm. 104487*.

Gellrich, M. (2006). Natural forest re-growth on abandoned agricultural land in the Swiss mountains: An economic analysis of patterns and causes using spatial statistical models and interviews, *PhD thesis, Faculty of Forest and Environmental Sciences, University of Freiburg.*

Giraldo, O. F. (2019). Political ecology of agriculture. *Page Political Ecology of Agriculture*.

Gobierno de España. (2020). *Funciones y estructura. Ministerio para la Transición Ecológica y el Reto Demográfico*. https://www.miteco.gob.es/es/ministerio/funciones-estructura/default.aspx (accessed 05/12/2022)

Gold, S. (2003). *The development of European forest resources, 1950 to 2000.* GENEVA TIMBER AND FOREST DISCUSSION PAPERS. UN; FAO.

Görg, C., Brand, U., Haberl, H., Hummel, D., Jahn, T., & Liehr, S. (2017). Challenges for social-ecological transformations: Contributions from social and political ecology. *Sustainability*, *9*(7), 1045.

Gortázar, C., Herrero, J., Villafuerte, R., & Marco, J. (2000). Historical examination of the status of large mammals in Aragon, Spain. *Mammalia*, *64*(4).

Guerrieri, R., Correia, M., Martín-Forés, I., Alfaro-Sánchez, R., Pino, J., Hampe, A., Valladares, F., & Espelta, J. M. (2021). Land-use legacies influence tree water-use efficiency and nitrogen availability in recently established European forests. *Functional Ecology*, *35*(6), 1325–1340.

Hajer, M. A. (1993). Discourse Coalitions and the Institutionalization of Practice: The case of acid rain in Britain. In F. Fischer & J. Forester (Eds.), *The argumentative turn in policy analysis and planning*. Duke University Press.

Hajer, M. A. (1995). *The politics of environmental discourse: Ecological modernization and the policy process*. Clarendon Press Oxford.

Hajer, M. A. (2006). Doing discourse analysis: Coalitions, practices, meaning. *Netherlands Geographical Studies (ISSN 0169-4839)*, *344*.

Hajer, M. A. (2009). *Authoritative governance: Policy making in the age of mediatization*. Oxford University Press.

Hajer, M. A., & Versteeg, W. (2005). A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives. *Journal of Environmental Policy & Planning*, *7*(3), 175–184. https://doi.org/10.1080/15239080500339646

Hajer, Maarten. A. (2005). Coalitions, Practices, and Meaning in Environmental Politics: From Acid Rain to BSE. In D. Howarth & J. Torfing (Eds.), *Discourse Theory in European Politics. Identity, Policy and Governance.* (pp. 297–315). Palgrave Macmillan.

Heeswijk, L. van, & Turnhout, E. (2013). The discursive structure of FLEGT (Forest Law Enforcement, Governance and Trade): The negotiation and interpretation of legality in the EU and Indonesia. *Forest Policy and Economics*, *32*, 6–13. https://doi.org/10.1016/j.forpol.2012.10.009

Hiedanpää, J. (2002). European-wide conservation versus local well-being: The reception of the Natura 2000 Reserve Network in Karvia, SW-Finland. *Landscape and Urban Planning*, *61*(2), 113–123.

Höchtl, F., Lehringer, S., & Konold, W. (2005). "Wilderness": What it means when it becomes a reality—a case study from the southwestern Alps. *Landscape and Urban Planning*, *70*(1–2), 85–95. https://doi.org/10.1016/j.landurbplan.2003.10.006

Hunziker, M., Felber, P., Gehring, K., Buchecker, M., Bauer, N., & Kienast, F. (2008). Evaluation of Landscape Change by Different Social Groups. *Mountain Research and Development*, *28*(2), 140–147. https://doi.org/10.1659/mrd.0952

INRAE. (2022). *The project SPONFOREST*. https://www6.inrae.fr/sponforest/Project (accessed 05/12/2022)

IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)].* IPCC.

Jacquemyn, H., Butaye, J., & Hermy, M. (2001). Forest plant species richness in small, fragmented mixed deciduous forest patches: The role of area, time and dispersal limitation. *Journal of Biogeography*, *28*(6), 801–812.

Jactel, H., Bauhus, J., Boberg, J., Bonal, D., Castagneyrol, B., Gardiner, B., Gonzalez-Olabarria, J. R., Koricheva, J., Meurisse, N., & Brockerhoff, E. G. (2017). Tree diversity drives forest stand resistance to natural disturbances. *Current Forestry Reports*, *3*(3), 223–243.

Jonsson, R., Rinaldi, F., Pilli, R., Fiorese, G., Hurmekoski, E., Cazzaniga, N., Robert, N., & Camia, A. (2021). Boosting the EU forest-based bioeconomy: Market, climate, and employment impacts. *Technological Forecasting and Social Change*, *163*, 120478.

Kaplan, T. J. (1993). Reading Policy Narratives: Beginnings, Middles, and End. In F. Fischer & J. Forester (Eds.), *The argumentative turn in policy analysis and planning* (pp. 167–185). Duke University Press.

Kauppi, P. E., Sandström, V., & Lipponen, A. (2018). Forest resources of nations in relation to human well-being. *PLoS One*, *13*(5), e0196248.

Keeley, J. E., Bond, W. J., Bradstock, R. A., Pausas, J. G., & Rundel, P. W. (2011). *Fire in Mediterranean ecosystems: Ecology, evolution and management*. Cambridge University Press.

Keenleyside. (2004). *Land abandonment, biodiversity and the CAP. Outcome of an international seminar in Sigulda, Latvia, 7-8 October 2004.* IEEP, Brussels.

Keenleyside, C., & Tucker, G. (2010). *Farmland abandonment in the EU: An assessment of trends and prospects*. Institute for European Environmental Policy, London.

Keller, R., & Truschkat, I. (Eds.). (2013). *Methodologie und Praxis der Wissenssoziologischen Diskursanalyse*. VS Verlag für Sozialwissenschaften. http://link.springer.com/10.1007/978-3-531-93340-5

Kim, S. (2003). *Irresolvable cultural conflicts and conservation/development arguments: Analysis of Korea's Saemangeum project*. *Policy Sciences, 36*, 125–149.

Knierim, A., Bieling, C., & Zander, P. (2021). How researchers shape the construction of landscape change–insights from a scenario study. *Landscape Research*, *46*(8), 1057–1070.

Konczal, A. A., Derks, J., de Koning, J. H., & Winkel, G. (2023). Integrating nature conservation measures in european forest management–An exploratory study of barriers and drivers in 9 european countries. *Journal of Environmental Management*, *325*, 116619.

Krott, M. (2005). *Forest policy analysis*. Springer Science & Business Media.

Lasanta, T., Arnáez, J., Pascual, N., Ruiz-Flaño, P., Errea, M. P., & Lana-Renault, N. (2017). Space–time process and drivers of land abandonment in Europe. *CATENA*, *149*, 810–823. https://doi.org/10.1016/j.catena.2016.02.024

Lasanta, T., Nadal-Romero, E., Khorchani, M. & Romero-Díaz, A. (2021). Una revisión sobre las tierras abandonadas en España: de los paisajes locales a las estrategias globales de gestión. *Cuadernos de Investigación Geográfica*, *47*(2).

Le Provost, G., Schenk, N. V., Penone, C., Thiele, J., Westphal, C., Allan, E., Ayasse, M., Blüthgen, N., Boeddinghaus, R. S., & Boesing, A. L. (2022). The supply of multiple ecosystem services requires biodiversity across spatial scales. *Nature Ecology & Evolution*, 1–14.

Leipold, S. (2014). Creating forests with words—A review of forest-related discourse studies. *Forest Policy and Economics*, *40*, 12–20. https://doi.org/10.1016/j.forpol.2013.12.005

Leipold, S., Feindt, P. H., Winkel, G., & Keller, R. (2019). *Discourse analysis of environmental policy revisited: Traditions, trends, perspectives*. *21*(5), 445–463. https://doi.org/10.1080/1523908X.2019.1660462

Leipold, S., Sotirov, M., Frei, T., & Winkel, G. (2016). *Protecting 'First World' Markets and 'Third World' Nature: The Politics of Illegal Logging in Australia, the European Union and the United States*. *39*, 294–304. https://doi.org/10.1016/j.gloenvcha.2016.06.005

Leipold, S., & Winkel, G. (2016a). Discursive Agency:(Re-) Conceptualizing Actors and Practices in the Analysis of Discursive Policymaking. *Policy Studies Journal*, *45*(3), 510–534. https://doi.org/10.1111/psj.12172

Leipold, S., & Winkel, G. (2016b). Divide and conquer—Discursive agency in the politics of illegal logging in the United States. *Global Environmental Change*, *36*, 35–45. https://doi.org/10.1016/j.gloenvcha.2015.11.006

Leipold, S., & Winkel, G. (2016c). Demolishing Dikes: Multiple Streams and Policy Discourse Analysis: Multiple Streams and Policy Discourse Analysis. *Policy Studies Journal*, *44*(1), 108–129. https://doi.org/10.1111/psj.12136

Linnér, B.-O., & Wibeck, V. (2020). Conceptualising variations in societal transformations towards sustainability. *Environmental Science & Policy*, *106*, 221–227. https://doi.org/10.1016/j.envsci.2020.01.007

Lloret, F., Escudero, A., Iriondo, J. M., Martínez-Vilalta, J., & Valladares, F. (2012). Extreme climatic events and vegetation: The role of stabilizing processes. *Global Change Biology*, *18*(3), 797–805.

Loorbach, D., Frantzeskaki, N., & Avelino, F. (2017). Sustainability transitions research: Transforming science and practice for societal change. *Annual Review of Environment and Resources*, *42*(1), 599–626.

López-i-Gelats, F., Tàbara, J. D., & Bartolomé, J. (2009). The rural in dispute: Discourses of rurality in the Pyrenees. *Geoforum*, *40*(4), 602–612. https://doi.org/10.1016/j.geoforum.2009.04.008

Lorimer, J., Sandom, C., Jepson, P., Doughty, C., Barua, M., & Kirby, K. J. (2015). Rewilding: Science, practice, and politics. *Annual Review of Environment and Resources*, *40*, 39–62. https://doi.org/10.1146/annurev-environ-102014-021406

Lovrić, M., Da Re, R., Vidale, E., Prokofieva, I., Wong, J., Pettenella, D., Verkerk, P. J., & Mavsar, R. (2020). Non-wood forest products in Europe–A quantitative overview. *Forest Policy and Economics*, *116*, 102175.

MacDonald, D., Crabtree, J. R., Wiesinger, G., Dax, T., Stamou, N., Fleury, P., Gutierrez Lazpita, J., & Gibon, A. (2000). Agricultural abandonment in mountain areas of Europe: Environmental consequences and policy response. *Journal of Environmental Management*, *59*(1), 47–69. https://doi.org/10.1006/jema.1999.0335

Mancheva, I. (2021). The role of legitimacy in the implementation of outputs from collaborative processes: A national dialogue for forest water consideration in Sweden. *Environmental Science & Policy*, *120*, 42–52. https://doi.org/10.1016/j.envsci.2021.02.004

Martín-Forés, I., Magro, S., Bravo-Oviedo, A., Alfaro-Sánchez, R., Espelta, J. M., Frei, T., Valdés-Correcher, E., Rodríguez Fernández-Blanco, C., Winkel, G., Gerzabek, G., González-Martínez, S. C., Hampe, A., & Valladares, F. (2020). Spontaneous forest regrowth in South-West Europe: Consequences for nature's contributions to people. *People and Nature*, *2*, 980–994. https://doi.org/10.1002/pan3.10161

Mather, A. S., & Needle, C. L. (1998). The forest transition: A theoretical basis. *Area*, *30*(2), 117–124.

Mausolf, K., Härdtle, W., Jansen, K., Delory, B. M., Hertel, D., Leuschner, C., Temperton, V. M., von Oheimb, G., & Fichtner, A. (2018). Legacy effects of land-use modulate tree growth responses to climate extremes. *Oecologia*, *187*(3), 825–837.

McBeth, M. K., Shanahan, E. A., & Jones, M. D. (2005). The Science of Storytelling: Measuring Policy Beliefs in Greater Yellowstone. *Society & Natural Resources*, *18*(5), 413–429. https://doi.org/10.1080/08941920590924765

Melero, Y., Stefanescu, C., & Pino, J. (2016). General declines in Mediterranean butterflies over the last two decades are modulated by species traits. *Biological Conservation*, *201*, 336–342.

Merckx, T., & Pereira, H. M. (2015). Reshaping agri-environmental subsidies: From marginal farming to large-scale rewilding. *Basic and Applied Ecology*, *16*(2), 95–103. https://doi.org/10.1016/j.baae.2014.12.003

Messier, C., Bauhus, J., Doyon, F., Maure, F., Sousa-Silva, R., Nolet, P., Mina, M., Aquilué, N., Fortin, M.-J., & Puettmann, K. (2019). The functional complex network approach to foster forest resilience to global changes. *Forest Ecosystems*, *6*(1), 1–16.

Miranda, D. O., Alegre, E. V. A., & Faus, A. M. M. (2013). *Agriculture in Mediterranean Europe: Between old and new paradigms*. Emerald Group Publishing.

Mitchell, S. J. (2013). Wind as a natural disturbance agent in forests: A synthesis. *Forestry: An International Journal of Forest Research*, *86*(2), 147–157.

Montiel, C., & Galiana, L. (2005). Forest policy and land planning policy in Spain: A regional approach. *Forest Policy and Economics*, *7*(2), 131–142. https://doi.org/10.1016/S1389-9341(03)00026-1

Moon, K., & Blackman, D. (2014). A guide to understanding social science research for natural scientists. *Conservation Biology*, *28*(5), 1167–1177.

Navarro, L. M., & Pereira, H. M. (2012). Rewilding Abandoned Landscapes in Europe. *Ecosystems*, *15*(6), 900–912. https://doi.org/10.1007/s10021-012-9558-7

Navarro, L. M., & Pereira, H. M. (2015). Rewilding abandoned landscapes in Europe. In H. M. Pereira & L. M. Navarro (Eds.), *Rewilding European Landscapes* (pp. 3–23). Springer.

Nichiforel, L., Keary, K., Deuffic, P., Weiss, G., Thorsen, B. J., Winkel, G., Avdibegović, M., Dobšinská, Z., Feliciano, D., & Gatto, P. (2018). How private are Europe's private forests? A comparative property rights analysis. *Land Use Policy*, *76*, 535–552.

Oliveira, T. M., Guiomar, N., Baptista, F. O., Pereira, J. M., & Claro, J. (2017). Is Portugal's forest transition going up in smoke? *Land Use Policy*, *66*, 214–226.

Otero, I., Marull, J., Tello, E., Diana, G., Pons, M., Coll, F., & Boada, M. (2015). Land abandonment, landscape, and biodiversity: Questioning the restorative character of the forest transition in the Mediterranean. *Ecology and Society*, *20*(2), 7. https://doi.org/10.5751/ES-07378-200207

Palau Puigvert, J. (2022). *Rewilding Iberia: Explorando el potencial de la renaturalización en España*. Lynx edicions.

Palmero Iniesta, M. (2021). Recent Forest Expansion in Europe (1985-2015). Patterns, Drivers, and Implications for Forest Growth. *PhD thesis, Centre for Ecological Research and Forestry Applications (CREAF), Universitat Autònoma de Barcelona.*

Palmero-Iniesta, M., Espelta, J. M., Gordillo, J., & Pino, J. (2020). Changes in forest landscape patterns resulting from recent afforestation in Europe (1990–2012): Defragmentation of pre-

existing forest versus new patch proliferation. *Annals of Forest Science*, *77*(2), 43. https://doi.org/10.1007/s13595-020-00946-0

Palmero-Iniesta, M., Pino, J., Pesquer, L., & Espelta, J. M. (2021). Recent forest area increase in Europe: Expanding and regenerating forests differ in their regional patterns, drivers and productivity trends. *European Journal of Forest Research*, *140*(4), 793–805. https://doi.org/10.1007/s10342-021-01366-z

Parker, R., Bayne, K., & Clinton, P. W. (2016). Robotics in forestry. *NZ Journal of Forestry*, *60*(4), 8–14.

Pausas, J. G., & Keeley, J. E. (2021). Wildfires and global change. *Frontiers in Ecology and the Environment*, *19*(7), 387–395.

Pereira, H. M., & Navarro, L. M. (Eds.). (2015). *Rewilding European Landscapes*. Springer International Publishing. http://link.springer.com/10.1007/978-3-319-12039-3

Pereira, L., Karpouzoglou, T., Doshi, S., & Frantzeskaki, N. (2015). Organising a safe space for navigating social-ecological transformations to sustainability. *International Journal of Environmental Research and Public Health*, *12*(6), 6027–6044.

Perpiña Castillo, C., Kavalov, B., Diogo, V., Jacobs-Crisioni, C., Batista e Silva, F., & Lavalle, C. (2018). *Agricultural Land Abandonment in the EU within 2015-2030. JRC113718, European Commission 2018.* https://ec.europa.eu/jrc/sites/default/files/jrc113718.pdf

Petit, R. J., & Hampe, A. (2006). Some evolutionary consequences of being a tree. *Annual Review of Ecology, Evolution, and Systematics*, 187–214.

Pettorelli, N., Durant, S. M., & du Toit, J. T. (Eds.). (2019). *Rewilding*. Cambridge University Press.

Pinillos, F., Picardo, A., Allué-Andrade, M., Soria, E., & Sanz, A. (2009). La resina: Herramienta de conservación de nuestros pinares. Diagnóstico y Propuestas de Actuación En El Sector Resinero. *Cesefor y Junta de Castilla y León*.

Piussi, P., & Pettenella, D. (2000). Spontaneous afforestation of fallows in Italy. In N. Weber (Ed.), *NEWFOR–New Forests for Europe: Afforestation at the Turn of the Century* (Vol. 151, pp. 151–163). European Forest Institute, Joensuu.

Plieninger, T., Dijks, S., Oteros-Rozas, E., & Bieling, C. (2013). Assessing, mapping, and quantifying cultural ecosystem services at community level. *Land Use Policy*, *33*, 118–129. https://doi.org/10.1016/j.landusepol.2012.12.013

Plieninger, T., Hui, C., Gaertner, M., & Huntsinger, L. (2014). The Impact of Land Abandonment on Species Richness and Abundance in the Mediterranean Basin: A Meta-Analysis. *PLOS ONE*, *9*(5), 1–12. https://doi.org/10.1371/journal.pone.0098355

Pointereau, P., Coulon, F., Girard, P., Lambotte, M., Stuczynski, T., Sánchez-Ortega, V., & Del Rio, A. (2008). *Analysis of farmland abandonment and the extent and location of agricultural areas that are actually abandoned or are in risk to be abandoned* (E. Anguiano, C. Bamps, & J. M. Terres, Eds.). European Commission, Joint Research Centre, Institute for Environment and Sustainability, Brussels.

Poorter, L., Bongers, F., Aide, T. M., Almeyda Zambrano, A. M., Balvanera, P., Becknell, J. M., Boukili, V., Brancalion, P. H., Broadbent, E. N., & Chazdon, R. L. (2016). Biomass resilience of Neotropical secondary forests. *Nature*, *530*(7589), 211–214.

Potapov, P. V., Turubanova, S. A., Tyukavina, A., Krylov, A. M., McCarty, J. L., Radeloff, V. C., & Hansen, M. C. (2015). Eastern Europe's forest cover dynamics from 1985 to 2012 quantified from the full Landsat archive. *Remote Sensing of Environment*, *159*, 28–43.

Potter, C., & Tilzey, M. (2005). Agricultural policy discourses in the European post-Fordist transition: Neoliberalism, neomercantilism and multifunctionality. *Progress in Human Geography*, *29*(5), 581–600. https://doi.org/10.1191/0309132505ph569oa

Prach, K., & Pyšek, P. (2001). Using spontaneous succession for restoration of human-disturbed habitats: Experience from Central Europe. *Ecological Engineering*, *17*(1), 55–62.

Proença, V., Honrado, J., & Pereira, H. M. (2012). From Abandoned Farmland to Self-Sustaining Forests: Challenges and Solutions. *Ecosystems*, *15*(6), 881–882. https://doi.org/10.1007/s10021-012-9557-8

Puerta-Piñero, C., Espelta, J. M., Sánchez-Humanes, B., Rodrigo, A., Coll, L., & Brotons, L. (2012). History matters: Previous land use changes determine post-fire vegetation recovery in forested Mediterranean landscapes. *Forest Ecology and Management*, *279*, 121–127.

Pülzl, H., Kleinschmit, D., & Arts, B. (2014). Bioeconomy–an emerging meta-discourse affecting forest discourses? *Scandinavian Journal of Forest Research*, *29*(4), 386–393.

Reed, M. S., Kenter, J., Bonn, A., Broad, K., Burt, T. P., Fazey, I. R., Fraser, E. D. G., Hubacek, K., Nainggolan, D., & Quinn, C. H. (2013). Participatory scenario development for environmental management: A methodological framework illustrated with experience from the UK uplands. *Journal of Environmental Management*, *128*, 345–362.

Rego, F. M. C. C., Rodríguez, J. M. M., Calzada, V. R. V., & Xanthopoulos, G. (2018). *Forest fires: Sparking firesmart policies in the EU.* European Commission, Brussels.

Regos, A., Domínguez, J., Gil-Tena, A., Brotons, L., Ninyerola, M., & Pons, X. (2016). Rural abandoned landscapes and bird assemblages: Winners and losers in the rewilding of a marginal mountain area (NW Spain). *Regional Environmental Change*, *16*(1), 199–211.

Renwick, A., Jansson, T., Verburg, P. H., Revoredo-Giha, C., Britz, W., Gocht, A., & McCracken, D. (2013). Policy reform and agricultural land abandonment in the EU. *Land Use Policy*, *30*(1), 446–457. https://doi.org/10.1016/j.landusepol.2012.04.005

Rewilding Europe. (2022). *Nature-based economies*. Rewilding Europe. https://rewildingeurope.com/rewilding-in-action/nature-based-economies/ (accessed 05/12/2022)

Rey Benayas, J. M. (2007). Abandonment of agricultural land: An overview of drivers and consequences. *CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources*, *2*(057). https://doi.org/10.1079/PAVSNNR20072057

Rey Benayas, J. M., & Bullock, J. M. (2012). Restoration of biodiversity and ecosystem services on agricultural land. *Ecosystems*, *15*(6), 883–899.

Reyna Doménech, S., Folch, L., & Alloza, J. A. (2002). La truficultura: Una dehesa rentable para los encinares en suelos calizos. *Cuadernos de La Sociedad Española de Ciencias Forestales*, *14*, 95–101.

Rodríguez Fernández-Blanco, C., Górriz-Mifsud, E., Prokofieva, I., Muys, B., & Novoa, C. P. (2022). Blazing the trail: Social innovation supporting wildfire-resilient territories in Catalonia (Spain). *Forest Policy and Economics*, *138*, 102719.

Roe, E. (1994). *Narrative policy analysis: Theory and practice*. Duke University Press.

Roura-Pascual, N., Pons, P., Etienne, M., & Lambert, B. (2005). Transformation of a rural landscape in the Eastern Pyrenees between 1953 and 2000. *Mountain Research and Development*, *25*(3), 252–261.

Rudel, T. K., Meyfroidt, P., Chazdon, R., Bongers, F., Sloan, S., Grau, H. R., Van Holt, T., & Schneider, L. (2020). Whither the forest transition? Climate change, policy responses, and redistributed forests in the twenty-first century. *Ambio*, *49*(1), 74–84.

Ruiz-Carbayo, H., Bonal, R., Espelta, J. M., Hernández, M., & Pino, J. (2017). Community assembly in time and space: The case of Lepidoptera in a Quercus ilex L. savannah-like landscape. *Insect Conservation and Diversity*, *10*(1), 21–31.

Ruiz-Carbayo, H., Pino, J., Bonal, R., James, P., Hampe, A., Molowny-Horas, R., & Espelta, J. M. (2020). Insect herbivory in novel Quercus ilex L. forests: The role of landscape attributes, forest composition and host traits. *Annals of Forest Science*, *77*(2), 1–12.

Ruskule, A., Nikodemus, O., Kasparinskis, R., Bell, S., & Urtane, I. (2013). The perception of abandoned farmland by local people and experts: Landscape value and perspectives on future land use. *Landscape and Urban Planning*, *115*, 49–61. https://doi.org/10.1016/j.landurbplan.2013.03.012

Russo, D. (2007). Effects of land abandonment on animal species in Europe: Conservation and management implications. *Integrated Assessment of Vulnerable Ecosystems under Global Change in the European Union. Project Report. European Commission, Community Research, Sustainable Development, Global Change and Ecosystems*.

Sadovnik, A. R. (2007). Qualitative Research and Public Policy. In *Handbook of public policy analysis: Theory, politics, and methods* (pp. 417–429). CRC/Taylor & Francis.

Saleh, D., Chen, J., Leplé, J.-C., Leroy, T., Truffaut, L., Dencausse, B., Lalanne, C., Labadie, K., Lesur, I., & Bert, D. (2022). Genome-wide evolutionary response of European oaks during the Anthropocene. *Evolution Letters*, *6*(1), 4–20.

San Roman Sanz, A., Fernandez, C., Mouillot, F., Ferrat, L., Istria, D., & Pasqualini, V. (2013). Long-Term Forest Dynamics and Land-Use Abandonment in the Mediterranean Mountains, Corsica, France. *Ecology and Society*, *18*(2), 38. https://doi.org/10.5751/ES-05556-180238

Sandom, C. J., Dempsey, B., Bullock, D., Ely, A., Jepson, P., Jimenez-Wisler, S., Newton, A., Pettorelli, N., & Senior, R. A. (2018). Rewilding in the English uplands: Policy and practice. *Journal of Applied Ecology*. https://doi.org/10.1111/1365-2664.13276

Sanz-Hernández, A., Jiménez-Caballero, P., Bacallao-Pino, L. M., Salvador Esteban, R., & Martín-Santafé, M. (2022). Discourses on social innovation and abandoned land reutilization

pathways. A case study on riverside landscapes in a mountain area of Spain. *Frontiers in Forests and Global Change*, *5*, 921649.

Sarkki, S., Parpan, T., Melnykovych, M., Zahvoyska, L., Derbal, J., Voloshyna, N., & Nijnik, M. (2019). Beyond participation! Social innovations facilitating movement from authoritative state to participatory forest governance in Ukraine. *Landscape Ecology*, *34*(7), 1601–1618.

Scherr, S. J., & McNeely, J. A. (2008). Biodiversity conservation and agricultural sustainability: Towards a new paradigm of 'ecoagriculture'landscapes. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *363*(1491), 477–494. https://doi.org/10.1098/rstb.2007.2165

Schierhorn, F., Müller, D., Beringer, T., Prishchepov, A. V., Kuemmerle, T., & Balmann, A. (2013). Post-Soviet cropland abandonment and carbon sequestration in European Russia, Ukraine, and Belarus. *Global Biogeochemical Cycles*, *27*(4), 1175–1185.

Schnitzler, A., & Génot, J.-C. (2013). *La France des friches: De la ruralité à la féralité*. Édition Quae.

Schnitzler, A., & Génot, J.-C. (2022). *La féralité: Un concept novateur pour les forêts*. *73*(2–3), 271–279. https://doi.org/10.20870/revforfr.2021.5472

Schnitzler, A., Génot, J.-C., Wintz, M., & Hale, B. W. (2008). Naturalness and conservation in France. *Journal of Agricultural and Environmental Ethics*, *21*(5), 423–436. https://doi.org/10.1007/s10806-008-9096-7

Seidl, R., Schelhaas, M.-J., Rammer, W., & Verkerk, P. J. (2014). Increasing forest disturbances in Europe and their impact on carbon storage. *Nature Climate Change*, *4*(9), 806–810.

Selby, A., Koskela, T., & Petäjistö, L. (2007). Evidence of lay and professional forest-based development discourses in three contrasting regions of Finland. *Forest Policy and Economics*, *9*(6), 633–646. https://doi.org/10.1016/j.forpol.2006.05.003

Selva, N., Chylarecki, P., Jonsson, B.-G., & Ibisch, P. L. (2020). Misguided forest action in EU Biodiversity Strategy. *Science*, *368*(6498), 1438–1439.

Smallbone, L. T., Mathews, A., & Lunt, I. D. (2014). Regrowth provides complementary habitat for woodland birds of conservation concern in a regenerating agricultural landscape. *Landscape and Urban Planning, 124*, 43–52.

Soliva, R. (2007). Landscape stories: Using ideal type narratives as a heuristic device in rural studies. *Journal of Rural Studies*, *23*(1), 62–74. https://doi.org/10.1016/j.jrurstud.2006.04.004

Soliva, R., Bollinger, J., & Hunziker, M. (2010). *Differences in preferences towards potential future landscaoes in the Swiss Alps*. *35*(6), 671–696.

Soliva, R., & Hunziker, M. (2009). Beyond the visual dimension: Using ideal type narratives to analyse people's assessments of landscape scenarios. *Land Use Policy*, *26*(2), 284–294.

Soliva, R., Rønningen, K., Bella, I., Bezak, P., Cooper, T., Flø, B. E., Marty, P., & Potter, C. (2008). Envisioning upland futures: Stakeholder responses to scenarios for Europe's mountain landscapes. *Journal of Rural Studies*, *24*(1), 56–71. https://doi.org/10.1016/j.jrurstud.2007.04.001

Sotirov, M., & Winkel, G. (2016). Toward a cognitive theory of shifting coalitions and policy change: Linking the advocacy coalition framework and cultural theory. *Policy Sciences*, *49*(2), 125–154. https://doi.org/10.1007/s11077-015-9235-8

Sotirov, M., Winkel, G., & Eckerberg, K. (2021). The coalitional politics of the European Union's environmental forest policy: Biodiversity conservation, timber legality, and climate protection. *Ambio*, *50*(12), 2153–2167.

Subedi, Y. R., Kristiansen, P., & Cacho, O. (2021). Drivers and consequences of agricultural land abandonment and its reutilisation pathways: A systematic review. *Environmental Development*, 100681. https://doi.org/10.1016/j.envdev.2021.100681

Taschen, E., Sauve, M., Taudiere, A., Parlade, J., Selosse, M.-A., & Richard, F. (2015). Whose truffle is this? Distribution patterns of ectomycorrhizal fungal diversity in Tuber melanosporum brûlés developed in multi-host Mediterranean plant communities. *Environmental Microbiology*, *17*(8), 2747–2761. https://doi.org/10.1111/1462-2920.12741

Terres, J.-M., Scacchiafichi, L. N., Wania, A., Ambar, M., Anguiano, E., Buckwell, A., Coppola, A., Gocht, A., Nordström Källström, H., Pointereau, P., Strijker, D., Visek, L., Vranken, L., & Zobena, A. (2015). Farmland abandonment in Europe: Identification of drivers and indicators, and development of a composite indicator of risk. *Land Use Policy*, *49*, 20–34. https://doi.org/10.1016/j.landusepol.2015.06.009

Thompson, M. (2003). *Cultural theory, climate change and clumsiness. Economic and Political Weekly,* 5107–5112.

Thompson, M., Ellis, R., & Wildavsky, A. (1990). *Cultural theory*. Westview Press.

Turnhout, E., Waterton, C., Neves, K., & Buizer, M. (2013). Rethinking biodiversity: From goods and services to "living with". *Conservation Letters*, *6*(3), 154–161.

Ursino, N., & Romano, N. (2014). Wild forest fire regime following land abandonment in the Mediterranean region. *Geophysical Research Letters*, *41*(23), 8359–8368.

Vainio, A., Tienhaara, A., Haltia, E., Hyvönen, T., Pyysiäinen, J., & Pouta, E. (2021). The legitimacy of result-oriented and action-oriented agri-environmental schemes: A comparison of farmers' and citizens' perceptions. *Land Use Policy*, *107*, 104358. https://doi.org/10.1016/j.landusepol.2019.104358

Valdés-Correcher, E., van Halder, I., Barbaro, L., Castagneyrol, B., & Hampe, A. (2019). Insect herbivory and avian insectivory in novel native oak forests: Divergent effects of stand size and connectivity. *Forest Ecology and Management*, *445*, 146–153.

van der Zanden, E. H., Carvalho-Ribeiro, S. M., & Verburg, P. H. (2018). Abandonment landscapes: User attitudes, alternative futures and land management in Castro Laboreiro, Portugal. *Regional Environmental Change*, *18*(5), 1509–1520. https://doi.org/10.1007/s10113-018-1294-x

van der Zanden, E. H., Verburg, P. H., Schulp, C. J. E., & Verkerk, P. J. (2017). Trade-offs of European agricultural abandonment. *Land Use Policy*, *62*, 290–301. https://doi.org/10.1016/j.landusepol.2017.01.003

Van Eeten, M. J. (2007). Narrative Policy Analysis. In F. Fischer, G. Miller, & M. S. Sidney (Eds.), *Handbook of public policy analysis: Theory, politics, and methods* (pp. 251–269). CRC/Taylor & Francis.

van Hulst, M. (2012). Storytelling, a model of and a model for planning. *Planning Theory*, *11*(3), 299–318. https://doi.org/10.1177/1473095212440425

van Hulst, M., & Ybema, S. (2020). From What to Where: A setting-sensitive approach to organizational storytelling. *Organization Studies*, *41*(3), 365–391. https://doi.org/10.1177/0170840618815523

Varela, E., Pulido, F., Moreno, G., & Zavala, M. Á. (2020). Targeted policy proposals for managing spontaneous forest expansion in the Mediterranean. *Journal of Applied Ecology*, *57*(12), 2373–2380. https://doi.org/10.1111/1365-2664.13779

Vilà-Cabrera, A., Espelta, J. M., Vayreda, J., & Pino, J. (2017). "New Forests" from the Twentieth Century are a Relevant Contribution for C Storage in the Iberian Peninsula. *Ecosystems*, *20*(1), 130–143. https://doi.org/10.1007/s10021-016-0019-6

Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability and transformability in social–ecological systems. *Ecology and Society*, *9*(2).

WallisDeVries, M. F., Poschlod, P., & Willems, J. H. (2002). Challenges for the conservation of calcareous grasslands in northwestern Europe: Integrating the requirements of flora and fauna. In *Biological Conservation, 104*(3), 265–273.

Warner, B. P. (2019). Explaining political polarization in environmental governance using narrative analysis. *Ecology and Society*, *24*(3), art4. https://doi.org/10.5751/ES-10999-240304

Wertebach, T.-M., Hölzel, N., Kämpf, I., Yurtaev, A., Tupitsin, S., Kiehl, K., Kamp, J., & Kleinebecker, T. (2017). Soil carbon sequestration due to post-Soviet cropland abandonment: Estimates from a large-scale soil organic carbon field inventory. *Global Change Biology*, *23*(9), 3729–3741.

Wetzel, W. C., Kharouba, H. M., Robinson, M., Holyoak, M., & Karban, R. (2016). Variability in plant nutrients reduces insect herbivore performance. *Nature*, *539*(7629), 425–427.

Whytock, R. C., Fuentes-Montemayor, E., Watts, K., Barbosa De Andrade, P., Whytock, R. T., French, P., Macgregor, N. A., & Park, K. J. (2018). Bird-community responses to habitat creation in a long-term, large-scale natural experiment. *Conservation Biology*, *32*(2), 345–354.

Winkel, G. (2012). Foucault in the forests—A review of the use of 'Foucauldian' concepts in forest policy analysis. *Forest Policy and Economics*, *16*, 81–92. https://doi.org/10.1016/j.forpol.2010.11.009

Winkel, G. (2013). ‚Dispositif turn' und Foucaultsche Politikanalyse. Reflektionen zur Dispositivanalyse am Beispiel des Politikfeldes Wald. In Caborn Wengler, J.; Hoffarth, B. & Kumięga, L.; (Ed.): Verortungen des Dispositiv-Begriffs. Analytische Einsätze zu Raum, Bildung, Politik. Springer VS, Wiesbaden, pp. 167-198. In J. Caborn Wengler, B. Hoffart, & L. Kumiega (Eds.), *Verortungen des Dispositiv-Begriffs. Analytische Einsätze zu Raum, Bildung, Politik* (pp. 167–198). Springer Verlag.

Winkel, G. (2014). When the pendulum doesn't find its center: Environmental narratives, strategies, and forest policy change in the US Pacific Northwest. *Global Environmental Change*, *27*, 84–95. https://doi.org/10.1016/j.gloenvcha.2014.04.009

Winkel, G., Blondet, M., Borrass, L., Frei, T., Geitzenauer, M., Gruppe, A., Jump, A., de Koning, J., Sotirov, M., Weiss, G., Winter, S., & Turnhout, E. (2015). The implementation of Natura 2000 in forests: A trans- and interdisciplinary assessment of challenges and choices. *Environmental Science & Policy*, *52*, 23–32. https://doi.org/10.1016/j.envsci.2015.04.018

Winkel, G., Gleißner, J., Pistorius, T., Sotirov, M., & Storch, S. (2011). The sustainably managed forest heats up: Discursive struggles over forest management and climate change in Germany. *Critical Policy Studies*, *5*(4), 361–390. https://doi.org/10.1080/19460171.2011.628002

Winkel, G., Leipold, S., Buhmann, K., Cashore, B., De Jong, W., Nathan, I., Sotirov, M., & Stone, M. (2017). Narrating illegal logging across the globe: Between green protectionism and sustainable resource use. *International Forestry Review*, *19*(1), 81–97. https://doi.org/10.1505/146554817822407367

Winkel, G., & Sotirov, M. (2016). Whose integration is this? European forest policy between the gospel of coordination, institutional competition, and a new spirit of integration. *Environment and Planning C: Government and Policy*, *34*(3), 496–514.

With, K. A. (2002). The landscape ecology of invasive spread. *Conservation Biology*, *16*(5), 1192–1203.

Yanow, D. (2000). *Conducting interpretive policy analysis* (Vol. 47). Sage Publications.

Yanow, D. (2007). Qualitative-Interpretive Methods in Policy Research. In F. Fischer, G. Miller, & M. S. Sidney (Eds.), *Handbook of public policy analysis: Theory, politics, and methods* (pp. 405–416). CRC/Taylor & Francis.

Young, J. C., Jordan, A., R. Searle, K., Butler, A., S. Chapman, D., Simmons, P., & Watt, A. D. (2013). Does stakeholder involvement really benefit biodiversity conservation? *Biological Conservation*, *158*, 359–370. https://doi.org/10.1016/j.biocon.2012.08.018

Zagaria, C., Schulp, C. J. E., Kizos, T., & Verburg, P. H. (2018). Perspectives of farmers and tourists on agricultural abandonment in east Lesvos, Greece. *Regional Environmental Change*, *18*(5), 1467–1479. https://doi.org/10.1007/s10113-017-1276-4

Zavalloni, M., D'Alberto, R., Raggi, M., & Viaggi, D. (2019). Farmland abandonment, public goods and the CAP in a marginal area of Italy. *Land Use Policy*, 104365. https://doi.org/10.1016/j.landusepol.2019.104365

Zoderer, B. M., & Tasser, E. (2021). The plurality of wilderness beliefs and their mediating role in shaping attitudes towards wilderness. *Journal of Environmental Management*, *277*, 111392. https://doi.org/10.1016/j.jenvman.2020.111392

Appendices

Appendix A

Interview guideline (translated to English) – Alto Tajo region

Introduction

1. Could you explain a little bit about your position in [the organization] and your relationship with the forest and forest management?
2. How is [your organisation/business…] involved in forest management and use in the Alto Tajo region and what are your main interests?
3. What could you tell me about the importance of the forest for the society in the Alto Tajo region?

Forest management and forestry sector

4. What is the importance of the forest sector in the Alto Tajo region? What are the most influential factors on the importance of the forest sector?
5. What are the most influential factors on the type of management that is done in the forests of the Alto Tajo Region?
6. What is the process of land abandonment that is occurring/has occurred in the Alto Tajo region? How does it relate to current forest management?

Natural Forest Regrowth (NFR)

7. What would you say are the most important benefits of the new forests that colonize the abandoned lands?
    a. In relation to the different timber and non-timber products.
    b. In relation to societal and cultural aspects.
    c. In relation to ecological aspects.
8. What do you consider to be the most important problems arising from the spontaneous growth of forest stands? Or that could become a problem in the future?
    a. In relation to the different timber and non-timber products.
    b. In relation to societal and cultural aspects.
    c. In relation to ecological aspects
9. How are NFR areas managed and used? Who uses them?
10. How is the management carried out in the NFR areas [ask specifically: Spanish Juniper areas]? What are the factors that most influence the type of management carried out in the new forest areas of the Alto Tajo region?
11. What do you consider to be the most important conflicts of interest deriving from the uses and management of abandoned land and the new forest masses that grow on them?

Vision

12. What is your vision of territorial management in the [case study] region and which actors would/play an important role?

Policies

What are the effects of different policies on the use and management of abandoned lands in the case study region?

a. Nature and biodiversity conservation policies (Natura 2000 Network, Renaturation/Rewilding, ...)
b. Agricultural and rural development policies (CAP, Rural Development Plan,...)
c. Renewable energy policies
d. Other policies?

14. Are there any of these policies that you think should be reformulated? How? Is there any other that does not exist, but should, in your opinion?

Final questions

- In relation to this topic, is there anything that did not appear during the interview, but that is important?
- In relation to this topic, do you know of any other person or institution with whom it would be interesting for me to get in touch? (Public/private...)
- Is there any literature or documentation I can consult on the subject?

Appendix B

Table B.1: Data on total forest land, forest land changes, and ownership structure. Source: Forest Europe, 2020.

	FRANCE	**SPAIN**
Total forest land + other wooded land in 2020	17,253,000 ha + 843,000 ha	18,572,000 ha + 9,382,000 ha
Share of land covered by forest + other wooded land in 2020	31 % + 1.5 %	37 % + 19 %
Average annual expansion rate 1990–2020	+ 0.6 %	+ 1%
Ownership structure	26 % public (including municipal forest) 74 % private	28 % public (including municipal forest) 72 % private

Appendix C

Table C.1: Overview of interviews with actors at regional/national policy levels in France and Spain.

Actors' affiliation	**Number of interviews; reference code**	
	France (n=15) generated 12/18–02/19	**Spain (n=12) generated 07/19–03/20**
Extensive agriculture and rural development representatives	2; A-FR	2; A-ES
Environmental representatives	6; E-FR	3; E-ES

Forestry representatives (private, public, industry in Spain)	2; F-FR	5; F-ES
Governmental institutions	3; G-FR	1; G-ES
Science	2; S-FR	1; S-ES

Appendix D

Interview guideline Spain (translated to English)

Introduction

1. What is the role of natural forest regrowth (NFR) on abandoned land in current policymaking and how has it developed since the 1960s in Spain?
2. How is your professional work related to NFR on abandoned land?
3. Could you describe your view on NFR on abandoned land in Spain related to problems and opportunities you perceive?
4. What should be done politically about NFR and the "new forests" from the viewpoint of your institution? If not mentioned, ask specifically regarding:
    a. Measures to keep landscapes open
    b. Reverting forest to agricultural land
    c. Rewilding and conservation project (recreation, tourism)
    d. Forest management
    e. Afforestation of agricultural land
    f. No management, leave it abandoned
5. NFR on abandoned land is discussed differently amongst political groups. Who are the most influential policy actors and what do they want with regards to NFR on abandoned land in Spain?
6. Regarding strategies (if applicable):
    a. What strategies do you [institution] use to achieve your objectives regarding NFR on abandoned land? What strategies have been influential in the debate?
    b. Whit whom (other actors) do you cooperate on the issue of NFR?
7. Finally, do you think NFR has its place in today's 'Spanish' landscapes? Why?
8. Is there anything else you think is important to mention on this topic?

Final remarks and end of interview