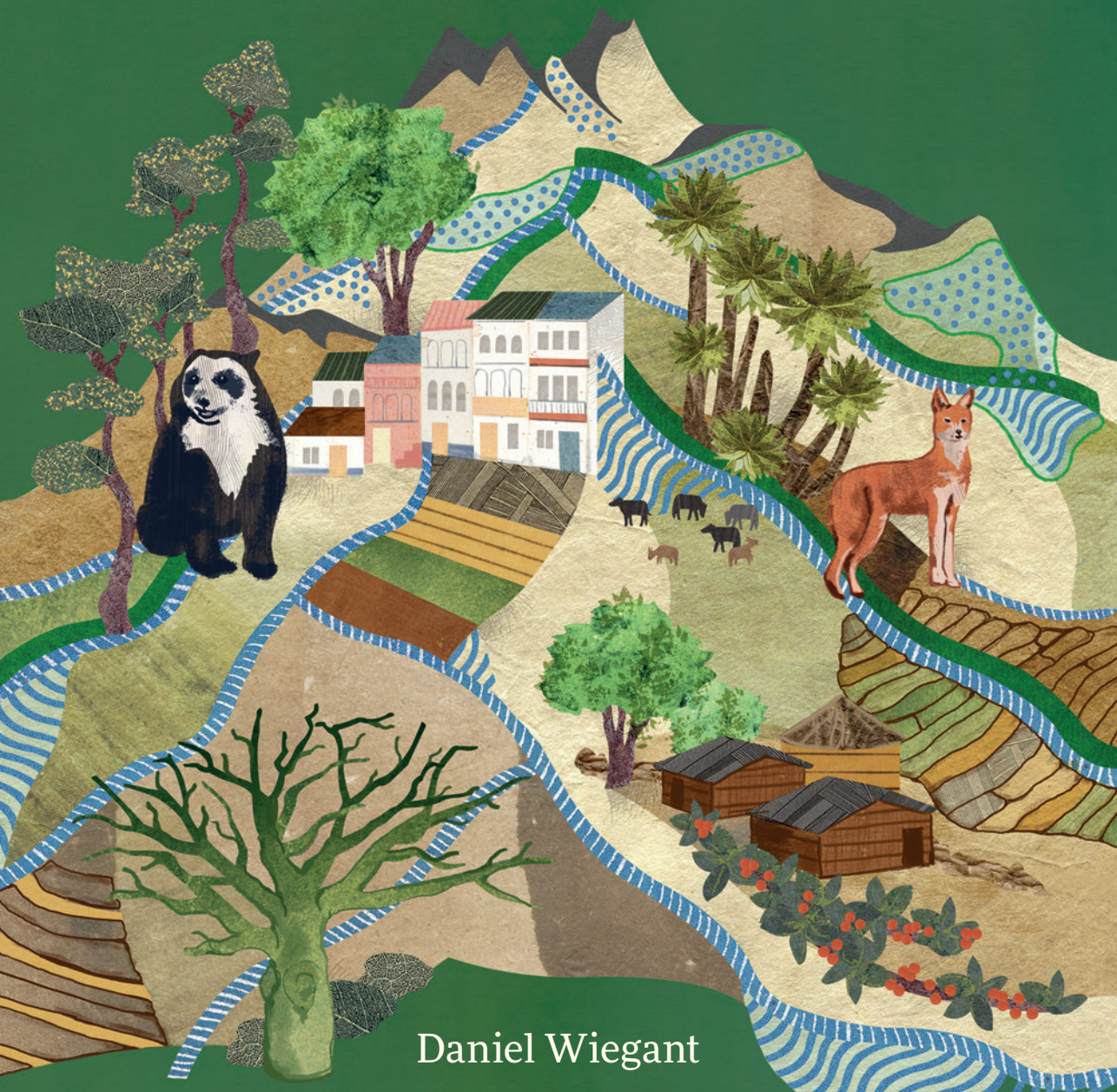
Translating national forest and landscape restoration targets into local action

Towards scale-sensitive governance



Daniel Wiegant

Propositions

1. Disentangling scale challenges is time consuming but essential to improve policy implementation.
   (this thesis)
2. Without genuine political receptiveness to learn from the past, there is no point in studying policy implementation.
   (this thesis)
3. Biotic homogenisation compromises landscape functionality, which has implications for the number of species grown in tree nurseries.
4. Reviewers who try to impose their own preferences on how to conduct a study are invited to conduct the study themselves.
5. Forest and landscape restoration requires a strong and well-funded public sector.
6. As we come to understand humanity's power to disrupt the Earth system, it is wise to take responsibility to calm the Earth system's powers we unleashed.

Propositions belonging to the thesis, entitled

Translating national forest and landscape restoration targets into local action. Towards scale-sensitive governance.

Daniel Wiegant

Wageningen, 3 October 2022

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Translating national forest and landscape restoration targets into local action

Towards scale-sensitive governance

Daniel Wiegant

Thesis

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The real voyage of discovery consists not in seeking new landscapes, but in having new eyes.

- Marcel Proust

To Alessandra & Ruben

The book cover shows a land use mosaic that is intersected by ecological corridors and water streams originating from upstream sources. Some of these water sources are in the process of being restored. Besides a typical Ecuadorian and Ethiopian rural community, flora and fauna representing the different case study landscapes are depicted. These include the spectacled bear (*Tremarctos ornatus*) and hummingbird (*Colibri coruscans*) for the *Chocó Andino*, the Ceibo tree (*Ceiba trichistandra*) for the *Bosque Seco*, the giant lobelia (*Lobelia Rhynchopetalum*) and the Ethiopian wolf (*Canis simensis*) for Mount Guna, and the coffee plant (*Coffea arabica*) for the *Kafa Biosphere* landscape.

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Introduction

1.1 The governance challenge of meeting ambitious restoration targets

In 2019, at the onset of the rainy season that runs from June to August, the Ethiopian Prime Minister Abiy Ahmed launched a historic, national tree planting campaign called the Green Legacy Initiative[1]. In this ambitious attempt to counter the effects of deforestation and climate change, almost all government offices closed and civil servants across the entire country helped to kick-off the campaign by planting nearly 354 million tree seedlings in the timespan of one single day[2]. During the entire 2019 campaign, more than 20 million of the country's 105 million inhabitants took part to plant a total of four billion trees that reportedly reforested 1.5 million hectares (Mha)[3]. The planting efforts received extensive national media coverage and brought Ethiopia into international headlines. As part of international initiatives to restore degraded and deforested land, the Ethiopian government has set a target to restore 15 Mha by 2030 and the Green Legacy Initiative was launched to contribute to this target. In 2020, the Initiative was given follow-up and the number of seedlings planted was expanded to five billion, while six billion tree seedlings were scheduled for 2021[4].

Ethiopia has been internationally acclaimed for its ambitious restoration targets and efforts to address the challenges it faces from deforestation and land degradation due to unsustainable agricultural practices and firewood collection[5]. The country's Green Legacy Initiative is part of a global trend in which high-level actors set ambitious targets to restore millions of hectares and plant billions of trees to mitigate climate change, stop biodiversity loss and halt land productivity decline (Holl and Brancalion, 2020). While restoration efforts play a crucial role in improving ecological integrity and human well-being when they are well-planned, the way they are promoted as quick, stand-alone silver bullet solutions is problematic and may negatively impact biodiversity and rural livelihoods, and increase CO_2 emissions when they do not take sufficient account of ecological and social realities on the ground (Di Sacco et al.,

1 UNEP (2019) *Ethiopia plants over 350 million trees in a day, setting new world record*. Story. Available on the internet: https://www.unep.org/news-and-stories/story/ethiopia-plants-over-350-million-trees-day-setting-new-world-record [accessed on December 13th 2021]

2 Getahun, E. (2020) *Ethiopia to grow 5 billion trees in the Second Green Legacy Campaign*. ICRAF blog. Available on the internet: https://www.worldagroforestry.org/blog/2020/06/09/ethiopia-grow-5-billion-trees-second-green-legacy-campaign [accessed on December 13th 2021]

3 UNEP (2019) *Spotlight on Ethiopia's tree-planting programme*. Story. Available on the internet: https://www.unep.org/news-and-stories/story/spotlight-ethiopias-tree-planting-programme [accessed on December 13th 2021]

4 Takouleu, J.M. (2021) *Ethiopia: a new campaign to plant 6 billion trees by 2022*. Available on the internet: https://www.afrik21.africa/en/ethiopia-a-new-campaign-to-plant-6-billion-trees-by-2022/ [accessed on December 13th 2021]

5 Mwai, P. (2019) *Did Ethiopia plant four billion trees this year?* BBC reality check. Available on the internet: https://www.bbc.com/news/world-africa-50813726 [accessed on December 13th 2021]

2021). Most restoration efforts make headlines with the number of trees they will plant or the number of hectares they will restore, rather than *how* it is achieved and sustained. However, such efforts risk failing in the long-term when it remains unclear how they align to governance processes at sub-national levels and to other policy objectives, or how they fit with ecological processes.

Ethiopia is one of more than 60 national governments that currently pledged ambitious forest and landscape restoration targets for the years 2020 and 2030[6], as part of the Bonn Challenge and the New York Declaration on Forests. The political, social and economic contexts of the countries that have pledged restoration targets are highly diverse (Schweizer et al., 2018) and the task that national governments have to implement restoration targets within corresponding timelines is enormous (Mansourian et al., 2017a). It is timely and relevant to better understand how national forest and landscape restoration targets are translated into local action, and what challenges emerge in the implementation process. It is furthermore needed to understand what governance arrangements and strategies can support effective implementation of the targets. The general research question of this dissertation is:

What scale challenges emerge when implementing policies to meet national restoration targets, and what scale-sensitive governance arrangements and strategies do actors use in dealing with such challenges?

To set the stage for answering this general research question, in the following sections I explain major land degradation trends, introduce the forest and landscape restoration concept, list the numerous restoration-oriented targets that have been pledged within diverse international platforms, and identify the relevant governance-related knowledge gaps and specific research questions that require additional attention. This is followed by an explanation of the *sector*, *scale*, *level* and *scale-sensitive governance* concepts, the research approach and methodology.

6 IUCN (2020) *Current pledges*. Available on the internet: https://www.bonnchallenge.org/pledges [accessed on January 4th 2022]

1.2 The wicked problem of land degradation

1.2.1 Land degradation

To meet the rising demand of the world's population, the spatial extent and intensity of land uses for agricultural purposes has shown an unabated long-term growth over the past century. Agriculture has become the chief direct driver of land degradation at the global level and has altered ecological processes on three-quarters of the Earth's land surface (Foley et al., 2007; IPBES, 2018; Willemen et al., 2020). Anthropogenic activities have resulted in widespread and ongoing deforestation and forest degradation, loss of natural grasslands, the disappearance of wetlands and soil degradation (UNCCD, 2017). In the tropics alone, an estimated 350 Mha has been deforested and converted to other land uses, while another 500 Mha have been degraded (Lamb et al., 2005). Deforestation has been continuous, and 4.3 Mha of old-growth tropical forest was destroyed annually during the 2014-2018 period (NYDF Assessment Partners, 2019).

Land degradation has become a pervasive, systemic phenomenon that has reached critical levels in many parts of the world. The fragmentation, regulation and loss of terrestrial and freshwater ecosystems has resulted in their gradual simplification and homogenisation (Lamb et al., 2005) and has eroded their capacity to generate ecosystem functions, including water regulation and purification, soil formation, nutrient cycling, wildlife habitat, pollination, seed dispersal, pest control and carbon stocks (Foley et al., 2005; IPBES, 2018; Lewis et al., 2015; Pörtner et al., 2021; Willemen et al., 2020). Many ecosystems have been degraded to such an extent that their functions cannot fully recover within decades (IPBES, 2018). Land degradation pushes Earth towards the sixth mass extinction of species (IPBES, 2018; Ripple et al., 2017) and adversely impacts the well-being of at least 3.2 billion people as a result of reduced water supply and quality and increased health and disaster vulnerability (Pörtner et al., 2021).

Several international reports have underlined the intertwinement between land degradation, biodiversity loss and climate change (IPBES, 2018; IPCC, 2022, 2019; UNCCD, 2017). Land degradation and biodiversity loss are exacerbated by climate change (IPCC, 2019; Pörtner et al., 2021) while land use change and associated ecosystem function losses increase the intensity, frequency and duration of extreme climatic events and adversely impact nature as well as food and water securities (IPBES, 2018).

The intertwinement of multiple crises makes land degradation an example of a *wicked problem* (Rittel and Webber, 1973). Wicked problems have a diffused character, making them difficult to define, locate and address. They cut across sectoral policy

domains and governance levels, which causes standard solutions that are based on a sectoral rationale or top-down approaches to be inadequate (Termeer et al., 2019). Actors in different sectors and at different governance levels may hold different explanations about the problem, giving rise to broad disagreement on what *the* problem is and causing the search for solutions to be open ended (Head and Alford, 2015; Rittel and Webber, 1973; Roberts, 2000). Each solution stems from a particular interpretation of the problem (see Mansourian 2018). Above all, wicked problems resist attempts to solve them, with today's problems being the result of the solutions to yesterday's problems (Termeer et al., 2019). These characteristics have far-reaching implications for how wicked problems can best be governed, since the idea that with the right information, the best policy solutions can be identified does not seem to work (Head and Alford, 2015; Termeer et al., 2019).

1.2.2 Forest and landscape restoration

In recognition of the human dependence on well-functioning ecosystems and realising that conserving existing natural ecosystems is no longer sufficient to maintain necessary ecosystem functions, forest and landscape restoration (FLR) has gained prominence as an approach to address biodiversity loss, climate change, water and food insecurity, and poverty (Arts et al., 2017; Chazdon et al., 2020; Erbaugh and Oldekop, 2018; IPBES, 2018; Mansourian et al., 2021). FLR was defined in 2000 as "a planned process that aims to regain ecological integrity and enhance human wellbeing in deforested or degraded landscapes" (Mansourian et al., 2017b). Key aspects of this definition are 1) the intentionality of FLR, in that it is a planned process, 2) the dual focus on ecological and social processes, and 3) a recognition that these processes have spatial and temporal dimensions (Mansourian and Sgard, 2019).

FLR aims to restore some of the ecosystem functions on which biodiversity and humans depend by creating multifunctional landscapes that balance those land uses that safeguard functionally-intact ecosystems with those providing material and non-material benefits to society (Brancalion and Chazdon, 2017; NYDF Assessment Partners, 2019; Pörtner et al., 2021; UNCCD, 2017). While the FLR process is well-defined, there is no universal set of FLR activities (NYDF Assessment Partners, 2019). Conservation and sustainable land management efforts can be complemented by multiple forms of restoration, ranging from (assisted) natural regeneration to revegetation or reforestation with single or multiple species of native or exotic trees, as well as agroforestry systems (Brancalion and Chazdon, 2017; Lamb et al., 2005; Stanturf et al., 2019). As part of FLR, attention is both placed on patch-level practices like agroforestry, silvopasture, hedgerows and woodlots, and on landscape-level elements like buffer zones around remnant ecosystem patches, ecological corridors and stepping stones between such patches, and degraded ecosystem patches in e.g.

water sources, riparian areas and steep slopes. Combining land sharing and land sparing measures into landscape-level planning can assist in reconciling ecological integrity and human well-being (Meli et al., 2019). Ecosystems are likely to regenerate with little assistance in areas that are close to forest remnants, where soil seed banks are largely intact and seed-dispersing fauna are still present. Meanwhile, active restoration measures like revegetation or reforestation may be required in areas where ecological processes are severely disrupted (Holl, 2017). Natural regeneration in particular fosters native species and their genetic diversity, and the spatial and temporal heterogeneity that fosters ecosystem resilience (Chazdon and Guariguata, 2016).

FLR aims to overcome the poor outcomes of past restoration efforts that focused on a limited number of forestry or ecological objectives (Mansourian and Parrotta, 2019). In the case of forestry, many restoration attempts were ecologically inappropriate (Veldman et al., 2015). While some focused on afforestation of ecosystems that were historically non-forested, such as grasslands, others promoted reforestation with large monocultures of exotic tree species. While forestry efforts addressed challenges such as timber insecurity, they had a negative impact on biodiversity and even reduced natural carbon stocks (Brancalion and Chazdon, 2017; Di Sacco et al., 2021; Pörtner et al., 2021). Meanwhile, ecological restoration efforts centred on restoring pristine natural ecosystems on small tracts of land, without considering the needs and priorities of local communities.

Past restoration efforts that focused on a limited number of forestry or ecological objectives were often disconnected from the broader socio-economic context (Mansourian, 2017a; NYDF Assessment Partners, 2019). Their limited spatial reach caused unsustainable land management practices that drive local deforestation and land degradation to remain unaddressed. To make restoration efforts succeed at higher spatial levels and in the long-term, there is a need to understand the social system and the interactions between social and ecological processes (Mansourian and Parrotta, 2019). A large spatial focus is considered essential for restoration success (Mansourian et al., 2017a) with the landscape level being generally considered the most adequate to confront land degradation (Arts et al., 2017; Djenontin et al., 2018; Sayer et al., 2013). Landscapes are large enough to allocate land in ways that create synergy and manage trade-offs between different land use objectives, and small enough to be sensitive to local ecological conditions and development needs (Görg, 2007; Pörtner et al., 2021). The long-term success of efforts to restore ecosystem functions and biodiversity furthermore depends on the specific sites that are being restored and how the separate restoration sites complement each other in the landscape mosaic (Di Sacco et al., 2021; Lamb et al., 2005).

Restoration needs to be complemented by conservation and sustainable land management efforts. Conserving remnant forest and non-forest ecosystems tempers the further loss and degradation of genetic and species diversity, reduces carbon emissions from land use change, maintains large carbon stocks, and reduces climate change impacts on nature and society (IPCC, 2019; Pörtner et al., 2021). The functions that are provided by intact ecosystems, including centuries-old carbon stocks, cannot be matched by those in restoring ecosystems (Lewis et al., 2015), making it pivotal to conserve the natural ecosystems that still remain (Cooke et al., 2019; Holl and Brancalion, 2020; NYDF Assessment Partners, 2019). The adoption of sustainable land management practices on agricultural land maintains healthy soils and productivity, enabling communities to produce food and sustain their livelihoods. The maintenance of healthy soils addresses the underlying drivers of deforestation and land use change, and reduces pressure on natural ecosystems (Brancalion and Chazdon, 2017; Di Sacco et al., 2021; Mansourian and Parrotta, 2019).

1.2.3 High-level restoration targets

The persistence of land degradation challenges, like tropical deforestation (NYDF Assessment Partners, 2019), and their impact at local to global levels has generated unprecedented political will to design policies and set voluntary targets to restore degraded and deforested land in their national territory (Fagan et al., 2020). A number of high-level initiatives were critical catalysts for the FLR approach. Most importantly, the Bonn Challenge was launched by the German Ministry of Environment and International Union for the Conservation of Nature (IUCN) in 2011 (Mansourian et al., 2021; Pistorius and Freiberg, 2014). It established the aspirational goal to restore 150 Mha of deforested and degraded land by 2020[7] and pledges to contribute to this goal have been made by national and sub-national governments, and non-public actors. At the 2014 UN Climate Summit, a broad coalition of governments and non-public actors endorsed and expanded the Bonn Challenge to restore 350 Mha by 2030, within the framework of the New York Declaration on Forests (NYDF Goal 5) (NYDF Assessment Partners, 2019). Several regional implementation platforms have emerged out of the Bonn Challenge, including the 2014 Initiative 20x20 to restore 20 Mha in Latin America and the Caribbean, the 2015 African Restoration Initiative (AFR100) to restore 100 Mha, the 2017 Agadir commitment to restore 8 Mha in the Mediterranean region and the 2019 regional initiative for Europe, the Caucasus and Central Asia (ECCA30) to restore 30 Mha (Mansourian et al., 2021).

7 IUCN (2020) About the challenge. Available on the internet: https://www.bonnchallenge.org/about [accessed on January 14th 2022]

The Bonn Challenge, NYDF and regional initiatives are platforms for governments to work on national development priorities while contributing to the achievement of global biodiversity, land degradation and climate change agreements (Mansourian et al., 2021; Stanturf et al., 2020). The restoration targets are particularly relevant to four Sustainable Development Goals (SDGs) (UN, 2015a): Goal 2 – Zero hunger (Target 4), Goal 6 – Clean water and sanitation (Target 6), Goal 13 – Climate action (Target 1) and Goal 15 – Life on land (Targets 1, 2, 3 and 4). According to the IPBES (2018), land degradation needs to be avoided and reversed if all SDGs are to be attained. Furthermore, the restoration targets of the Bonn Challenge and NYDF are in line with the objectives of the three UN Rio Conventions. Aichi Target 15 of the Convention on Biological Diversity (CBD) aimed to restore at least 15 percent of degraded ecosystems at the global level by 2020 (CBD, 2011). The Convention to Combat Desertification (UNCCD) aims to achieve land degradation neutrality by 2030 (UNCCD, 2017) and Article 5 of the Convention on Climate Change's (UNFCCC) Paris Agreement encourages actions to conserve, sustainably manage and enhance sinks and reservoirs of greenhouse gases, including forests in developing countries (UN, 2015b).

While neither the Bonn Challenge, NYDF nor the SDGs and Rio conventions are legally binding, they have provided a basis for action and mobilised unparalleled political will to address land degradation at the global level (Chazdon et al., 2017; Stanturf et al., 2020). National commitments for ecosystem restoration mount to almost 300 Mha (CBD, 2020). National governments of 63 countries made a pledge to the Bonn Challenge[8] and 41 endorsed the NYDF[9]. Meanwhile, the global recognition that land degradation needs urgent attention has led to the declaration of the UN Decade of Ecosystem Restoration (2021-2030) (Aronson et al., 2020; Chazdon et al., 2020) during which countries strive to prevent, halt and reverse the degradation of a diversity of ecosystems, ranging from forests to grasslands, peatlands, farmlands, freshwater ecosystems, mountains and others[10].

8 IUCN (2020) *Current pledges*. Available on the internet: https://www.bonnchallenge.org/pledges [accessed on January 4th 2022]

9 Forest Declaration (2022) *Endorsers of the New York Declaration on Forests*. Available on the internet: https://forestdeclaration.org/about/nydf-endorsers [accessed on January 4th 2022]

10 UNEP & FAO. *Types of ecosystem restoration*. Available on the internet: https://www.decadeonrestoration.org/types-ecosystem-restoration [accessed on January 4th 2022]

1.3 Gaps in the literature and specific research questions

1.3.1 Governing forest and landscape restoration

With support for FLR being mobilised, the implementation of restoration targets at the local level is the next challenge (Stanturf et al., 2020). Despite the unprecedented political ambitions, countries show limited progress in translating national restoration targets into local action (Chazdon et al., 2020; Cooke et al., 2019; NYDF Assessment Partners, 2019) and most of them lack a detailed and viable plan (Mansourian and Parrotta, 2019). The huge ambitions to restore hundreds of millions of hectares and the tight timelines to fulfil them make understanding the governance context for FLR a priority (Mansourian et al., 2017a). It is, however, relatively recent that FLR governance has started receiving attention from the scientific community (Mansourian and Sgard, 2019). The dynamics and outcomes of landscape-level restoration governance remain poorly studied (Dawson et al., 2017) while the governance arrangements required to facilitate and sustain restoration efforts are not obvious (Wilson and Cagalanan, 2016).

Area-based targets give little guidance for the implementation of restoration efforts. Neither conceptual clarity regarding FLR nor a clear approach to determine whether restoration targets are being met exist (Chazdon et al., 2017; Erbaugh et al., 2020; Mansourian, 2018). Most FLR assessments focus on the evaluation of restoration potential at global, national or sub-national levels through the use of remote sensing techniques and metadata (Stanturf et al., 2020). In addition, there are a number of studies that propose general principles, norms or rules to make restoration successful (e.g. Suding et al. 2015, Brancalion and Chazdon 2017, Cooke et al. 2019, Di Sacco et al. 2021). However, both the restoration potential and general principles studies offer limited insights about the complex governance realities on the ground, the challenges that emerge in the process of implementing and sustaining restoration targets and how these can be addressed (Mansourian and Sgard, 2019; Stanturf et al., 2020).

FLR involves a diversity of actors who depend on a given landscape or who otherwise influence it through their land management decisions and policies (Chazdon, 2017; Stanturf et al., 2019). The outcomes of a FLR process are determined by whether and how actors across sectors and governance levels interact, and how these interactions relate to the ecological processes they aim to influence. This multidimensional character of FLR makes implementation challenging (Mansourian and Parrotta, 2019). Different actors may have varied interests and expectations about the use of natural resources in a landscape, the benefits derived from them, and the purpose of restoration (Stanturf et al., 2020). The ambiguity surrounding the FLR concept may actually have contributed to its widespread adoption (Mansourian, 2018). Still, the

lack of clarity on how FLR is implemented may allow certain actors to claim success in meeting their restoration targets while in reality they did not make a significant impact on mitigating and adapting to climate change, preventing biodiversity loss and strengthening sustainable livelihoods (Di Sacco et al., 2021; Fagan et al., 2020; Mansourian et al., 2017b).

Depending on the nature of governance processes, actors are able to express their needs and priorities to a greater or lesser extent and contribute towards negotiated solutions that accommodate land uses and restoration forms that balance ecological and social objectives (Mansourian, 2017a). A failure to recognise the interests and priorities of all actors may hamper the sustainability of restoration efforts (Mansourian et al., 2017a; Sayer et al., 2013; Wilson and Cagalanan, 2016). Stanturf et al. (2020) have highlighted that the extent and complexity of FLR implementation at the local level raises a clear need to further study the progress made in restoring landscapes in specific local contexts and disseminating the findings for policy learning and technical training to restoration practitioners.

1.3.2 Specific research questions

The overall aim of my dissertation is to understand the cross-level, cross-scale and cross-sector nature of FLR governance, the challenges that emerge when public agencies implement national restoration targets at the local level, and the variety of governance arrangements and strategies that actors use to overcome some of these challenges (*Figure 1.1*). To this end, four specific research questions are posed focusing on different knowledge gaps in the literature (*Table 1.1*).

RQ1: What cross-level misalignment and cross-scale mismatch emerge in the process of implementing policies to meet national restoration targets?

Translating national restoration targets into local action is an inherently cross-level and cross-scale endeavour. It is cross-level because implementation takes place between the national and sub-national levels, and cross-scale because processes on the governance scale seek to influence processes on the ecological scale. Scale challenges may emerge across levels and across scales. Misalignment may occur between governance levels when no effective mechanisms are in place to align national targets to local ecological conditions and social contexts, needs and capacities (Pistorius and Freiberg, 2014; Pörtner et al., 2021). Particularly when the actors who set high-level targets have little knowledge about the local level, targets may turn out hard to implement (Schweizer et al., 2019). Furthermore, cross-scale mismatch can emerge between governance processes and ecological processes. Although restoration is an ecological process, it is profoundly a human effort (Mansourian and Parrotta,

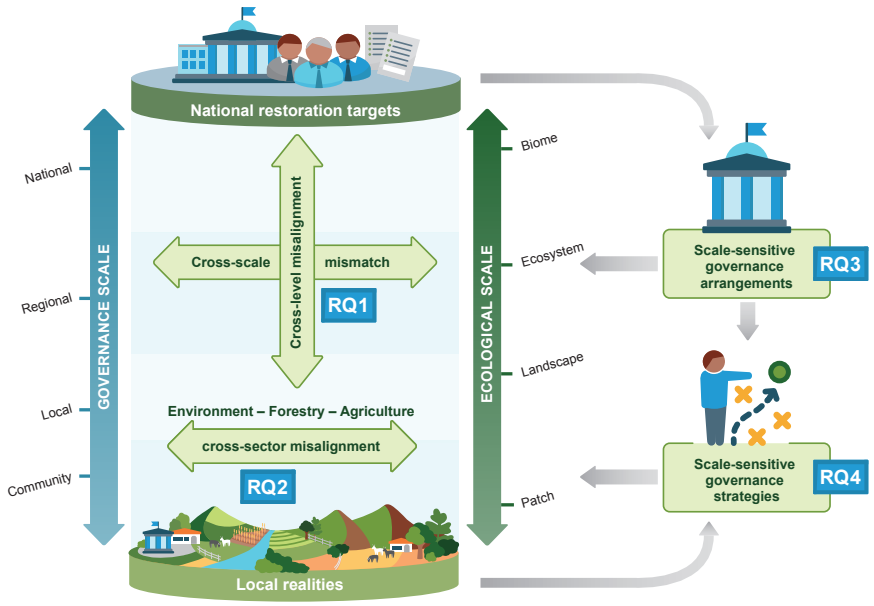

Figure 1.1 Conceptual model of this dissertation, highlighting the concepts and research questions

Table 1.1 General research question and specific research questions (RQ) of this dissertation

General research question	What scale challenges emerge when implementing policies to meet national restoration targets, and what scale-sensitive governance arrangements and strategies do actors use in dealing with such challenges?
Research question 1	What cross-level misalignment and cross-scale mismatch emerge in the process of implementing policies to meet national restoration targets?
Research question 2	How do cross-sector challenges influence the implementation of policies to meet national restoration targets?
Research question 3	What scale-sensitive governance arrangements enable restoration actors to create cross-scale fit and cross-level alignment in order to achieve forest and landscape restoration objectives?
Research question 4	What scale-sensitive governance strategies enable restoration actors to stay on course towards achieving forest and landscape restoration objectives in a context where new scale challenges emerge?

2019; Ostrom, 2009) and restoration success will depend on the extent to which the temporal and spatial dimensions of governance processes fit the ecological processes they aim to influence. However, only few studies were published on how multi-level restoration governance unfolds and what cross-level misalignment and cross-scale mismatch occur when public actors implement policies at the local level to meet their national restoration targets (e.g. Yin and Yin 2009, Dang et al. 2019). Analysing cross-scale mismatch and cross-level misalignment in the implementation of restoration targets can provide insights about the governance arrangements and strategies needed to improve the governance of FLR.

RQ2: How do cross-sector challenges influence the implementation of policies to meet national restoration targets?

Analysing the cross-sector interactions that take place at the same governance level is essential to understand the full complexity of multi-level restoration governance. Several studies have described the effects of interactions between different land use sectors on FLR governance (Carmenta and Vira, 2018; van Oosten et al., 2018) even though evidence seems fragmented. Cross-sector challenges may emerge when the mandates and objectives of sector agencies, such as agriculture, environment and forestry, are poorly aligned (IPBES, 2018). Absent or poor cross-sector interaction can result in contradicting sector policies that undermine the sustainability of restoration efforts (Carmenta and Vira, 2018) and cause trade-offs between different land use interests, rather than synergies, to prevail (Brancalion and Chazdon, 2017). The lack of clarity about what FLR entails may cause actors to interpret restoration objectives differently, in line with what best suits their objectives (Mansourian, 2018). Conservation actors may place a main focus on the restoration of habitat for endangered species, agricultural actors may see landscape restoration as a way to improve soil productivity and rural livelihoods in general, and forestry actors may be focused on maximising benefits for sustainable timber production. The purpose of this research question is to create an understanding of how horizontal interactions between sector agencies at the same governance level feed into vertical interactions that occur between different governance levels in the implementation of restoration targets.

RQ3: What scale-sensitive governance arrangements enable restoration actors to create cross-scale fit and cross-level alignment in order to achieve forest and landscape restoration objectives?

The inherent multi-scale and multi-level nature of FLR governance makes it hard to implement restoration targets. Landscape-level restoration efforts often do not fit jurisdictional boundaries (Mansourian, 2017a; Robinson et al., 2017) and are influenced by governance processes that occur at different levels, from the international and national levels, down to the regional and local levels (Ekroos et al., 2017). Multiple authors have highlighted the need for new governance arrangements that facilitate integrated landscape management and create cross-level alignment to design and implement restoration efforts and ensure that restoration benefits are distributed across different levels (Chazdon et al., 2020; Erbaugh and Oldekop, 2018; Robinson et al., 2017; Stanturf et al., 2019). To understand their characteristics and effects on restoration processes, attention needs to be draw to the governance arrangements that foster cross-level alignment and cross-scale fit and assess how they have played out in practice. Such insights could facilitate public and non-state actors to make the implementation of their restoration targets more sensitive to the multi-level and multi-scale nature of FLR governance.

RQ4: What scale-sensitive governance strategies enable restoration actors to stay on course towards achieving forest and landscape restoration objectives in a context where new scale challenges emerge?

Taking a landscape-level restoration approach implies a shift from project-oriented to process-oriented activities that are long-term, iterative and evolve over time (Ansell and Torfing, 2015; Sayer et al., 2013). Therefore, besides the governance arrangements that aim to create cross-scale fit and cross-level alignment, it is important to study the governance process that follows their establishment. Since there are likely to be winners and losers in the process of promoting restoration-oriented land use change (Mansourian, 2017a), it is essential to react to any emerging governance challenges to ensure that the priorities and needs of people who live in, and depend on, a landscape are addressed while ecological integrity is improved in line with intentions. Given that the FLR concept is relatively new, only few examples of successful FLR efforts that have passed through a long-term implementation process exist (Stanturf et al., 2019). Hence, studying the governance strategies that are used following the establishment of scale-sensitive governance arrangements may inform efforts that seek to ensure a continued flow of ecosystem functions while safeguarding livelihood benefits.

1.4 Theoretical framework

In the theoretical framework, I elaborate on the scale theory-related concepts that are central to my dissertation. I explain the meaning and relevance of these concepts, and show how they were used to study how national restoration targets are translated into local action.

1.4.1 Understanding governance

Governance is closely related to decision-making and refers to all the activities of social, political and administrative actors that are making purposeful attempts to guide and steer society towards the achievement of public goods (Termeer et al., 2010). The national government has long been seen as the centre of political authority and control (Rhodes, 1997) by setting the agenda of societal problems, deciding on policy objectives and implementing policies in a top-down, hierarchical manner (Termeer et al., 2010). Since the late 1980s and 1990s, however, reforms have caused the national government to gradually become less central and have reduced its capacity to directly deliver public goods to society (Cairney, 2019). These processes were a reaction to questions related to the domains within which societal issues need to be addressed, who has the legitimacy and authority to deal with them, and how the interests of different groups need to be considered (Gray and Purdy, 2018).

A threefold shift away from centralised government authority has been observed: 1) upwards to international actors and organisations, 2) downwards to sub-national governments and communities, and 3) outwards to civil society and non-state actors (Hooghe and Marks, 2003; Pierre and Peters, 2000). Multiple centres of decision-making have emerged as a result that focus on the provision of public goods (Gray and Purdy, 2018). This development has often been characterised as the 'shift from government to governance', in which it is often suggested that one is replaced with the other (Buizer et al., 2011). Yet, the role of the national government has by no means disappeared but rather been transformed (Jessop, 2002). What follows is a process of continuous interaction among a constellation of actors at different levels of decision-making, including the national government, to achieve public goods (Termeer et al., 2010).

1.4.2 Understanding sectors, scales and levels

Global environmental change processes such as land degradation are increasingly understood to have causes and effects that span across multiple levels, from the local to the global (Cash, 2000). Gibson et al. (2000) highlighted that in such situations there is no single 'correct' level at which particular processes can be studied. Research rather needs to focus on their multi-level character and the interdependencies and

interactions between actors at different governance levels (Cash and Moser, 2000; Görg, 2007; Termeer and Dewulf, 2014). My dissertation builds on the multi-level governance literature (e.g. Hooghe and Marks 2003) that gained prominence in European public administration and policy studies. Multi-level governance explores the decision-making processes that occur within and across different politico-administrative levels, from the supra-national to the national and sub-national levels (Stephenson, 2013). The policy-making and decision-making processes that are studied are mainly vertical (cross-level) but also horizontal (cross-sector). I go beyond these two perspectives by also explicitly studying the cross-scale interactions between governance processes and the ecological processes they seek to influence. In doing so, I distinguished the governance scale and ecological scale. The vertical and horizontal policy processes that are studied as part of multi-level governance fall within the governance scale, while the relevant ecosystem processes these policies seek to influence fall within the ecological scale.

While the *sector*, *scale* and *level* concepts are helpful to analyse how FLR governance unfolds, there are different approaches to how these are used within different natural and social science disciplines (Gibson et al., 2000). Particularly in the social sciences, no common definitions exist for the concepts, not even within disciplines. While some use scales and levels interchangeably, others strictly separate them (Scholes et al., 2013; van Lieshout et al., 2011). This conceptual ambiguity in the scale theory literature (Buizer et al., 2011; Padt and Arts, 2014) can give rise to confusion since the types of interactions observed are influenced by choices regarding which scales and levels are studied. To enable a more precise analysis of FLR governance, I therefore provide conceptual clarity about how the *sector*, *scale* and *level* concepts are used in my dissertation.

Sector: the extent of government responsibilities is so large and the environment so complex that governments need to find ways to pay enough attention to a few important issues while ignoring many others (Cairney, 2019). Governments have dealt with this matter by dividing and 'institutionalising' specific tasks and responsibilities into different sectors and related specialised agencies. Examples that are relevant to FLR are land use-related sectors such as agriculture, forestry, conservation and water. The responsibility to regulate and use natural resources tends to be distributed across multiple specialised agencies, which tend to hold competing demands on land use (Ingold et al., 2019; Reed et al., 2016). Sectors are ubiquitous and cause there to be no single centre at the heart of decision-making (Cairney, 2019). The existence of autonomous agencies has enabled public authorities to specialise in a number of important issues, while also causing fragmentation and giving rise to 'siloed' agencies that primarily focus on their own policy issues (Peters, 2018).

Cross-sector interactions may influence cross-level interactions (Young, 2002), for example as the result of diverging ideas between sector agencies about what the main land degradation challenges and preferred solutions are (Mansourian, 2017a).

Scale: *scale* is a unifying concept connecting social and biophysical phenomena (Cumming et al., 2013). Two basic definitions of scale exist. First, scale is a measure for the actual size or extent of social or biophysical phenomena (Padt and Arts, 2014). Second, scale is an analytical tool that contains a graduated range of values that are used to measure and study the environment and the processes that govern it (Cash et al., 2006). In the latter definition, scale is a measuring rod that researchers employ to organise their understanding of the interactions that occur in the world, and gather knowledge about these (Cash and Moser, 2000). Scales enable a comparison of qualitatively different things by abstracting them in a standardised way from a complex and dynamic reality (Padt and Arts, 2014). Given that scales are largely a social construct, the concept can be used by a wide variety of disciplines and be adapted to any specific context and topic to study a wide diversity of human-environment interactions (Buizer et al., 2011; Cash and Moser, 2000).

Among the most commonly distinguished scales to study social and biophysical phenomena are the spatial and temporal scales (Ansell and Torfing, 2015; Cash et al., 2006; Padt and Arts, 2014). Indeed, social and biophysical phenomena have temporal and spatial dimensions (Vervoort et al., 2012). The spatial dimension refers to the spatial reach of ecological and governance processes, which can range from small-sized to large-sized. The temporal dimension refers to the duration of ecological and governance processes, and can range from short-term to long-term (Termeer and Dewulf, 2014). Yet, the spatial and temporal scales are considered insufficient to study multi-level environmental governance, given the existence of other cross-level issues, in addition to those related to space and time. Cash et al. (2006) brought more specificity to scale theory by bringing in several scales that are central to governance studies, including the jurisdictional, institutional and management scales (Termeer et al., 2010). While the jurisdictional scale refers to clearly bounded and organised public authorities that play a role in addressing a specific problem, the institutional scale refers to relevant rules and regulations related to the problem, and the management scale considers the plans that are elaborated to address the problem. Following Termeer and Dewulf (2014), I use the *governance scale* as an analytical tool that brings jurisdictional, institutional and management elements together to study the actions of public and non-state actors, and the governance arrangements that are relevant to a particular issue. I also use the *ecological scale* to study how restoration-oriented ecological processes play out in space and time, and how they relate to governance processes. The ecological scale refers to the system of biophysical

phenomena that generate and deliver ecosystem functions (Scholes et al., 2013) and that are the target of restoration efforts to recover these ecosystem functions.

Level: Many scales comprise some form of hierarchical structure and different scale levels can be distinguished (Gibson et al., 2000). The distinction between scales and levels added precision to the literature (Ansell and Torfing, 2015). Levels are the units of analysis that are situated at various locations along a scale (Cash et al., 2006). While ecologists for example think in terms of biomes, ecosystems and forest patches, governance scholars think of countries, provinces and municipalities. Padt and Arts (2014) emphasize that levels are not quantitative units on the measuring rod but rather qualitative orders of measurement.

On the governance scale, I distinguish the international, national, provincial, municipal and community levels of governance to study how relevant actors influence ecological processes through their restoration efforts. In the public sector, a hierarchy exist between different levels as a result of authority, in which the power of lower-level governments tends to be restricted by higher-level governments (Termeer et al., 2010). There also tends to be a clear division of tasks and responsibilities between government levels. National governments are often involved in direction-setting by designing policies and strategies, while local governments are in the lead to implement these policies and strategies within their jurisdiction. While constitutions have a long-term validity, and policies and strategies tend to have medium-term validity, annual plans have only short-term validity.

On the ecological scale I distinguish the biome, ecosystem, landscape and patch level. Ecological systems have a relatively well-defined hierarchical structure of levels of organisation (Scholes et al., 2013). The range of scale levels at which ecological processes take place is continuous and heterogeneous in nature, although some spatial and temporal dimensions may be more important for particular processes than others (Cash et al., 2006). The landscape tends to be the ecological level that is targeted by restoration efforts to achieve biodiversity and climate change objectives. Meanwhile, given that natural regeneration is slow and usually takes at least one or two decades, it is only through the continuous monitoring of land use changes over a longer period of time that the impacts of restoration on ecosystem functions can be assessed (Mansourian and Parrotta, 2019; Stanturf et al., 2020).

1.4.3 Understanding cross-scale mismatch and cross-level misalignment

Based on the *scale* and *level* concepts, Cash et al. (2006) made a distinction between *cross-scale* and *cross-level* interactions. Cross-scale and cross-level research pays explicit attention to how interaction occurs between and within scales (Ansell and

Torfing, 2015). When cross-scale and cross-level interactions threaten to adversely affect the resilience of the social-ecological system, *scale challenges* may arise (Cash et al., 2006; Cumming et al., 2006; Gibson et al., 2000). In this dissertation, I study the scale challenges that emerge between the governance and ecological scales, and between governance levels (*Figure 1.2*).

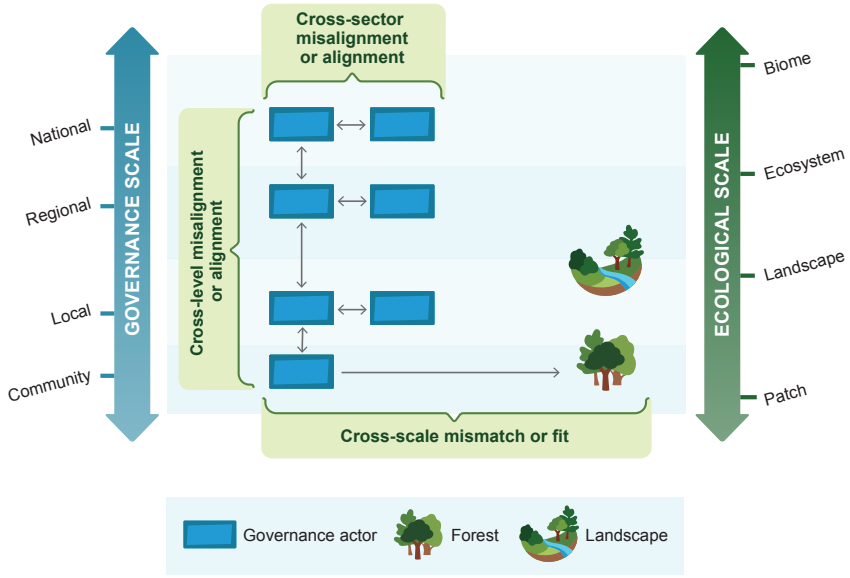

Figure 1.2 Three kinds of FLR governance interactions are studied. An example is shown for each: cross-sector misalignment or alignment, cross-scale mismatch or fit, and cross-level misalignment or alignment.

Cross-scale mismatch emerges when governance processes do not fit the spatial or temporal reach of the ecological processes that they seek to influence (Cumming et al., 2006; Mansourian and Parrotta, 2019). Meanwhile, cross-level misalignment on the governance scale emerges as the result of a blind spot, a plurality problem, or when governance processes at one level misalign with governance processes at another level. Cash et al. (2006) identified three types of scale challenges that are of great concern for actors that manage public goods:

- *Blind spot – The failure to recognise important scale and level interactions* (Type A): this challenge refers to a lack of understanding of key processes that occur across scales and levels (Vervoort et al., 2012), which may cause a solution that is formulated at one level to result in new problems at other levels or scales (Buizer et al., 2011; Cash

and Moser, 2000). A blind spot[11] emerges when actors only pay attention to a single governance level or scale without giving due attention to cross-scale or cross-level interactions that are inherent to the system. This may be the result of an inability to observe or influence the full spectrum of cross-scale and cross-level interactions that are relevant to an issue, given their inherent complexity (Cash et al., 2006).

- *Mismatch – The persistence of cross-scale mismatch and cross-level misalignment* (Type B): an archetypical and widespread cross-scale challenge is the cross-scale mismatch (Cash et al., 2006; Gibson et al., 2000; Termeer et al., 2010), which occurs when governance processes are not coterminous, neither in space nor time, with the ecological processes they seek to influence (Cash et al., 2006; Cash and Moser, 2000; Cumming et al., 2006; Kok and Veldkamp, 2011; Scholes et al., 2013; van Lieshout et al., 2011). Spatial mismatch occurs when the spatial reach of governance processes does not fit the spatial reach of relevant ecological processes, making it difficult to solve an ecological problem or sustain ecosystem functions (Ostrom et al., 1961; Termeer and Dewulf, 2014). Likewise, temporal mismatch occurs when the temporal reach of governance processes does not fit the temporal characteristics of relevant ecological processes. In addition to cross-scale mismatch, cross-level misalignment can result from governance processes at one level not being aligned to relevant governance processes at another level (Termeer and Dewulf, 2014).

- *Plurality – The failure to recognise heterogeneity in the way scales are perceived and valued by different actors* (Type C): this challenge refers to the notion that there is no single best characterisation for a problem or solution that applies to the entire system, or to all actors involved (Cash et al., 2006). Depending on their interests, various actors can highlight different aspects of a problem as being the most relevant and focus on different levels at which a problem is manifested (Folke et al., 2005). Framing an issue as a local, regional, national or global problem can lead to conflicting perspectives and may drive processes of actor inclusion and exclusion when finding solutions (van Lieshout et al., 2011). Frames can cause certain scale levels to become dominant while others are made less important, by placing certain actors at the 'right' level at the centre of authority to offer the solution (Cash et al., 2006; Cash and Moser, 2000). Yet, a focus on one single level or set of solutions is likely to lead to ineffective decisions and inequitable outcomes, since such solutions are only best to a select group of actors (Buizer et al., 2011).

11 Cash et al. (2006) referred to this scale challenge as 'ignorance'. However, in the dissertation the term 'blind spot' is used as this leaves the possibility open that the challenge did not emerge purposefully.

Scale challenges that emerge in FLR governance may cause restoration efforts to be ineffective and unsustainable and even lead to a loss of ecosystem heterogeneity and local livelihoods (Cumming et al., 2006). FLR governance can be further complicated by cross-sector challenges. Hence, it is important to understand how scale challenges play out across scales and levels, and identify opportunities to create cross-scale fit where mismatch exists, and cross-level alignment where misalignment exists through scale-sensitive governance.

1.4.4 Understanding scale-sensitive governance

Scale-sensitive governance of the environment (Padt et al., 2014) is a form of governance that fosters cross-scale and cross-level observation and action to effectively respond to existing cross-scale and cross-level challenges and prevent new challenges from emerging (Steen and Termeer, 2011). Suggested responses to cross-scale and cross-level challenges mainly focus on attempts to change governance-scale processes in order to fit spatially and temporally with ecological-scale processes, or to create alignment between different governance levels (Termeer et al., 2010). Within scale-sensitive governance I distinguish governance arrangements and strategies:

- *Scale-sensitive governance arrangements*: a governance arrangement is the ensemble of rules, processes and instruments that structure interactions between public and/or non-state actors to achieve collective goals within a specific domain (Termeer et al., 2011). Different branches of the governance literature, i.e. the collaborative, adaptive, multi-level and polycentric governance, generated insights related to how specific governance arrangements can create cross-scale fit where mismatch exists or cross-level alignment where misalignment exists. Cross-scale fit can be achieved by expanding or narrowing the spatial and temporal reach of existing arrangements (Ansell and Torfing, 2015), or by creating new arrangements (Termeer and Dewulf, 2014). To create cross-level alignment it is suggested to establish interaction and exchange between relevant governance levels through the design of specific governance arrangements (Andersson and Ostrom, 2008; Berkes, 2006; Termeer et al., 2010).

- *Scale-sensitive governance strategies*: in addition to governance arrangements, cross-scale and cross-level interactions can be influenced by a repertoire of governance strategies that actors deploy to address scale challenges (Termeer and Dewulf, 2014). To flexibly address changing institutional, political and environmental circumstances, actors need to be able to create adequate cross-level linkages, at the right moment, on the right issues (Cash and Moser, 2000; Olsson et al., 2006). This requires a continuous and iterative governance process that is based on a thorough understanding of human-environment system dynamics (Folke et al., 2005) and that learns from the outcomes of strategies that were implemented earlier (Pahl-Wostl et al., 2007; Termeer

et al., 2010). Scale-sensitive strategies are likely to benefit from combining different ways of understanding interactions between scales and between levels, which requires the willingness of actors to assimilate new knowledge (Cumming et al., 2013).

1.5 Research approach and methodology

In this section, I describe the research approach, explain the research design and case study selection, and give an overview of the data collection and analysis methods that were used.

1.5.1 Research approach

In my dissertation, I followed a critical realism approach to understand cross-sector, cross-scale and cross-level interactions, the multiple challenges that emerge when translating national restoration targets into local action and the ways in which actors have dealt with them. Critical realism is a scientific alternative to positivism and constructivism and draws elements from both to define ontology (what is real, the nature of reality) and epistemology (the human knowledge of reality, which captures only a small part of a deeper and vaster reality) (Fletcher, 2017). Critical realism's critique on positivism is that it reduces ontology to epistemology, while its critique on constructivism is that it views reality as entirely constructed by human knowledge or discourse (Fletcher, 2017). Critical realism acknowledges that attempts can be made to understand the real social world and seeks to select the theories that facilitate working from what is observed to explain the factors that have made certain social phenomena possible and that led to specific outcomes.

As highlighted in the theoretical framework, natural and social scientists have used the *scale* and *level* concepts differently. Sayre (2005) made a distinction between the ontological and epistemological moments of scale. The ontological moment explains that governance and ecological processes have a specific spatial and temporal reach and take place at a specific level, making scales and levels a pre-given and objective reality through which complex ecological and social interactions can be studied. The epistemological moment highlights that scales and levels are socially constructed and shaped by political and economic processes (Kurtz, 2003). An example of a level that is both seen as an ontology or epistemology is the landscape. While ecologists may see it as a space in the material world that exists irrespective of the observer, for social scientists the landscape remains a subjective concept (Mansourian et al., 2021). Different actors may hold diverging views on where to draw landscape boundaries, making delineating these a power-laden decision that can cause conflict (Mansourian, 2017a). Another critique of *scales* and *levels* stems from the 'flat ontology'

or 'post-place' perspective in which actors are organised as social networks that are not tied to specific geographical locations. This is the case, for example, with so-called global cities whose local authorities can bypass the regional and national levels and interact directly with each other at the international level (Ansell and Torfing, 2015; Buizer et al., 2011). Yet, this perspective can be exaggerated when the importance of concrete locations and governance processes at the levels that are 'bypassed' are completely ignored.

I did not explicitly focus on the social construction of scales, levels or sectors by political and economic processes – the 'politics of scale' (Kurtz, 2003) – nor on how their boundaries are set. I took the politico-administrative hierarchy of jurisdictional levels (Stephenson, 2013) as a point of departure to identify public and non-state actors that are physically located at the national, regional, municipal and community levels. Yet, since the choice for specific scales and levels determines the kind of processes and challenges that are observed during research (Buizer et al., 2011; Kok and Veldkamp, 2011; Padt and Arts, 2014) I aimed to be clear and transparent about the scales and levels of observation in the theoretical framework, and provide a detailed description of the research design, case study selection and data collection and analysis methods in the remainder of this section.

1.5.2 Research design

In the context of FLR, much attention has gone to the elaboration of global restoration potential and priority maps (e.g. Minnemeyer et al. 2011, Bastin et al. 2019, Brancalion et al. 2019, Strassburg et al. 2020). These maps highlight the sheer extent of the land degradation problem and have generated enthusiasm for restoration. The rationale underlying the continued production of increasingly high-resolution restoration potential and priority maps is the idea of informing conservation and restoration decisions across the globe (Wyborn and Evans, 2021). While global maps create an understanding of the places that matter most for restoration, they often ignore socio-economic and political contexts, and tend to overstate their policy relevance at national and sub-national level (Erbaugh and Oldekop, 2018). Conservation and restoration decision-making is complex and messy, and global maps offer little guidance to the action that eventually needs to occur at the local level (Cash and Moser, 2000; Wyborn and Evans, 2021). Local contexts run the risk of being misrepresented by potential and priority maps, which may not support the development of contextually-relevant solutions that build on the knowledge, experience, capacity and values of local actors. Most importantly, the prominence given to these maps has largely crowded out other forms of research that generate empirical and contextually-rich knowledge that aligns better with the level of policy action (Wyborn and Evans, 2021).

In this dissertation, I adopt an exploratory multiple case study design to generate empirical and contextually-rich knowledge related to the translation of national restoration targets into local action. A case study is an empirical inquiry that studies a phenomenon in its real-life context (Yin, 2003). This is particularly relevant in situations where it is hard to pull apart the studied phenomenon from the wider context. Exploratory case studies are needed when there is a lack of detailed preliminary research or when little is known about the particular setting in which the research is conducted. Such exploratory studies are a method to understand what is going on and how to study something, and to define specific questions worth pursuing in future research (Blaikie, 2010; Mills et al., 2012). I use the case study design to understand the interactions across sectors, scales and levels, the challenges that emerge in the FLR governance process, and the ways in which actors overcome cross-scale and cross-level challenges. Importantly, it is difficult to generalise from one case to another and no case or set of cases can address this concern in a satisfactory way (Yin, 2003). Rather than to other cases, case study research should try to generalise findings to theory, analogous to the way that scientists generalise the results of their experiments to theory, and not to other experiments.

The research that is part of this dissertation is conducted in close collaboration with several partner organisations. The Consortium for Sustainable Development of the Andean Ecoregion (Condesan) was the research partner in Ecuador (Chapter 2), and the Water & Land Resource Centre (WLRC) of Addis Ababa University was the research partner in Ethiopia (Chapters 3 and 4). The Netherlands Environmental Assessment Agency (PBL) and World Resources Institute (WRI) also supported the research at various stages. Two MSc. students of International Development Studies at Wageningen University conducted their thesis within the context of this dissertation and were instrumental in collecting and analysing data related to scale-sensitive governance strategies (Chapter 6).

1.5.3 Case study selection

Central to this dissertation are the FLR governance contexts of two mountainous countries: Ecuador and Ethiopia. Both are among the leading countries in their respective continents when it comes to restoration-related policy frameworks (Kassa et al., 2017; Schweizer et al., 2018). The national government of Ecuador set the target of restoring 0.5 Mha of degraded and deforested land and prepared the 2014-2017 (MAE, 2014) and 2019-2030 (MAE, 2019) National Forest Restoration Plans to achieve the target. Meanwhile, the federal government of Ethiopia pledged to restore 15 Mha of land and made reforestation and forest management part of its ambitious Climate Resilient Green Economy Strategy (FDRE, 2011).

I choose two mountainous countries because the mountain regions of the world play a central role in generating diverse ecosystem functions on which local and downstream communities depend (Mathez-Stiefel et al., 2017). Their forest, grassland and wetland ecosystems are the source of major rivers, regulate water flows and improve water quality (Martín-López et al., 2019) in addition to providing habitats for biodiversity and carbon sequestration. Mountains are also highly vulnerable to land use and management changes due to their steep gradients. The loss of montane forests, grasslands and wetlands erodes their ecological integrity and diminishes their material and non-material benefits to society. Importantly, extinction risks are highest in island-like biodiversity hotspots, such as mountains (Pörtner et al., 2021). Ecuador and Ethiopia are both located in biodiversity hotspots (*Figure 1.3*), which are regions that contain at least 1,500 endemic plant species and that have lost 70 percent or more of their historical habitat range (Mittermeier et al., 2011). The selected case study landscapes in Ecuador are located on the boundary of the Tropical Andes and Tumbes-Chocó-Magdalena Corridor, while in Ethiopia the selected landscapes fall within the Eastern Afromontane hotspot.

Figure 1.3 Location of the Tropical Andes, Tumbes-Chocó-Magdalena and Eastern Afromontane biodiversity hotspots. Source: Adapted from *Conservation International Foundation, 2014*

While both countries have ambitious restoration-oriented policy frameworks, their political contexts are highly dissimilar. In Ecuador, the 2008 constitution established decentralised autonomous governments at the provincial, municipal and parish levels (Asamblea Constituyente, 2008). These governments obtained political, financial

and administrative autonomy, and tasks and responsibilities related to territorial land use planning (Senplades, 2017). On the other hand, Ethiopia also went through a decentralisation process when it adopted a federal structure in the 1990s. However, its political structure has remained highly centralised in practice. The federal government has followed the 'developmental state' model (Clapham, 2018) for which the five-year Growth and Transformation Plans are illustrative, and has implemented policies from the top-down. The different governance trajectories of Ecuador and Ethiopia offer two contrasting contexts to study the translation of national restoration targets into local action, and the scale challenges that emerge as a result.

Chapter	Country	Case studies
2	Ecuador 	 Chocó Andino landscape, Pichincha Province
		 Bosque Seco landscape, Loja Province
3, 4	Ethiopia 	 Mount Guna landscape, Amhara Regional State
		 Kafa Biosphere landscape, Southern Regional State
5		84 restoration governance cases in Africa, Africa, Europe, North America, Oceania and South America
6	Ecuador 	FONAG Water Protection Fund, Quito
		FORAGUA Regional Water Fund, Loja

Figure 1.4 Selection of case studies for each chapter

Through the selection of case studies (*Figure 1.4*), I have sought to understand the challenges and opportunities associated with translating national restoration targets into local action. To answer research questions 1 and 2, I focus on tracing multi-level governance processes in Ecuador and Ethiopia from the national to the local level (Chapters 2, 3 and 4) and on studying the restoration efforts of two water funds (Chapter 6). Supported by Ecuadorian and Ethiopian informants, I identified two landscapes in each country where local restoration-related efforts have lasted long enough to provide a thick description of FLR governance processes. To respond to

research question 3, I use the scientific databases of Scopus and Web of Science to identify and subsequently review 84 restoration-related governance cases (Chapter 5). To answer research question 4, I study two Ecuadorian water funds that focus on the conservation and restoration of watersheds (Chapter 6). A multiple case study design is followed for each research question to make the conclusions more robust compared to those derived from a single case (Yin, 2003).

1.5.4 Data collection methods

To answer the four research questions, I rely on five data collection methods, namely policy and project document review, semi-structured interviews, focus group discussions, participatory observation and systematic literature review (*Table 1.2*). With the exception of the systematic literature review, I combine different methods in each chapter to triangulate empirical data related to policy implementation processes (Carter et al., 2014). I simultaneously involved in data collection and data analysis to direct data collection and research attention towards the most interesting and relevant issues that emerged in each particular context (Charmaz, 1996). This allows the research to become increasingly more focused.

Table 1.2 Data collection methods

Research question	Data collection	Feeding into
RQ1: cross-scale and cross-level challenges	▪ Policy and project document review ▪ 54 interviews (from 11-2018 to 03-2019) in Ecuador ▪ 56 interviews (from 10-2019 to 12-2019) in Ethiopia ▪ 48 interviews (from 09-2019 to 12-2019) in Ecuador ▪ 14 focus groups (from 10-2019 to 12-2019) in Ethiopia ▪ Participatory observation during fieldwork	▪ Ch. 2, 3, 6 ▪ Ch. 2 ▪ Ch. 3 ▪ Ch. 6 ▪ Ch. 3 ▪ Ch. 2, 3, 6
RQ2: cross-sector challenges	▪ Policy and project document review ▪ 56 interviews (from 10-2019 to 12-2019) in Ethiopia ▪ 14 focus groups (from 10-2019 to 12-2019) in Ethiopia ▪ Participatory observation during fieldwork	▪ Ch. 4 ▪ Ch. 4 ▪ Ch. 4 ▪ Ch. 4
RQ3: scale-sensitive governance arrangements	▪ Systematic literature review of 84 peer-reviewed journal articles selected from a primary body of 1,344 articles	▪ Ch. 5
RQ4: scale-sensitive governance strategies	▪ Policy and project document review ▪ 48 interviews (from 09-2019 to 12-2019) in Ecuador ▪ Participatory observation during fieldwork	▪ Ch. 6 ▪ Ch. 6 ▪ Ch. 6

The aim of the data collection is to develop analytical categories that fit closely to what happens in the real social world and that have relevance to practitioners in the study context. The following data collection methods are used:

- *Policy and project document review*: the collection of information in different types of documents is an essential starting point for case study research (Yin, 2003). Policy documents contain details about policy objectives, actors and instruments, while programme and project documents offer relevant insights about activities and contextual matters in a landscape under study. These details and insights can inform other research methods, like interviews, and triangulate data from other sources (Yin, 2003).

- *Interviews*: interviews facilitate an understanding of individuals' experiences, opinions and perspectives, and allow for an in-depth exploration of themes directly relevant to a topic. Semi-structured interviews follow a specific set of questions that are derived from a checklist, while maintaining an open-ended character and allowing for spontaneity, flexibility and responsiveness to individuals (Carter et al., 2014; Yin, 2003). Compared to focus group participants, interviewees are more likely to discuss sensitive topics, especially when interviews are conducted on an anonymous basis.

- *Focus groups*: this method allows a group of participants to hear each other's answers to a particular question, which enables individuals to make additional comments that they might not have made otherwise. Focus groups stimulate the identification and sharing of various perspectives on the same topic.

- *Participatory observation*: although very time consuming, participatory observation gives the researcher an opportunity to gain first-hand experience about relevant real-life events within their context (Yin, 2003).

- *Systematic literature review*: this method helps to understand large amounts of information and produce a scientific summary of the evidence to answer a specific question (Petticrew and Roberts, 2006). To limit selection bias, systematic reviews attempt to comprehensively identify, appraise and synthesize all relevant studies focusing on a specific topic. In this way, a systematic review is a research method that is similar to a survey, albeit of the literature rather than of people.

1.5.5 Data analysis methods

The data analysis methods are inspired by grounded theory (Charmaz, 1996) to progressively go from case study contexts and inductively developing abstract conceptual categories, towards identifying patterned relationships within them. For Chapters 2, 3, 4 and 6, I conduct an inductive analysis of the interview and focus group transcripts. Conversely, for Chapter 5, I do a deductive analysis of peer-reviewed journal articles, by applying pre-defined categories while systematically work through the data. The interview and focus group transcripts as well as the systematically-selected peer-reviewed articles provide detailed data or 'thick descriptions' (Geertz, 1973) related to FLR governance. I take a substantive approach, meaning that I am concerned with capturing and interpreting meanings in the data and focus on what the text says (Spencer et al., 2014). By capturing and analysing the lived experience, opinions and perspectives of the FLR community of practice regarding the implementation of restoration policies, I rely on knowledge from the 'inside' (Charmaz, 1996). Inevitably, my own worldviews and assumptions influence my interpretation of what interviewees communicate, and thus I also build on knowledge from the 'outside'.

Coding and managing the data is an important link between data collection and developing an emergent theory to address a research question (Spencer et al., 2014). Categories rarely emerge immediately and directly from the data, and developing an organising system proceeds slowly as themes and patterns are noticed in the data. I use *sectors*, *scales*, *levels*, and their temporal and spatial dimensions as sensitizing concepts to develop ideas about cross-sector, cross-scale and cross-level interactions emerging from the data (Bowen, 2006). For each individual chapter, codes are applied cross-sectionally to all interview and focus group transcripts used for that chapter (Spencer et al., 2014). I use initial codes on the transcripts to break up the data into categories, capture the essence of cross-sector, cross-scale and cross-level interactions in the case study contexts, and progressively develop the code for each cross-sector, cross-scale and cross-level challenge by going through more transcripts. Data segments are sorted, compared with each other and, where needed, re-categorised until a good fit between the data and the organising system is found. The specific content of data segments helps to further refine each category. As such, the establishment of categories is in itself a 'scholarly achievement' (Tesch, 1990). In theory-building research, categories are not only viewed as instruments to organise the data, but also as research results.

After the data is coded, all data segments coded in a specific category are brought together in one place to be able to continuously read all segments of that category (Tesch, 1990). The data then goes through a process of description, analysis in relation

to sensitising concepts, and interpretation to understand how different parts of the data are connected at higher levels of abstraction (Gibson and Brown, 2011; Spencer et al., 2014). In Chapters 2, 3 and 4 I use detailed interview quotes to strengthen the analysis of the different scale challenges, to keep the human story in the forefront and make the analysis more accessible to a wider audience (Charmaz, 1996). In addition, whenever an argument is made in the results, I list all the interviewees who emphasize the specific argument, thereby providing transparency about how broadly an argument is supported and by whom (Bazeley, 2009).

1.6 Structure of the dissertation

To answer my general research question, I build on four empirical studies and one systematic literature review that each constitute one chapter in this dissertation (*Table 1.3*). In Chapters 2 and 3, I analyse the cross-scale and cross-level challenges that arise when translating national restoration targets into local action in Ecuador and Ethiopia. In Chapter 4, I study the cross-sector challenges that affect the way national restoration targets are implemented. In Chapter 5, I build on various branches of the governance literature to study scale-sensitive governance arrangements that create cross-scale fit and/or cross-level alignment. In Chapter 6, I focus on the scale-sensitive strategies that two Ecuadorian water funds are deploying or plan to deploy to overcome the scale challenges they face as part of their restoration efforts. Lastly, in the discussion I answer the general research question and specific research questions, explain my contribution to different scientific fields, discuss the main limitations and directions for future research, and offer recommendations for practice.

Table 1.3 Overview of this dissertation

Chapter	Question	Publication status
1. Introduction		
2. Unravelling scale challenges in Ecuadorian forest and landscape restoration governance	Research question 1	Published in *Land Use Policy*
3. Unravelling scale challenges in Ethiopian forest and landscape restoration governance	Research question 1	Published in *Ecology and Society*
4. Cross-sector challenges in Ethiopian forest and landscape restoration governance	Research question 2	Under review in a peer-reviewed journal
5. Scale-sensitive governance in forest and landscape restoration: a systematic review	Research question 3	Published in *Regional Environmental Change*
6. Ecuadorian water funds' use of scale-sensitive strategies to stay on course in forest and landscape restoration governance	Research questions 1 and 4	Published in *Journal of Environmental Management*
7. Discussion		

2

Unravelling scale challenges in Ecuadorian forest and landscape restoration governance

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Abstract

The forest and landscape restoration (FLR) targets set as part of the Bonn Challenge draw attention to the governance arrangements required to translate national FLR targets into local action. To achieve the targets, actors at multiple levels of the governance scale aim to influence relevant processes on the ecological scale. In this article, we focus on the scale challenges relating to the implementation of Ecuador's restoration targets, by analysing the implementation of the 2014–2017 National Forest Restoration Plan in the montane *Chocó Andino* and *Bosque Seco* landscapes. From 54 semi-structured interviews, a document review, and geographical data analysis, we identified two temporal (i, ii) and three spatial scale challenges (iii, iv, v): i) Political cycles mismatch with FLR timelines; ii) Planning horizons mismatch with FLR timelines; iii) National restoration objectives mismatch with decentralised land use planning realities; iv) The governance level of existing FLR efforts misaligns with the level receiving restoration funds; and v) Tensions exist between the spatial dimensions of biodiversity and water-related restoration efforts. The findings highlight that more attention must be given to scale-sensitive governance to make the process in which national FLR targets are translated into local action more effective.

2.1 Introduction

A continued, long-term increase in the extent and intensity of anthropogenic land use has led to the loss or diminished regulation capacity of ecosystems (Dawson et al., 2017; Foley et al., 2005). The loss or reduction of an ecosystem's capacity to sustain biological or economic productivity – generally termed land degradation – results in decreased yields, income, and food security and a weakening of vital ecosystem functions (Barbut and Alexander, 2015). Currently, land degradation processes are systemic phenomena that negatively impact the well-being of at least 3.2 billion people and push the planet towards a sixth mass extinction of species (IPBES, 2018). The restoration of degraded lands has therefore become an urgent priority to ensure human well-being and protect biodiversity and ecosystem functions (IPBES, 2018; IPCC, 2019).

Over two billion hectares of deforested and degraded lands worldwide currently offer opportunities for restoration (Pistorius and Freiberg, 2014). In recognition of these significant opportunities and an urgency to act, unparalleled political will has been demonstrated at the international level to achieve ambitious restoration targets (Chazdon et al., 2017; Suding et al., 2015). Significant commitments have been made as part of the 2010 Aichi Convention on Biological Diversity to restore at least 15 percent of degraded ecosystems globally and as part of the 2011 Bonn Challenge, which aims to inspire national and sub-national governments to restore 150 million hectares of deforested and degraded forest by 2020. The 2014 New York Declaration on Forests extended the Bonn Challenge target to restore a combined 350 million hectares of forest landscapes by 2030 (Suding et al., 2015). In the wake of the Bonn Challenge, several government-led regional efforts have been formed, such as the Initiative 20x20 in Latin America (Murcia et al., 2017). Fifty national governments and six sub-national governments have made restoration pledges to restore a specific number of hectares within their territory (bonnchallenge.org).

The pledges made as part of the Bonn Challenge follow the forest and landscape restoration (FLR) approach (Chazdon et al., 2017). This approach has been defined as a "planned process that aims to regain ecological integrity and enhance human well-being in deforested and degraded landscapes" (Mansourian, 2017a, p. 21). In the FLR process, both forest and non-forest ecosystems, as well as other land uses, are accommodated in a landscape to achieve sustainable food production, the provision of ecosystem functions, and biodiversity conservation (Chazdon et al., 2017). As a way to reconcile socio-economic and ecological priorities within multi-functional landscapes, the area-based or landscape approaches to environmental governance have received increased recognition (Reed et al., 2017). FLR comprises

three dimensions (Mansourian, 2016; Mansourian and Parrotta, 2019). First, the governance objective is to regain ecological integrity in a way that ensures ecosystem functioning and provides social benefits; second, the landscape is the spatial dimension to achieve this objective; and third, there is an implicit temporal dimension as restoration is a long-term process.

Montane landscapes are of particular importance to protect biodiversity and ensure human well-being (Mathez-Stiefel et al., 2017; Price and Egan, 2014). With mountains generating higher precipitation levels than their surrounding low-lying areas, montane ecosystems play a crucial role in the regulation of water flows on which local and downstream agricultural systems and urban areas depend (Putzel et al., 2017). In addition, functioning montane ecosystems host high levels of biodiversity, reduce the occurrence and intensity of soil erosion, landslides, and flood events, and sequester atmospheric carbon. Because of their steep gradients however, montane landscapes are particularly vulnerable to disturbances triggered by the interplay between climate change and land use changes (Putzel et al., 2017), making them an important target of restoration initiatives.

National FLR plans, strategies, and policies have been and continue to be developed by many countries (Chazdon et al., 2017). With numerous authors highlighting the importance of governance to achieve successful FLR (Adams et al., 2016; Chazdon et al., 2017; Dawson et al., 2017; Guariguata and Brancalion, 2014; Mansourian, 2016; Opdam et al., 2015), particular attention is drawn to the governance arrangements required to translate the Bonn Challenge pledges into local action. Despite FLR's prominence in policy frameworks, it remains unclear how governments at different levels align governance arrangements with relevant ecological processes to create multifunctional landscapes (Mathez-Stiefel et al., 2017). It also remains largely uncharted how FLR plans and policies are achieved locally (Mansourian and Parrotta, 2019) and influenced by landscape context specificities. In spite of these knowledge gaps, governments at multiple levels are increasingly required to play their part in fulfilling national restoration targets, either by shaping enabling conditions to meet national targets locally or by actually finding the space in their jurisdiction to reconcile ecological and social priorities.

Our central question is: what are the scale challenges encountered in forest and landscape restoration governance? In the theoretical framework, we elaborate on the theory of scales and levels to explain the emergence of scale challenges. Subsequently, we clarify the policy and case study contexts, followed by an explanation of the data collection and analysis. In the results, we elaborate on the scale challenges encountered in FLR policy implementation, as well as on the governance arrangements

that are shaped by landscape and policy level actors to navigate future scale challenges.

2.2 Theoretical framework

Restoration efforts often fail to meet their targets because they are not sufficiently comprehensive and they address degradation drivers in isolation (IPBES, 2018). No single actor has the knowledge or the resources to single-handedly solve complex problems such as land degradation. As a result of the diffusion of state power towards international actors (upward), decentralised governments and communities (downward), and civil society and non-state actors (outward) (Termeer and Dewulf, 2014), the involvement of actors that operate at different scales and levels is required (Ansell and Torfing, 2015; van Lieshout et al., 2011). In such a system, there is no single preferred level at which a phenomenon can best be studied; a multi-level perspective is required (Gibson et al., 2000). The scale concept offers a useful lens through which to analyse the challenges that emerge in such governance processes (Padt and Arts, 2014).

2.2.1 Scales and levels

Scale is understood as a dimension – or measuring rod – that facilitates the study of biophysical and social phenomena (Padt and Arts, 2014). We distinguish the ecological and the governance scale. The ecological scale comprises the various levels at which an ecological phenomenon plays out. It has a spatial and a temporal dimension (Gibson et al., 2000). Whereas the spatial dimension refers to the geographical extent and detail of a phenomenon like land degradation, the temporal dimension deals with the relevant timeframe and periods concerned. The governance scale comprises the various levels at which formal and informal governance arrangements are positioned in relation to a particular issue or sector (Termeer and Dewulf, 2014). Useful governance scale elements identified by Cash et al. (2006) include the jurisdictional scale, referring to nested public authority units, and the institutional scale, which consists of the rules that shape decision making. The governance scale also has a spatial and a temporal dimension (Termeer and Dewulf, 2014).

Different levels can be distinguished on each scale and most frequently refer to specific positions along the scale dimension. A level is not a quantitative unit but rather a qualitative order of measurement (Padt and Arts, 2014). Relevant ecological levels on the spatial dimension are the patch, landscape, and ecosystem, and the short, medium, and long term on the temporal dimension. Relevant governance levels on the spatial dimension include national, provincial, and municipal government.

Different levels on the institutional scale have varying temporal implications. Whereas a constitution usually has long-term validity, policies may change every four to five years, and operating rules can change in an even shorter term.

2.2.2 Scale challenges

FLR processes take place within the ecological system. However, FLR is a governance process that generates both social and ecological system impacts. If it is to meet social and ecological priorities in the millions of hectares that are now pledged, FLR needs to be integrated into the land use mosaic through an effort that spans multiple generations (Mansourian and Parrotta, 2019). When actors do not consider spatial and temporal dimensions on the ecological scale, or do not make meaningful attempts to align spatial and temporal dimensions on the governance scale, scale challenges emerge (Gibson et al., 2000). Cash et al. (2006) distinguished three types of scale challenges, and Termeer and Dewulf (2014) elaborated the scale-sensitive observing notion to deal with these. Both the three scale challenge types identified by Cash et al. (2006) and the scale-sensitive observing implications are discussed in the following:

A. Blind spot – the failure to recognise important cross-scale and cross-level interactions: The implementation of policies may be suboptimal if attention focuses on just one single level or scale (Cash et al., 2006). A restoration policy may target one jurisdictional level to provide short-term support without sufficiently considering possible constraints that exist at that level. A policy might also be blind to pre-existing, local restoration dynamics that could increase policy success. When cross-level or cross-scale interactions are not examined, restoration efforts may turn out to be ineffective or unsustainable. Cross-scale issues may relate to agricultural practices in groundwater recharge areas that unintentionally lead to the drying of springs on which the same farmers depend. Cross-level governance issues could relate to conflicts between policies and rules that are made at different governance scale levels. To address potential blind spots, interactions and interdependencies between ecological and governance scales must be understood, and an analysis is required of how interdependent actors collaborate or not (Termeer and Dewulf, 2014).

B. Mismatch – the persistence of mismatch between scales and misalignment between levels: This may happen when governance arrangements cannot find the appropriate spatial and temporal fit between the demand on an ecosystem and the ecosystem's ability to meet that demand (Cash et al., 2006). Spatial mismatch occurs when the spatial reach of governance arrangements does not align with the ecological processes that are being restored. Temporal mismatches occur when the temporal reach of governance processes does not fit with the temporal characteristics of ecological processes. In addition, cross-level misalignment can persist when policies

lack local specificity and support (Cumming et al., 2013), for example from land users whose land use practices need to be altered as part of the FLR process. To prevent this scale challenge from occurring, cross-scale fit and cross-level alignment need to be explored to create fit with relevant ecological processes (Termeer and Dewulf, 2014). Creating a better fit may involve changes in the reach of governance arrangements. This could be upwards to higher levels (more actors, longer-term planning horizons, larger jurisdictions) or downward to lower levels (fewer actors, shorter planning horizons, smaller jurisdictions) (Ansell and Torfing, 2015).

C. Plurality – the failure to recognise heterogeneity in the way that scales are perceived and valued: Specific actors may define an issue in such a way that certain scales or levels become dominant, whereas others are given less significance. This could then place them at the centre of authority to offer the solution. Van Lieshout et al. (2011) call this process scale framing – the process of framing an issue by using a certain scale and/or level. When it comes to FLR, it could be that high-level institutions highlight its carbon sequestration benefits or ecological connectivity, whereas rural communities are mainly concerned with protecting their water sources. A bias towards certain interests, perceptions, and values at one level may result in ineffective and inequitable decisions for another level. There is no single best characterisation for a problem or solution that applies to the entire system or all actors involved (Cash et al., 2006). To recognise heterogeneity in the way issues are perceived and valued, observers need to be aware of the different scale frames that actors at levels enact to push their interests (van Lieshout et al., 2011).

2.3 Methods

2.3.1 General approach

Focusing the research on two montane landscapes in Ecuador, we adopted a qualitative multiple case study design (Yin, 2014) to understand the context in which we could analyse how challenges play out across scales and levels. Data were collected through a preliminary document review and in-depth semi-structured interviews. Interview references are placed between brackets ([...]) in the text and acronyms of the interviewed organisations are listed in Figure 1. By transcribing the interviews in detail, we created a thick description (Geertz, 1973) of FLR governance processes as perceived by actors within Ecuador's community of practice.

To analyse the scale challenges in FLR policy implementation, we used grounded theory-informed exploratory methods to systematically and inductively analyse the qualitative data. These methods were complemented by deductive sensitising

concepts – the scale and level notions and their temporal and spatial dimensions – that were used as a point of departure to analyse the interviews (Charmaz, 1996). It is not our intention to test a hypothesis, but rather to contribute to building theory about the scale challenges typically encountered in FLR governance.

2.3.2 National policy context

Cut through by the Andes mountains, Ecuador is a country in South America that pledged to restore 500,000 hectares of degraded and deforested lands as part of the Bonn Challenge. Schweizer et al. (2018) listed Ecuador as a country with a large diversity of restoration policy frameworks, implementation mechanisms, and cross-sector initiatives. It is also one of four countries in Latin America that created a specific national restoration strategy (Méndez-Toribio et al., 2017). Ecuador hence offers a relevant case to study and analyse how national FLR policies are implemented locally and the challenges that emerge in the process.

Ninety-one natural ecosystem types are found in continental Ecuador, covering over 15.3 million hectares or 59.8 percent of the country (MAE, 2016a). Of these, forest ecosystems covered almost 12.8 million hectares in 2014 after the loss of 2.2 million hectares of forest between 1990 and 2014. An estimated 47 percent of Ecuador's territory suffers from land degradation as a result of ecosystem conversion for cattle raising and agriculture, deforestation in upper catchments, excessive soil tillage, and agriculture on steep slopes (MAE, 2016b).

Restoration gained particular prominence in Ecuador's policy landscape with the adoption of the new constitution in 2008. The constitution contains 13 references to ecosystem restoration, including the right of society to live in a healthy and ecologically balanced environment (Art. 14) and the right of nature to be restored (Art. 72) (Asamblea Constituyente, 2008). This prominence has triggered the integration of restoration targets in multiple plans and strategies, ranging from national development plans (Senplades, 2017, 2013) to sector-specific strategies that relate to forests (MAE, 2018, 2016a, 2014, 2013), agriculture (MAE, 2013), biodiversity (MAE, 2016b), climate (MAE, 2012), and water (República del Ecuador, 2014). Building on decades of reforestation policy, several policies have been created since 2008 to restore various types of native vegetation, either by reforestation or natural regeneration. The Ministry of Environment (MAE) has been mainly responsible for implementing restoration policies, and the former National Planning and Development Secretariat (Senplades) has been instrumental in determining local implementation as part of a wider decentralisation process.

In 2013, momentum for landscape restoration in Ecuador received another significant stimulus when the World Resources Institute requested the President's Office to become part of Initiative 20x20 and make a pledge to restore degraded and deforested land [INABIO]. Instigated by the President's ambition to join the initiative and to fulfil restoration objectives set in the 2013–2017 National Development Plan (Senplades, 2013), the National Forest Restoration Plan was created by MAE. This plan envisioned the restoration of 500,000 hectares between 2014 and 2017 (MAE, 2016a) to achieve a net zero deforestation balance, based on predicted deforestation rates between 2008 and 2017 (MAE, 2014).

The National Forest Restoration Plan became the first restoration policy to be implemented through the Decentralised Autonomous Governments (GAD), which in Ecuador consist of the provincial, municipal, and parish governments. The roles and responsibilities of these local governments were determined as part of a decentralisation process that was started in 2008, and, to obtain funding from Senplades to fulfil these roles, local governments are required to revise their Territorial Land Use and Development Plans after each local election. To pool resources and better implement their roles and responsibilities, two or more local governments also have the possibility to form a local government association – *mancomunidad* in Spanish (República del Ecuador, 2010).

2.3.3 Landscape restoration cases

We focus on the governance context of two montane forest landscapes: the *Chocó Andino* and the *Bosque Seco* (*Map 2.1*). These landscapes are examples of places where civil society and local governments initiated FLR-relevant efforts well before implementation of the National Forest Restoration Plan. Local FLR-relevant initiatives included the creation of a *mancomunidad* in each landscape to improve natural resource management in the affiliated local governments.

The local government associations of the *Chocó Andino* and the *Bosque Seco* ranked first and second, respectively, for the 2017 Green Prize of Ecuador's Development Bank, which aims to support local governments' sustainable environmental initiatives. Thus, both landscapes contain local sustainable land management initiatives that are recognised at the national level. The two landscapes enable us to study the implementation of the National Forest Restoration Plan in places where FLR-relevant governance arrangements already existed, whether and how the policy made use of local FLR-relevant governance arrangements, and the kind of scale challenges that emerged in the process. We have taken the territories of the relevant local government associations to delineate the two landscapes.

Map 2.1 Location of the *Chocó Andino* (purple) and *Bosque Seco* (yellow) landscapes in Ecuador

▪ *Chocó Andino*: Situated next to the national capital Quito, the *Chocó Andino* has witnessed a high density of conservation and restoration efforts in the past few decades. Particularly since the start of the decentralisation process, conservation efforts have gained importance. The Quito Metropolitan District government, civil society organisations such as Condesan and Imaymana Foundation, and the local government association have been the most prominent restoration actors. The Association of Rural Parishes of the Chocó Andino Bioregion (MCA) occupies ±151,000 hectares and was created in 2014 to promote environmental protection and sustainable land management [MCA1]. Located between 400 and 4,600 metres above sea level, the *Chocó Andino* is at the crossroads of the Tropical Andes and Túmbes-Chocó-Magdalena biodiversity hotspots and hosts high levels of biodiversity and endemism. In 2010, vegetation cover in MCA consisted of moist forest (45.6 percent), secondary forest (6 percent), highland grasslands (0.9 percent), shrubland (16.3 percent), agriculture (30.1 percent), and other (1.1 percent) (Bosques Andinos, 2018). Agriculture and cattle raising constitute an important livelihood, with over 80 percent of MCA's productive land use being dedicated to extensive cattle raising. The gross deforestation rate has been decreasing over the past decades and currently stands at about 200 ha a year (Bosques Andinos, 2018).

- *Bosque Seco*: Situated in the southwest near the Peruvian border, the *Bosque Seco* has a lower density of conservation and restoration efforts. Nevertheless, conservation and restoration efforts have gained considerable importance over the past decades, with the civil society organisation Nature and Culture International (NCI), the regional water fund (FORAGUA), and the local government association playing critical roles in restoring parts of the dry forest – *Bosque Seco* in Spanish. The Association of Municipalities of the Southwest of Loja Province "Dry Forest" (MBS) covers ±433,300 ha and unites six municipalities. MBS was established in 2014 to strengthen water resource conservation and promote sustainable economic development [MBS1]. Two ecosystems can be distinguished in the *Bosque Seco* landscape (MBS, 2012): 1) the moist forest remnants between 1,000 and 2,300 metres above sea level, which have suffered from increasing land use conversion pressures resulting from the expansion of extensive cattle raising and corn production, and 2) the dry forest Túmbes biodiversity hotspot in the low-lying parts, between 90 and 1,000 metres above sea level. The dry forests found in the southwest are among the most extensive and best preserved in Ecuador and Peru (Ordóñez Delgado et al., 2013).

2.3.4 Data collection

We reviewed documents, analysed geographical data, and conducted interviews. Firstly, a preliminary screening was made of policy documents (Asamblea Constituyente, 2008; MAE, 2018, 2016a, 2016b, 2014, 2013, 2012; República del Ecuador, 2017, 2014, 2010; Senplades, 2017, 2013), as well as reports that focus on restoration in the *Chocó Andino* (e.g. Bosques Andinos, 2016; Torres, 2015) and the *Bosque Seco* landscape (e.g. MBS, 2012; Ordóñez Delgado et al., 2013). To obtain an idea of the regulations and strategies used to guide local restoration action, the documents were reviewed regarding their restoration and rehabilitation notions. Several landscape-level reports were read in their entirety to understand the landscape context and inform the semi-structured interview checklists. The National Forest Restoration Plan document (MAE, 2014) formed the basis for analysing forest restoration policy implementation.

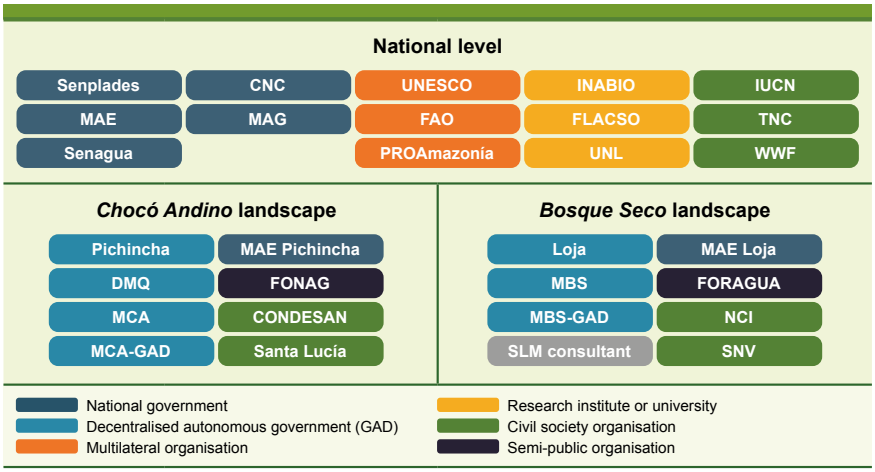
Secondly, restoration-related geographic data were obtained to create three geographic maps (*Maps 2.1, 2.2* and *2.3*) that visualise conservation and restoration-relevant areas in the two landscapes. Thirdly, 54 semi-structured interviews were held between November 2018 and March 2019. For the interviews, we used a purposive sampling strategy to identify all relevant actors in these cases (*Figure 2.1*). The decision to interview a person was based on that person's perceived centrality in either national FLR policy or local restoration efforts. Figure 1 indicates all actors interviewed.

Scales, levels, and the scale challenges described by Cash et al. (2006) were used as sensitising concepts to integrate various cross-scale and cross-level topics in the interview checklists for national and landscape actors. Interview topics included motivations to restore, restoration-related policy implementation mechanisms, cross-level and cross-sector collaboration, governance arrangements, land use planning, and reconciliation of restoration with rural livelihoods. The checklists' semi-structured nature ensured sufficient width of topics covered and enough openness to discuss other cross-scale and cross-level issues that were considered important by the interviewed restoration actors. A person was asked questions only when the interviewer considered the questions to be appropriate, and specific questions were added to clarify actor-specific restoration issues. The semi-structured interview checklists are available in Spanish in Annex A.

The interviews were recorded and fully transcribed. To ensure confidentiality, we used abbreviations to link viewpoints to organisations rather than to individuals. In the cases where one person from an organisation was interviewed, only that organisation's abbreviation is used, whereas in the cases where multiple persons from the same organisation were interviewed, a specific number is added to the abbreviation. MCA2 refers to the second interview with a technical team member of the *Mancomunidad del Chocó Andino* and MAE4 refers to the fourth interview with a staff member of the *Ministerio del Ambiente*. In a few cases, a former employee was interviewed on events that occurred while the person worked at a pertinent organisation. In those cases, the organisational code of the former employer was used.

2.3.5 Data analysis

We simultaneously engaged in data collection and analysis phases, in line with the principles of grounded theory (Charmaz, 1996). We followed the path of analytic progression (Miles and Huberman, 1994) in which we first tried to understand the nature of the FLR governance context in Ecuador, and then analyse the elements and dimensions of scale challenges and shape a framework on how elements and dimensions are connected. In this way, data were condensed, clustered, sorted, and linked over time (Miles and Huberman, 1994), and different leads in the data were followed. In Results, we provide an analysis of generic FLR scale challenges derived from data that can be further refined and updated by other researchers (Charmaz, 1996). Multiple actors experienced the identified scale issues as challenges.



CONDESAN	Consortium for the Sustainable Development of the Andean Ecoregion
CNC	National Council of Competencies
DMQ	Quito Metropolitan District municipal government
FAO	Food and Agriculture Organisation of the United Nations
FLACSO	Latin American Social Sciences Institute
FONAG	Water Protection Fund
FORAGUA	Regional Water Fund
INABIO	National Biodiversity Institute
IUCN	International Union for the Conservation of Nature
Loja	Loja Province government
MAE	Ministry of Environment
MAE Loja	Ministry of Environment Loja Province branch
MAE Pichincha	Ministry of Environment Pichincha Province branch
MAG	Ministry of Agriculture
MBS	Association of Municipalities of the Southwest of Loja Province
MBS-GAD	Municipal government belonging to the MBS: Celica, Macará, Paltas, Puyango, Zapotillo
MCA	Association of Rural Parishes of the Chocó Andino Bioregion
MCA-GAD	Parish government belonging to the MCA: Calacalí, Gualea, Mindo, Nanegal, Nanegalito, Nono, Pacto
NCI	Nature and Culture International
Pichincha	Pichincha Province government
PROAmazonía	Integrated Programme for the Amazon for Forest Conservation and Sustainable Production
Santa Lucía	Santa Lucía Cooperative
Senagua	National Water Secretariat
Senplades	National Secretary of Planning and Development
SNV	Netherlands Development Organisation
TNC	The Nature Conservancy
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNL	National University of Loja
WWF	World Wildlife Fund

Figure 2.1 Interviewed actors, their position in the case study, characteristics, and abbreviations

2.4 Results

We took the temporal and spatial dimensions of the ecological and governance scales as a lens through which to detect scale challenges (Cash et al., 2006) in Ecuador's FLR governance context. We identified five temporal or spatial scale challenges linked to the implementation of the National Forest Restoration Plan in the *Chocó Andino* and the *Bosque Seco*. Following a brief overview of the challenges (*Table 2.1*), we discuss them more elaborately with evidence from the interviews at the national and landscape level.

2.4.1 Political cycles mismatch with restoration timelines

As part of the National Forest Restoration Plan's implementation, a discrepancy became clear between the short-term logic of election cycles and the inherently long-term timelines linked to the restoration of native vegetation. When the Ecuadorian President's Office set the ambition to restore 500,000 hectares of degraded lands, it was important for the high-level politicians involved that this policy would show the national government's success and leverage political support [INABIO]. The temporal mismatch between the governance and ecological scales that resulted from the drive to achieve this ambition in a four-year timespan was not, however, corrected by MAE or by the President's Office [MAE3]. "They did not understand that nature was not going to run at the pace of political campaigns. The main mistake was to transform the National Forest Restoration Plan into a generator of political achievements" [INABIO].

Furthermore, an interest in showing tangible results in the short term also biased politicians towards highly visible planting of fast-growing tree species instead of natural regeneration, or towards investments in other sectors. As tree planting makes it easy for politicians to show their constituencies that they are actively implementing a project, in many cases FLR was reduced to the number of trees or the area planted [MAE4]. "The government did not bother about how the seedlings had been planted, but rather that they had been planted" [UNL2]. It proved hard to convince politicians about the biodiversity benefits of natural regeneration [MAE3], even though it does more justice to the diversity of species found in most ecosystems while also being a better starting point in harsh, dry environments like the *Bosque Seco*.

A similar drive by politicians in the *Chocó Andino* and the *Bosque Seco* to show short-term results before their political cycle ended caused them to favour other projects over FLR [MCA-GAD5]. "They do not see environment issues as something that generates votes. They rather focus on infrastructure and health" [MBS2]. Arguing that their constituencies will judge them on how they performed in office, politicians are inclined to focus on the construction of pipelines to bring water from

Table 2.1 Five scale challenges identified in the case study landscapes

	Scale challenge	Description	Challenge type (Cash et al., 2006)
SC1	Political cycles mismatch with restoration timelines	Short-term-oriented political cycles created a mismatch with the long-term character of restoration. The desire to meet political interests at the governance scale resulted in ineffective decisions for the ecological scale.	B) Temporal mismatch between the governance scale and the ecological scale
SC2	Planning horizons mismatch with restoration timelines	By working with a four-year compensation scheme for landowners to restore native vegetation cover on their land, the National Forest Restoration Plan did not align with longer-term restoration timelines.	B) Temporal mismatch between the governance scale and the ecological scale
SC3	National restoration objectives mismatch with decentralised land use planning realities	Local governments had neither the capacity nor the experience to integrate the National Forest Restoration Plan's landscape-level objectives in their land use planning. The national government failed to anticipate local land use planning realities by creating technical guidelines, providing proper assistance, or pushing for land use planning norms.	A) Failure to recognise important dependencies between different governance levels resulting in spatial planning challenges
SC4	The governance level of existing restoration efforts misaligns with the level receiving restoration funds	The National Forest Restoration Plan barely channelled any restoration funding to pre-existing restoration efforts and actors, whereas the parish government level received most funds, despite being new to the theme.	B) Spatial misalignment between governance levels
SC5	Tensions exist between the spatial dimensions of biodiversity and water-related restoration efforts	Heterogeneity existed in the spatial dimensions on the ecological scale that are linked to different restoration efforts and used to enable and determine restoration success. Notable tensions exist between spatial dimensions used by biodiversity and water-related restoration efforts.	C) Failure to recognise and support the heterogeneity in the spatial dimensions on the ecological scale to engage in restoration

source to tap, while neglecting water source protection [MAE3; Senagua; NCI1; NCI2]. The latter is seen as cumbersome because it creates competing land use claims. On multiple occasions, a desire to meet short-term political interests has thus resulted in decisions that are ineffective in fostering long-term restoration processes.

2.4.2 Planning horizons mismatch with restoration timelines

A similar mismatch is seen between the long-term nature of FLR and the short-term planning horizons in the National Forest Restoration Plan. The plan was based on a four-year financial compensation for those landowners who decided to reforest or regenerate parts of their property. A yearly compensation was paid by local governments to landowners, depending on the progress in native vegetation growth during the four to five years that the plan lasted. However, the plan did not consider sufficiently the sustainability of the restoration results after the project period [MAE Loja]. In the *Bosque Seco*, it was observed that "closing the area is not necessarily sustainable because, when it has regenerated after five or ten years, the agreement ends and the landowner can decide to put his livestock in again. It has then served nothing" [MBS-GAD3].

In the *Chocó Andino*, MCA's technical team highlighted the challenge of providing a proposition to landowners that does not affect their income negatively. This could be achieved by combining improved farm practices with the restoration of those parts of their property that are not suitable for agriculture or cattle ranching, like riparian areas or steep slopes [MCA1; MCA2]. However, MAE declined requests by MCA to invest in restoration-oriented farm practices because its funds were earmarked for either tree planting or natural regeneration, not for livelihood improvement [MCA1]. The short-term planning horizon of the National Forest Restoration Plan raised similar concerns in the *Bosque Seco*. "The challenge is that the plan missed one crucial step. Firstly, it is key to create preparedness among the people through economic activities. From there, one can start talking about restoration. If you talk about restoration without anything in return, they are not willing to participate" [MBS2].

Local actors in the *Chocó Andino* and the *Bosque Seco* came to realise that it is better to focus restoration funds on making rural livelihoods more nature-inclusive in the long term than to compensate landowners for the project period only. With cattle raising and agriculture being key economic and cultural activities in the *Chocó Andino* and the *Bosque Seco*, it would have been particularly relevant to see how these could be made more nature-inclusive in the long run [Santa Lucía]. "It is important to build cattle raisers' capacity, so that on fewer hectares they can do more" [MCA-GAD4]. However, MAE failed to recognise that meaningful restoration could not be achieved during the plan's four-year timespan [MBS2].

2.4.3 National restoration objectives mismatch with decentralised land use planning realities

The National Forest Restoration Plan was designed to restore 500,000 hectares of native vegetation cover through five elements: restoration in hydrological protection zones, landslide protection zones, natural area buffer zones, biological corridors, and other biodiversity conservation areas (MAE, 2014). However, these objectives were not accompanied by land use planning norms that determined how local governments could integrate explicit restoration and conservation goals in their Territorial Land Use and Development Plans. Nor did local governments have the capacity or the experience to use their land use plans to fulfil biodiversity and water objectives by delineating restoration sites in their jurisdiction for this purpose. Most land use plans were created merely to meet funding requirements of the former National Planning and Development Secretariat, rather than to actively use them as a planning tool [Senplades2]. Thus, no connection could be made between the funds becoming available to local governments for restoration and their land use planning process.

Despite the local challenges that could have been foreseen, the National Forest Restoration Plan was not accompanied by technical guidelines to indicate how local governments could select restoration sites [MAE4]. In addition, MAE experts who assisted local governments to implement the plan did not have the required land use planning knowledge or experience. They focused merely on the standard procedures relating to tree planting and checking tree survival, rather than giving land use planning guidance to local governments [INABIO; UNL2]. As a consequence, restoration occurred in places where it was easy for local governments to work, instead of in places that were most suitable from a landscape perspective [MAE2].

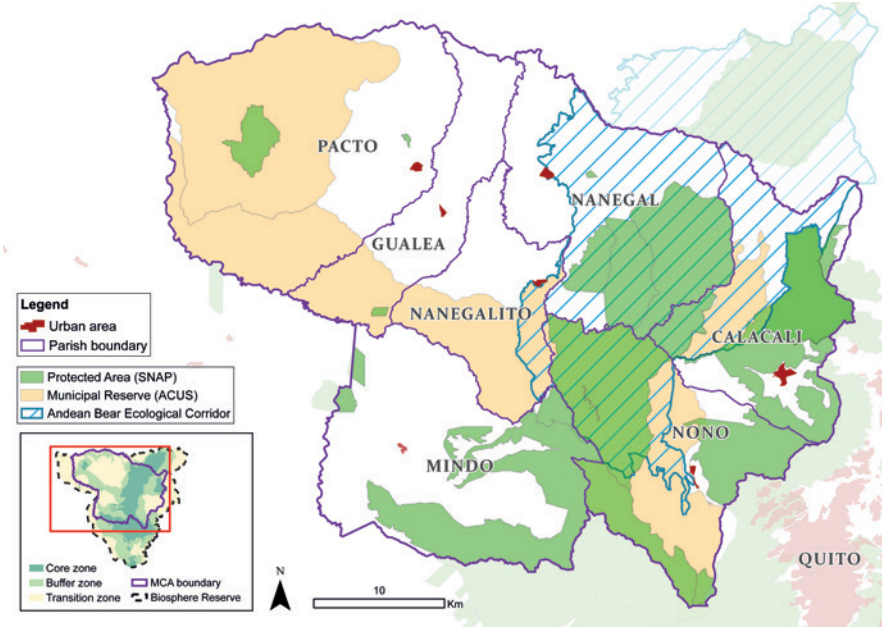
The absence of guidelines and guidance capacity was a result of the speed with which the National Forest Restoration Plan had to be implemented. Agreements had to be signed with local governments for 100,000 hectares during the plan's first year alone to be on track to meet the 500,000-hectare target [MAE3]. With MAE simply looking for more land to fulfil its hectare targets, the plan hence accepted a high number of restoration hectares from individual parishes without having a clear understanding of whether the parishes could give substance to the restoration objectives identified by the plan [MAE3; INABIO]. "One of the main causes of failure has been that it was a very high goal that had to be reached, which meant that the quality of restoration was not guaranteed. It was simply looking for hectares at the local level. Whoever wanted to restore was accepted in the National Plan" [MAE4].

2.4.4 The governance level of existing restoration efforts misaligns with the level receiving restoration funds

Another misalignment was observed between the governance level at which pre-existing FLR efforts had taken place and the level that predominantly received funds from the National Forest Restoration Plan. Whereas the inexperienced parish governments were on the receiving end of the plan's predefined implementation scheme, MAE did not consider FLR efforts with explicit biodiversity and water-relevant objectives that already existed in the *Chocó Andino* (*Map 2.2*) and the *Bosque Seco* (*Map 2.3*) and that could have benefited greatly from the National Forest Restoration Plan.

Chocó Andino: In the *Chocó Andino*, the focus over the past decade has been on the creation of rules and governance arrangements to strengthen environmental protection and sustainable production [MCA-GAD3; MCA-GAD7]. Most of the landscape's conservation areas are the result of municipal policies of Quito's metropolitan district government. These include an Ecological Corridor for the Andean Bear (the spectacled bear) that covers 60,000 hectares of protected forest and 97,000 hectares of municipal reserves where natural resources are co-managed sustainably with landowners [DMQ]. Another catalyst in the landscape's conservation was the establishment of MCA. The association was born from the parishes' recognition that political unity is crucial to resist the national government's strategies to promote mining and agricultural commodities [MCA1; DMQ; MCA-GAD7]. In an effort to strengthen the *Chocó Andino*'s conservation and sustainable development, the parish governments pushed for a municipal ordinance in 2016 that imposes restrictions on construction and agriculture in riparian zones and water sources, and curbs land fragmentation, uncontrolled agricultural expansion, and mining within MCA territory [DMQ; MCA1]. The success of the various municipal policies and the establishment of MCA have attracted much attention to the landscape and resulted in the declaration of a Biosphere Reserve in Pichincha Province's *Chocó Andino* in 2018 [MCA2].

Many local FLR-relevant policy dynamics were ongoing in the Chocó Andino landscape when the National Forest Restoration Plan was implemented. Still, neither the municipal reserves, the Ecological Corridor, nor MCA's technical team received support from MAE, and the plan disbursed funding to a governance level that was new to the restoration field. The funds were also much larger than the budget that parish governments would normally handle [MAE1]. An MCA parish would normally manage US$ 140,000 annually, but the plan increased this to US$ 550,000 [MCA1], hence generating capacity problems for the parishes in the process.



Map 2.2 Existing conservation and restoration efforts in the *Chocó Andino* landscape. There is misalignment between the parish government level that received most restoration funds – indicated by the purple boundaries – and the level of existing and planned FLR efforts. These are the areas that fall within the National System of Protected Areas in green, the municipal reserves in yellow, an Ecological Corridor in stripped blue, the local government association that comprises the seven depicted parish governments, and the Biosphere Reserve shown in the map on the bottom left (source: elaborated by the authors, with geographical data from Condesan and MAE).

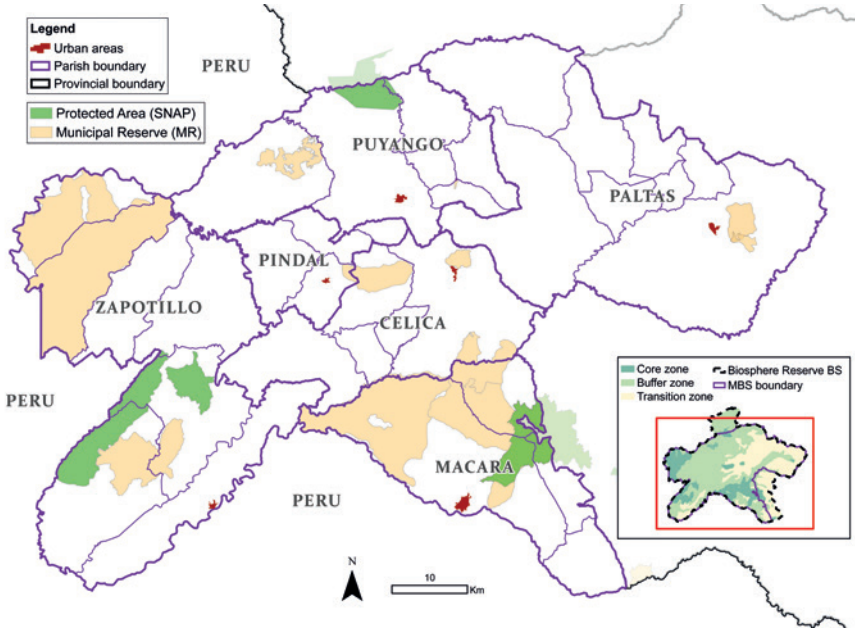
Bosque Seco: FLR efforts in the *Bosque Seco* have focused mainly on improving water flows in its montane areas and on biodiversity conservation in the low-lying parts. Restoration efforts started in the 1990s with a micro-catchment management project that promoted area enclosures and natural regeneration. The project united the municipalities that would later establish MBS in 2011 and that would continue along the same line [SNV]. With water scarcity being a recurrent challenge in the dry forest, NCI also started assisting municipalities to specifically promote the restoration of water sources to ensure water availability while safeguarding biodiversity [NCI1]. NCI did so by stimulating municipalities to adopt ordinances that declare municipal reserves in the water source areas and to raise an environmental tax to enable land purchase to restore the water sources. In the wake of these efforts, NCI established FORAGUA in 2009 to further assist municipalities in the protection and restoration

of water sources. In Loja Province where the *Bosque Seco* landscape is located, the National Forest Restoration Plan signed a total of 37 agreements, of which 35 were with parish governments [MAE Loja]. However, it had not been the parishes that had undertaken earlier restoration efforts, but rather NCI, FORAGUA, and the various municipalities united in MBS. Another indication of the pre-existing conservation and restoration dynamics in the landscape is the declaration of the *Bosque Seco* Biosphere Reserve, which MBS and NCI got accepted in 2014 [MBS1]. Finally, MBS did become directly involved in the National Forest Restoration Plan, with 2,600 hectares, after MBS's technical team successfully lobbied MAE to include municipalities and their associations on the list of beneficiaries.

With MBS being a notable exception, National Forest Restoration Plan funds predominantly flowed to a governance level that was not best positioned to restore ecological connectivity or improve water regulation at the landscape level in the *Bosque Seco*. The fact that the plan did not align its funds better with pre-existing FLR efforts in both landscapes was a missed opportunity, because it could have built more on local visions, local concerns, and local pride.

2.4.5 Tensions exist between the spatial dimensions of biodiversity and water-related restoration efforts

A last scale challenge concerns heterogeneity in the spatial dimensions on the ecological scale that are used at the national and landscape level, with notable tensions emerging between the spatial dimensions that are used by biodiversity and water-related restoration efforts. At the national level, restoration success was determined by the number of hectares with restored native vegetation, although the exact location of these hectares *de facto* received little attention [MAE4]. For MAE, what was basically important was to find the 500,000 hectares in time within Ecuador's national territory. At the landscape level on the contrary, existing FLR efforts had paid more attention to the underlying ecological connectivity and water regulation objectives of restoration, making the exact location of such efforts matter much more. Water scarcity is a concern that worries people in particularly the montane areas of the *Chocó Andino* and the *Bosque Seco*, making water source restoration an important strategy to solve locally felt challenges [NCI2; Pichincha]. "We used to have a lot of water sources, but slowly these have been degrading. Now there is practically no water in summer. What we want to do is recover the streams that used to provide water to the town" [MBS-GAD2]. Indeed, most of the municipal reserves that were established in the *Bosque Seco* have great hydrological importance [MBS2] and were considerably degraded and deforested at the time of their purchase. In the *Chocó Andino* too, the importance of water availability is reflected in MCA's strategic planning to better protect areas that currently do not have a formal



Map 2.3 Existing conservation and restoration efforts in the *Bosque Seco* landscape. There is a spatial misalignment between the parish government level that received most restoration funds – indicated by the purple boundaries – and the level of existing and planned FLR efforts. These are the areas that are part of the National System of Protected Areas in green, the municipal reserves in yellow, the local government association of six municipalities – whose names are mentioned in the map – and the Biosphere Reserve shown in the map on the bottom right (source: elaborated by the authors, with geographical data from NCI, MBS, FORAGUA, and MAE).

conservation status as a municipal reserve, but that are nevertheless crucial from a water regulation perspective [MCA2].

Despite the importance of restoration to improve water regulation at the landscape level, it has taken a long time to create a dedicated level on the governance scale that matches the spatial specificities of water regulation. As part of the National System of Protected Areas, a historical bias can still be observed towards biodiversity conservation. Private or municipal reserves can receive protected area support from MAE only when there is sufficient evidence of exceptional biodiversity in those areas. Areas that are too small or too degraded are not eligible to be declared protected. As a result, the water regulation functions that can be provided by currently degraded areas once they are restored was not recognised. However, the fact that areas of

exceptional importance for water regulation exist, such as highland grasslands (*páramos*), made the National Water Secretariat (Senagua) declare Ecuador's first hydrological protection area in 2018 [Senagua]. This new model breaks with the conventional biodiversity conservation scheme with which MAE has worked and does more justice to current levels of landscape fragmentation where remaining ecosystem patches are often small and degraded. "What was difficult about the biodiversity framework was that you had to provide evidence of exceptional biodiversity to be eligible for protection. Many areas, however, are exceptionally important as a water source, but so degraded that there is no longer exceptional biodiversity, like endemic species. With this new legal framework, there can still be protection" [FONAG].

Ecuador's forest restoration policies have continued to evolve. Learning from the lessons drawn from the National Forest Restoration Plan's 2014–2017 phase, MAE has designed a new implementation model to run between 2019 and 2030. The model starts from the realisation that parish governments alone do not have the capacity to implement FLR efforts [MAE Loja]. Territorial roundtables have therefore been envisioned to enable collaboration between FLR actors at different levels and spheres operating in a given territory [MAE4]. Depending on local circumstances, roundtables can consist of provincial, municipal, and parish governments, as well as technical partners like research institutes, civil society organisations, private actors, and water funds to facilitate local governments' capacity building (MAE, 2018). The roundtable model explicitly intends to favour restoration quality over quantity, by prioritising restoration where it has a function rather than just looking for more hectares. The roundtables are envisioned to function as platforms for local actors to draw attention to local interests and to set FLR targets that are based on an understanding of landscape-specific water and biodiversity concerns [MAE1]. With actors jointly shaping priorities, the model aims to ensure that restoration action addresses locally felt challenges in the future and integrates these priorities in Territorial Land Use and Development Plans [MAE4].

2.5 Discussion

The question central to this article is: what are the scale challenges encountered in forest and landscape restoration governance? Elucidating the cross-scale and cross-level challenges that are specific to FLR is highly valuable because the prominence of this multi-actor endeavour will continue to grow as restoration pledges are being implemented.

The results show that the National Forest Restoration Plan was established to serve short-term political interests and was implemented through a pre-determined scheme that looked neither at local realities nor at what local implementing actors needed; nor did it show the flexibility needed to take pre-existing FLR efforts into account. To reconcile multiple levels within a landscape context, Guariguata and Brancalion (2014) highlighted that the main challenge is to find the right mix between command and control and governance that includes non-state actors and regulatory flexibility. Too much focus on strict fulfilment of restoration targets leaves little space to negotiate visions that link to local realities and priorities. Indeed, the Bonn Challenge has already been critiqued for its focus on a specific number of restored hectares of degraded and deforested lands, without giving sufficient consideration to the effectiveness of restoration projects (Mansourian et al., 2017b). Stanturf et al. (2019) conclude that the chances of achieving restoration targets are enhanced when linked to accepted local goals and aspirations. Building on existing governance arrangements and conservation efforts allows FLR to be taken up as part of a broader process that addresses local interests and concerns. The two case studies show that there is no shortage of governance arrangements that are grounded in local realities and that develop FLR-relevant visions, as the examples of the local government associations, the water fund, and the Biosphere Reserves testify.

With regard to the relevance of the findings for FLR governance in other areas, it must be stated that both the *Chocó Andino* and the *Bosque Seco* landscape are well-known at the national level for their local conservation and restoration efforts. What this study's results show is that scale challenges can even be found in places where many restoration efforts exist and where one would expect more capacity for scale-sensitive governance. The results and conclusions are hence relevant for other areas where FLR efforts have materialised as well as for places where no FLR efforts currently exist (Romijn et al., 2019), so that future scale challenges can be avoided and the need for scale-sensitive observation in landscape restoration governance can be understood.

The process of detecting restoration-related mismatch and finding better fit is an ongoing one. Continuous adaptation is required to reach the adequate level at which FLR needs to be negotiated. Creating a better fit does not mean having the best fit between levels on the ecological and the governance scale. Termeer and Dewulf (2014) consider it impossible to find fixed and lasting fits between levels on these scales, implying that scale challenges can be realistically addressed only by organising governance at multiple levels. For example, MCA covers an area that ranges from 400 to 4,600 metres above sea level. From a biodiversity restoration perspective, it is crucial to cover the wide range of ecological zones that fall within this altitude range. From a human perspective however, the livelihood and priorities of a cattle farmer in the high-altitude parish of Calacalí are different from those of a sugar cane farmer in the low-lying parish of Pacto. An institution like the local government association needs to give space to the heterogeneity in a landscape to accommodate differing and overlapping conservation and restoration priorities. Effective integration across spatial dimensions requires flexible governance arrangements (Mansourian and Parrotta, 2019).

The idea that continuous adaptation is required to reach the level at which restoration is best negotiated raises questions about the specific roles, responsibilities, and capacities needed by governments at different levels to shift scales or to manage across or at multiple levels (Ansell and Torfing, 2015). With governments being increasingly required to play their part in fulfilling national FLR targets, more research is needed on the strategies applied at multiple levels to overcome scale challenges and organise decision space to reconcile national FLR targets with local realities. Collaborative monitoring approaches that integrate restoration actors across governance levels could assist in cross-level coordination, information sharing, and learning, and encourage adaptive management in forest and landscape restoration (Guariguata and Evans, 2020).

In terms of limitations, it is important to note that the scale challenges identified in Ecuador do not exist in isolation from a plethora of other challenges that do not directly have cross-scale or cross-level origins. Scale challenges are intertwined with more common challenges related to corruption, political orientations, lack of financial resources, land tenure insecurity, and inter-agency coordination. All challenges together make up the complex FLR governance picture in which each deserves attention. In fact, it is often another challenge, such as a lack of capacity at a particular governance level or the lack of cross-sector collaboration at the same level, that may lead to the emergence of a scale challenge. Scale challenges themselves are also intertwined. Lastly, we acknowledge that the methods chosen are not the only way to study FLR governance. We have chosen to build on the lived experience of Ecuador's

FLR community of practice to highlight context and nuance when describing the various temporal and spatial scale challenges linked to the local implementation of national FLR targets.

2.6 Conclusion

This article focused on the scale challenges faced in FLR governance in the montane *Chocó Andino* and *Bosque Seco* landscapes. We identified five scale challenges in both landscapes. Two temporal challenges emerged because neither (i) political cycles nor (ii) short-term planning horizons were aligned with long-term restoration timelines. Spatial scale challenges arose from the fact that (iii) the national restoration objectives mismatched with decentralised land use planning realities, (iv) the governance level of existing restoration efforts misaligned with the level predominantly receiving restoration funds, and (v) tensions existed between the spatial dimensions of biodiversity and water-related restoration efforts.

Cross-scale and cross-level challenges that emerge in the implementation of FLR policies need to be observed with more sensitivity. This requires more attention on the temporal and spatial set-up of governance arrangements and how these link to the temporal needs of FLR and the spatial character of existing FLR efforts. Preliminary results relating to the territorial roundtables show that more attention is already being paid in Ecuador to address FLR at the right governance level and to better integrate FLR in territorial land use planning.

Acknowledgements

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3

Unravelling scale challenges in Ethiopian forest and landscape restoration governance

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Abstract

Ethiopia's federal government has committed to one of the most ambitious forest and landscape restoration targets as part of the Bonn Challenge. To achieve the targets, actors at multiple governance levels aim to influence relevant ecological processes, drawing particular attention to the governance processes that are used to translate national restoration targets into local action. We take a multi-level governance approach and focus on the cross-scale and cross-level challenges that arise in Ethiopia's forest and landscape restoration governance context. To this end, we analyse public and non-state actor-led efforts related to participatory forest management and area enclosure in the Kafa Biosphere and Mount Guna landscapes. From 56 semi-structured interviews, 14 focus group discussions and a policy and project document review, we identified five cross-scale and cross-level challenges: 1) short-term tree planting campaigns and quota mismatch with restoration timelines; 2) planning horizons of restoration-related international development projects mismatch with restoration timelines; 3) federal and international budget allocation for alternative livelihoods mismatches with sustained local restoration processes; 4) federal forest and land policies mismatch with the secure land tenure conditions needed to sustain local restoration efforts; and 5) misalignment of the forest and landscape restoration portfolio exists in the cascading government structure. The need to achieve and sustain national FLR targets requires increased focus on how existing and future restoration-related governance arrangements create fit with the temporal and spatial dimensions of forest and landscape restoration processes, and on how governance arrangements create alignment between governance levels.

3.1 Introduction

Land degradation processes have now become systemic phenomena that push the world towards a sixth mass extinction of species and negatively affect the well-being of at least 3.2 billion people as a result of reduced water supply and quality and increased health and disaster vulnerability (IPBES, 2018; IPCC, 2019; Pörtner et al., 2021). The recognition that urgent action on land degradation, biodiversity decline and climate change is needed has translated into great political momentum for ambitious targets to restore degraded and deforested lands (Mansourian and Parrotta, 2018; Suding et al., 2015). Significant pledges have been made as part of the Bonn Challenge, which aims to inspire national and sub-national governments to restore 150 million hectares (Mha) by 2020. The New York Declaration on Forests extended the Bonn Challenge target to restore a total of 350 Mha of degraded and deforested landscapes by 2030 (bonnchallenge.org). In the wake of these global policy-driven platforms, several government-led regional initiatives have been formed, such as the African Forest Landscape Restoration Initiative (AFR100) to restore 100 Mha of African lands by 2030, and in which over 30 national governments pledged to restore a specific number of hectares at the national level (afr100.org).

Restoration pledges made as part of the Bonn Challenge follow the Forest and Landscape Restoration (FLR) approach, which has been defined as a "planned process that aims to regain ecological integrity and enhance human well-being in deforested and degraded landscapes" (Mansourian, 2017a). The dual objective of improving both ecological integrity and human well-being makes the landscape perspective particularly relevant (Mansourian and Parrotta, 2018) to reconcile both forest and non-forest ecosystems as well as other land uses in a landscape to simultaneously produce food, preserve ecosystem functions and conserve biodiversity (Chazdon et al., 2017; Temperton et al., 2019).

With numerous restoration targets set by national governments, the governance arrangements used at the national and subnational level to translate high-level commitments into local restoration action require particular attention (Guariguata and Brancalion, 2014; Mansourian, 2016; Wiegant et al., 2022b, 2020). Still, despite the prominence of restoration in policy frameworks, it remains largely uncharted how FLR strategies and policies are achieved locally (Fagan et al., 2020; Mansourian and Parrotta, 2019), whether and how their implementation is influenced by the characteristics of landscape contexts, and what challenges emerge in the process of reconciling the ecological and social objectives of FLR at the local level.

Recognising the development challenges that landscape degradation poses, Ethiopia's federal government pledged to restore 15 Mha of degraded and deforested land by 2030, as part of the 2014 New York Declaration on Forests (MEFCC, 2018a), making Ethiopia among the African countries with the most ambitious restoration targets. These targets are anchored in several federal policy frameworks that place sustainable forest management and restoration at the centre of national development (Techel et al., 2019). This includes earlier restoration targets that were set in the 2011 Climate Resilient Green Economy (CRGE) strategy, which is Ethiopia's overarching development framework to reach middle-income country status by 2025 while keeping greenhouse gas emissions low (FDRE, 2011). The CRGE strategy has objectives to reduce pressure on forests and woodlands, afforest and reforest 3 Mha, improve management of 4 Mha of degraded forests and woodlands, and rehabilitate degraded pastures and farmland through area enclosure, and has largely relied on access to bilateral and multilateral climate finance to implement its initiatives (FDRE, 2011). Other policy frameworks that have put forest management and restoration central are Ethiopia's REDD+ strategy (FDRE, 2018) and the second Growth & Transformation Plan (GTP II) (FDRE, 2016). GTP I and II have been important milestones towards realising the CRGE strategy's national development vision. GTP II continued the restoration-related efforts started by the CRGE and posed more specific objectives for the 2016-2020 period, including the aim to increase the forest cover from 15.5% in 2015 to 20% by 2020, and to double the area under enclosure from an initial 10.9 Mha to 22.5 Mha.

Focusing on Ethiopia's FLR governance context, we aim to identify the challenges that emerge when actors at different levels of the governance scale aim to influence relevant restoration processes on the ecological scale. Our central research question is: what are the cross-scale and cross-level challenges encountered in forest and landscape restoration governance in Ethiopia? We answer this question by studying the implementation of the main restoration mechanisms: participatory forest management and area enclosure, which are the main government-led landscape restoration mechanisms (Kassa et al., 2017). While participatory forest management is practiced in areas like the moist Afromontane ecosystem where significant but degraded remnant forests are found, area enclosure is mainly practiced in places like the dry Afromontane ecosystem where natural vegetation cover has historically largely disappeared.

- *Participatory Forest Management*: Participatory forest management was introduced in Ethiopia during the 1990s by civil society organisations (CSOs) to specifically improve forest management in landscapes that still had significant forest cover. After a decade of experimentation, the mechanism was formally recognised by the

government in the 2007 Forest Proclamation and in 2010 a national upscaling programme began. The arrangement moves rights and responsibilities from the government to rural communities living in and around designated forest areas (Cronkleton et al., 2017). While the government remains the forest's legal owner, it co-manages the forest with rural communities based on a negotiated management plan (MEFCC, 2018b). While tree cutting is not allowed for commercial purposes, communities may sustainably harvest and sell non-timber forest products from their forest (Gebrewold, 2016).

- *Area Enclosure*: by taking away human and livestock pressure, area enclosure has been practiced to restore the economic and ecological functions of degraded communal lands (Lemenih and Kassa, 2014). Surrounding communities are not allowed to let their livestock graze freely in an enclosure (Gebrewold, 2016). However, once restored, communities will be able to use the areas as a source of fodder, wood and other livelihood-related products, based on commonly developed and agreed utilisation arrangements. Area enclosures are often combined with soil and water conservation structures, assisted natural regeneration and tree planting to improve soil water retention. Without additional measures, revegetation will take place from seeds that are still present in the soil.

We adopted an exploratory multiple case study design to study the multi-level FLR governance context in Ethiopia as it has been little researched, not clearly specified, and characterised by a difficult to access research context and lack of data (Baxter and Jack, 2008; Mills et al., 2012; Yin, 2003). We explored two government-led landscape restoration mechanisms through a case study approach, and built on the experience and perspectives of members of Ethiopia's FLR community of practice at the federal, regional, zonal, district and community level. In this way, we created a thick description of FLR governance to understand the different cross-scale and cross-level challenges that emerge when national restoration targets are implemented at the local level. To analyse how cross-scale and cross-level challenges arise, we first elaborate the scale and level concepts in the theoretical framework. In the methods section, we clarify the case study contexts, and explain our data collection and analysis process. In the results we elaborate the cross-scale and cross-level challenges encountered in Ethiopian FLR governance.

3.2 Theoretical framework

Given that global environmental change processes are increasingly understood to have causes and effects that span across multiple levels, from the local to the global (Cash, 2000), there is no single 'correct' level of analysis (Gibson et al., 2000) and a multi-level perspective is rather needed. We used the scale concept as an analytical tool to detect challenges across scales and levels that emerge from FLR governance processes.

3.2.1 Scales and levels

Scale is a unifying concept that connects social and biophysical phenomena (Cumming et al., 2013). There are two basic definitions of scale. First, scale is a measure for the actual magnitude or extent of social or biophysical phenomena (Padt and Arts, 2014). Second, scale is an analytical tool that contains a graduated range of values used to measure and study the environment and the processes governing it (Cash et al., 2006). In the latter definition, scale is a measuring rod that researchers use to organise their understanding of the interactions that take place in the world and to gain knowledge about them (Cash and Moser, 2000) (*Figure 3.1*). Scales allow comparison of qualitatively different things by abstracting them from a complex and dynamic reality in a standardised way (Padt and Arts, 2014). Since scales are largely a social construct, the concept can be used by different scientific disciplines and can be adapted to any specific context and topic to study a wide diversity of interactions between humans and the environment (Buizer et al., 2011; Cash and Moser, 2000).

Two of the most distinguished scales to study social and biophysical phenomena are the spatial and temporal scales (Ansell and Torfing, 2015; Cash et al., 2006; Padt and Arts, 2014). However, these scales are considered insufficient to study multi-level environmental governance, given the existence of other cross-scale and cross-level challenges, in addition to those related to space and time. Cash et al. (2006) added more specificity to the theory by introducing several scales that are central to governance studies, including the jurisdictional, institutional and management scales (Termeer et al., 2010). While the jurisdictional scale refers to clearly delineated and organised government authorities, the institutional scale refers to relevant rules and regulations, and the management scale focuses on the plans that are elaborated to address a particular issue.

Following Termeer and Dewulf (2014), we use the governance scale as an analytical tool that brings together jurisdictional, institutional and management elements to study the restoration efforts of public and non-state actors. We also use the ecological scale to study the ecological processes that public and non-state actors seek to

influence through their different restoration-oriented governance arrangements and strategies. Both ecological and governance processes have a spatial and a temporal dimension (Vervoort et al., 2012). The spatial dimension refers to the spatial reach of ecological and governance processes, which can vary from large to medium and small-sized. The temporal dimension refers to the duration of ecological and governance processes and can vary from long term to medium and short term (Termeer and Dewulf, 2014).

Many scales contain some form of hierarchical structure and several scale levels can be distinguished (Gibson et al., 2000). Levels are the units of analysis located at different locations along a scale (Cash et al., 2006). This distinction between scales and levels has added precision to the scale literature (Ansell and Torfing, 2015). On the ecological scale, the biome, ecosystem, landscape and patch levels can be distinguished. Ecological systems have a relatively well-defined hierarchical structure of levels of organisation (Scholes et al., 2013) and on each of them different ecological processes can be observed. Also in the public sector there is a hierarchy between different levels due to authority, with the power of lower-level governments often being limited by higher-level governments (Termeer et al., 2010). There also tends to be a clear division of tasks and responsibilities between government levels. Important

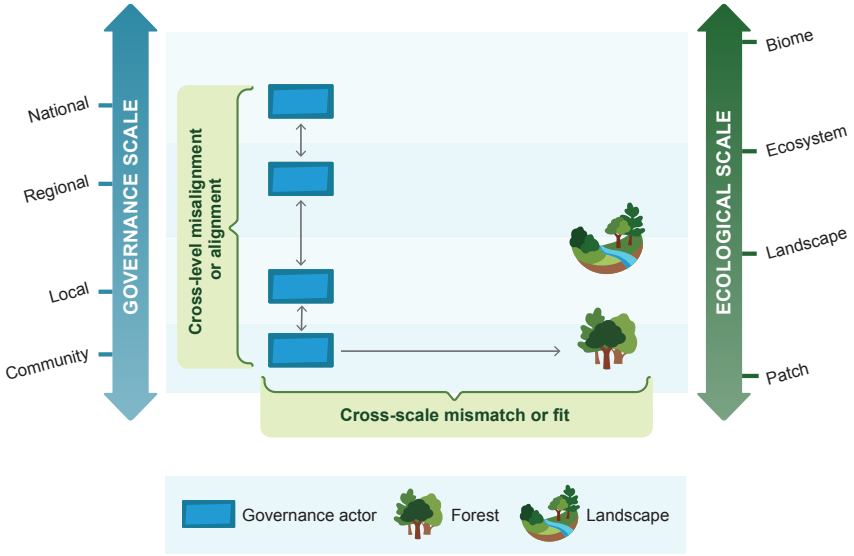


Figure 3.1 We studied cross-scale and cross-level interactions in Ethiopia's FLR governance context, and the challenges arising from these. An example is given for cross-scale mismatch or fit, and cross-level misalignment or alignment

governance levels in Ethiopia include the federal, regional, zone, *woreda* (district) and *kebele* (ward) levels.

3.2.2 Cross-scale and cross-level challenges

To meet national restoration targets, actors at different governance levels seek to influence relevant ecological processes. When implementing restoration targets, actors may create or be confronted with challenges that work out across scales, and across governance levels. Cash et al. (2006) distinguished three types of cross-scale and cross-level challenges:

A. Blind spot - the failure to recognise important scale and level interactions: this challenge refers to a lack of understanding of key processes that occur across scales and levels (Vervoort et al., 2012), which may cause a solution that is formulated at one level to result in new problems at other levels or scales (Buizer et al., 2011; Cash and Moser, 2000). If a national public actor targets the district level to achieve its policy objectives without regard to the constraints that exist at that particular level, the implementation of the policy may be ineffective or unsustainable (Cash et al., 2006). Blind spots may be the result of an inability to observe or influence the full spectrum of cross-scale and cross-level interactions that are relevant to an issue, given their inherent complexity.

B. Mismatch - the persistence of cross-scale mismatch and cross-level misalignment: an archetypical cross-scale challenge is the cross-scale mismatch (Cash et al., 2006; Gibson et al., 2000; Termeer et al., 2010). It occurs when governance processes are not coterminous with the ecological processes they seek to influence, neither in space nor time (Cash et al., 2006; Cash and Moser, 2000; Cumming et al., 2006). Spatial mismatch arises when the spatial reach of governance processes does not fit the spatial reach of relevant ecological processes (Ostrom et al., 1961; Termeer and Dewulf, 2014). Temporal mismatch occurs when the temporal reach of governance processes does not fit the temporal characteristics of relevant ecological processes. Moreover, cross-level misalignment can arise when relevant governance processes at different levels are not aligned, hindering a smooth governance process (Termeer and Dewulf, 2014).

C. Plurality - the failure to recognise heterogeneity in the way scales and levels are perceived and valued by actors at different levels: there is no single best description for a problem or solution that applies to the whole system or to all actors involved (Cash et al., 2006). Depending on their interests, different actors may highlight different aspects of a problem as the most relevant and focus on different levels at which a problem manifests itself (Folke et al., 2005). Framing an issue as a local, regional, national or global problem can lead to conflicting perspectives and may drive processes of actor inclusion and exclusion in finding solutions (van Lieshout

et al., 2011). Frames can cause certain scale levels to become dominant while others are made less important, placing certain actors who are located at the 'right' level at the centre of authority to offer the solution (Cash et al., 2006; Cash and Moser, 2000).

Although scales and levels may be considered as a reflection of reality, multiple scholars claim that scales and levels are human constructs that are constantly reconstructed in the interface of science, society and politics (Buizer et al., 2011; Kurtz, 2003). The choice of actors to focus on particular scale levels can be strongly linked with political issues (Cash et al., 2006).

3.3 Methods

In this section, we elaborate on the Ethiopian land degradation and restoration context, and then focus on the two landscapes where we studied the implementation of restoration efforts. We continue with an overview of the data collection and data analysis process.

3.3.1 National context

The Ethiopian highlands fall within the Eastern Afromontane biodiversity hotspot (Mittermeier et al., 2011), which can be divided into moist and dry parts. In these highlands, however, historic agricultural expansion, overgrazing, fuelwood collection, and more recently large agriculture investments have led to ongoing processes of deforestation, forest degradation, soil erosion and loss of fertility (Hurni et al., 2015; Lemenih and Kassa, 2014; MEFCC, 2018b). Virtually all land use changes in the highlands have been unidirectional, from natural forest and grassland landscapes to human-managed farmlands, exotic tree plantations and human settlements (Providoli et al., 2019). Land conversion has been driven by a reliance of nearly 83% of the population on subsistence farming and livestock , coupled with increasing population pressure. Land degradation is no longer a mere local problem, but threatens food security and impacts water quantity and quality downstream. According to a recent inventory, a total of 82 Mha in Ethiopia was assessed to have potential for tree-based landscape restoration, including 88% of Amhara region and 73% of the Southern Nations Nationalities and People's (SNNP) region (MEFCC, 2018a).

The federal government has been pursuing sustainable land management efforts for decades in response to the widespread drought and famine of the 1970s and 1980s, which were believed to be largely caused by land degradation (Lemenih and Kassa, 2014; Providoli et al., 2019). Efforts have been concentrated in Ethiopia's highlands where population density is highest and forest and land degradation most severe

(Kassa, 2018). The Ministry of Agriculture (MoA) and the Environment, Forest and Climate Change Commission (EFCCC) play central roles in state-led restoration initiatives. Following a federal system since 1995 (Gebrewold, 2016), Regional States have the power to plan and implement their own development activities within the framework of federal policies and proclamations (MEFCC, 2018b). Agencies at the regional state level are responsible for implementing restoration policy targets and manage land and natural resources, while zones, *woredas* and *kebeles* are all responsible for doing their part in the implementation process. At the *kebele* level, sustainable land management efforts are coordinated by MoA-employed development agents who provide extension services. The agents are mobilising rural community members, who are expected to provide 25–40 days of free labour in the dry season to carry out public works including soil and water conservation and tree planting (Lemenih and Kassa, 2014; MEFCC, 2018b).

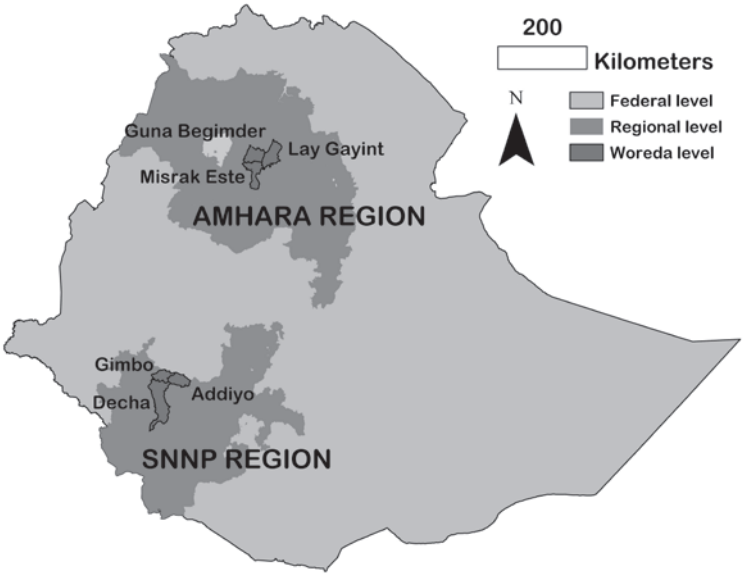
Over the years, the federal government's long-term commitment to sustainable land management has mobilised major investments from multilateral and bilateral development partners (Agostini et al., 2017; Providoli et al., 2019). Initiatives that have supported restoration efforts that are MoA-led have included the World Food Programme-funded MERET project, which later informed the Productive Safety Net Programme (PSNP) and the Sustainable Land Management Programme (SLMP), both of which are funded by the World Bank, GEF and other partners (MEFCC, 2018b). Current efforts are the World Bank's Resilient Landscapes and Livelihoods (RLLP) and Climate Action through Landscape Management (CALM) programmes that both started in 2019. Large restoration efforts that are EFCCC-led are the Norway-funded REDD Investment Plan and Sweden-funded National Forest Sector Development Programme (NFSDP) (MEFCC, 2018b). In recent years, more visibility has been given to planting trees. This is illustrated by the campaign to plant 4 billion trees announced in 2019 by Prime Minister Abiy Ahmed and which was followed by the planting of 5 billion trees in 2020, as part of the government's Green Legacy Campaign to plant a total of 20 billion tree seedlings in four years.

3.3.2 Landscape case studies

To analyse the cross-scale and cross-level challenges occurring in Ethiopian FLR governance, we base our results on two landscape case studies: the Kafa Biosphere, where the study of Gimbo, Decha and Addiyo *woredas* provided insight into the implementation of participatory forest management, and the Mount Guna Community Conservation Area where the study of the Lay Gayint, Guna Begimder and Misrak Estie *woredas* that surround Mount Guna provided insight into the implementation of a large area enclosure (*Map 3.1* and *Figure 3.2*). We identified landscapes in which restoration efforts had been conducted for a number of years and which could provide

a thick description of the cross-scale and cross-level interactions that take place as part of FLR governance. Given the lack of documentation of FLR governance processes in the scientific and gray literature, key informants at the national level were important to identify suitable landscapes. While some were not accessible at the time of fieldwork due to the volatile security situation (e.g. Bale Mountains), others had already received some research attention (e.g. Abreha We Atsbeha in Tigray and Humbo in SNNP region). Mount Guna and Kafa Biosphere reserve were selected because they provided a rich governance context with multiple restoration-oriented actors, which had still not been studied.

▪ *Kafa Biosphere*: The Kafa Biosphere Reserve is located in Kafa Zone of SNNP Regional State. Located between 500 and 3,350 metres above sea level, the reserve is home to large areas of Ethiopia's moist evergreen montane forests, bamboo thickets and wetlands (Bender-Kaphengst, 2011) that make it an important freshwater source. The region is considered the origin of *Coffea arabica* and is still home to many wild coffee varieties. Although it was little affected until the 1970s, large areas of the landscape have been disturbed and fragmented as a result of excessive logging and forest conversion to smallholder farming, pastures and commercial plantations over the decades (MEFCC, 2018b). The creation of a UNESCO Biosphere Reserve in 2010, at



Map 3.1 Location of the studied districts (*woredas*) in Ethiopia. (source: elaborated by the authors, with geographical data from WLRC).

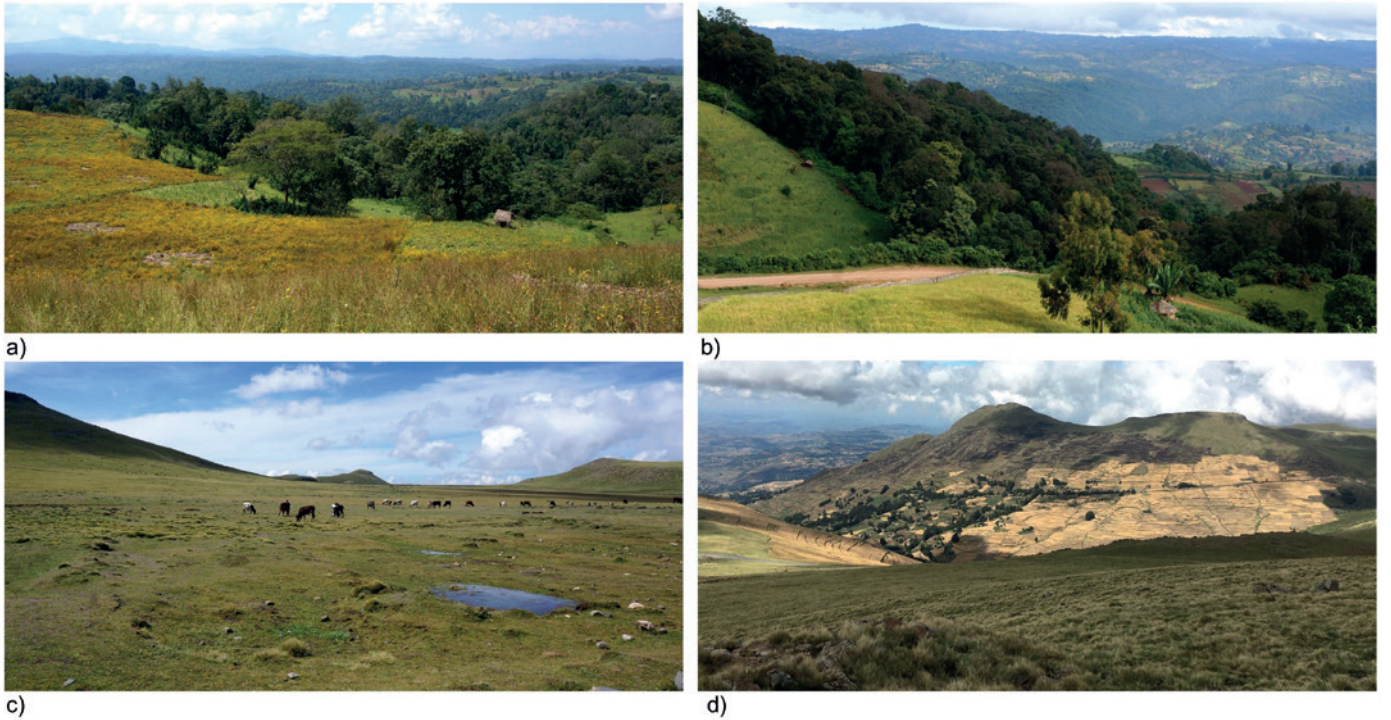


Figure 3.2 Forest remnants in *Kafa*'s Gimbo (a) and Addiyo (b) *woredas*, and livestock herding and crop cultivation in *Mount Guna*'s Guna Begimder (c) and Misrak Estie (d) *woredas*.

the urging of German CSO NABU, has created opportunities to conserve the remaining coffee forests and promote sustainable development in Kafa. Participatory forest management is currently an important mechanism to conserve and restore degraded forests in this southwestern part of the country.

- *Mount Guna*: The Mount Guna Community Conservation Area is located in the South Gondar Zone of Amhara Regional State. The conservation area, which extends between 3,200 and 4,113 metres above sea level, contains natural afro-alpine grasslands and tree species that provide important water regulation functions to the Tekeze and Blue Nile basins and the sub-basin of Lake Tana (BoCTPD & ORDA, 2012). Overgrazing and agricultural expansion have put Guna's grasslands under increasing pressure in recent decades. The 4,615 ha Community Conservation Area was demarcated in 2013 and closed in two separate phases, as part of the IFAD-funded Community-Based Integrated Natural Resources Management Project in Lake Tana Watershed (2010-2017) (Gebrewold, 2016). This project aimed to contribute to the eradication of poverty, and to realise carbon sequestration, biodiversity and water regulation benefits by improving ecosystem integrity.

3.3.3 Data collection

We reviewed policy and project documents and conducted interviews and focus group discussions. First, a screening was made of policy documents (FDRE, 2016, 2011) as well as project reports that focus on restoration in the *Kafa Biosphere* landscape (e.g. Bender-Kaphengst 2011) and *Mount Guna* landscape (e.g. BoCTPD & ORDA 2012). To get an idea of the regulations and strategies used to guide restoration efforts, the documents were reviewed for their reference to restoration in order to understand the landscape context and inform the semi-structured interview checklists.

Second, between October and December 2019, 56 semi-structured interviews, 14 focus group discussions and field observations were conducted by an independent research team consisting of a Dutch and Ethiopian national, who have no links with organisations that carry out restoration efforts in Ethiopia and no previous experience in the two case study landscapes. *Figure 3.3* shows all the interviewed actors and their positions in the case study. For the interviews, we used a purposive sampling strategy to identify relevant actors. The decision to interview an individual was based on our judgement of the individual's central role in FLR governance processes at the federal, regional, zone and *woreda* level, or restoration efforts in the two landscapes. For the focus groups discussions, we conducted a focus group discussion with *woreda*-employed environmental and natural resource management experts in each of the six studied *woredas*. Furthermore, we conducted a focus group discussion with members of natural resource user groups in each *woreda*. In Kafa Zone, these were participatory forest management groups, and in the South Gonder Zone these were grassland

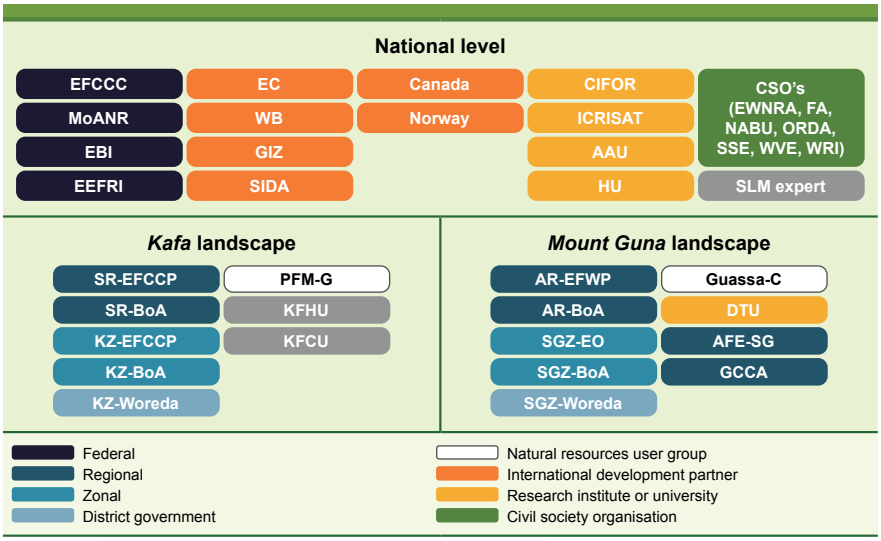
(Guassa) committees. The groups and their members were identified with the help of a forest management expert in Kafa Zone, and the Mount Guna Community Conservation Area office in South Gonder Zone. There is no overlap between the individuals that were interviewed as part of this research, and those that participated in the focus group discussions. The aim of the focus group discussions was to gain insight into these groups' interactions with higher-level restoration actors, such as the government and CSOs, and the challenges they face. No explicit attention was paid to variation in opinions between specific group members.

To allow for frank discussion and to guarantee confidentiality, we have made sure that experiences and perspectives do not refer to individuals but to organisations. *Figure 3.3* lists all institutional abbreviations used to support evidence. In view of existing sensitivities, civil society organisations have been further anonymised, so that perceptions cannot be traced back to a specific organisation. In cases where one individual from an organisation was interviewed, only that organisation's abbreviation is used, while in cases where multiple individuals from the same organisation were interviewed, a specific number is added to the abbreviation. For example, EFCCC5 refers to the fifth interview with an official of the *Environment, Forest and Climate Change Commission* and LCSO2.2 refers to the second interview with an employee of a Local Civil Society Organisation, which was coded '2'. *Figure 3.3* shows civil society organisations that were interviewed, in alphabetical order.

Interview topics included restoration tasks and responsibilities, drivers to restore, policy and project implementation mechanisms, cross-level and cross-sector interaction, land use planning, and the links between restoration and rural livelihoods. The semi-structured nature of the checklist provided sufficient width and openness to discuss other cross-scale and cross-level issues that were considered important by interviewees. An individual was asked certain questions only when the interviewer deemed them appropriate, and specific questions were added to clarify actor-specific restoration issues.

3.3.4 Data analysis

We simultaneously collected and analysed the data so that the interviews could increasingly focus on the most interesting and relevant issues that emerged at each specific governance level (Charmaz, 1996). Our reflection on previous answers influenced the questions from the interview checklist that were asked to subsequent interviewees. Interviews were recorded and fully transcribed to create a thick description (Geertz, 1973) of FLR governance context as observed by actors within the Ethiopian FLR community of practice. All interviews and focus groups that were conducted in Amharic, were transcribed in English by an Amharic native speaker



AAU	Addis Ababa University
AFE-SG	Amhara Forest Enterprise, South Gonder branch
AR- BoA	Amhara Region Bureau of Agriculture
AR-EFWP	Amhara Region Environment, Forest and Wildlife Protection Authority
Canada	Canadian Embassy
CIFOR	Centre for International Forestry Research
CSO	Civil society organisation
DTU	Debre Tabor University
EBI	Ethiopian Biodiversity Institute
EC	European Commission
EEFRI	Ethiopian Environment and Forest Research Institute
EFCCC	Environment, Forest and Climate Change Commission
EWNRA	Ethio Wetlands and Natural Resources Association
FA	Farm Africa
GCCA	Guna Community Conservation Area office
GIZ	German Society for International Cooperation
Guassa-C	Guassa Committee members from communities of the Estie, Guna Begimder and Lay Gayint districts of South Gonder Zone
HU	Hawassa University
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICSO	International civil society organisation
KZ- BoA	Kafa Zone Bureau of Agriculture
KZ-EFCCP	Kafa Zone Environment, Forest and Climate Change Protection Authority
KZ-Woreda	Environment and NRM experts of the Adiyo, Decha and Gimbo districts of Kafa Zone
KFCU	Kafa Forest Coffee Farmers Cooperative Union
KFHU	Kafa Forest Honey Producers Cooperative Union
LCSO	Local civil society organisation
MoANR	Ministry of Agriculture and Natural Resources
NABU	German Nature and Biodiversity Conservation Union
Norway	Norwegian Embassy
ORDA	Organisation for Rehabilitation and Development in Amhara
PFM-G	Participatory Forest Management Group members from communities of the Adiyo, Decha and Gimbo districts of Kafa Zone
SGZ-BoA	South Gonder Zone Bureau of Agriculture
SGZ-EO	South Gonder Zone Environment Office
SGZ-Woreda	Environment and NRM experts of the Estie, Guna Begimder and Lay Gayint districts of South Gonder Zone
SIDA	Swedish International Development Cooperation Agency
SNNPR	Southern Nations, Nationalities and People's Region
SR- BoA	SNNP Region Bureau of Agriculture
SR-EFCCP	SNNP Region Environment, Forest and Climate Change Protection Authority
SSE	SOS Sahel Ethiopia
WB	World Bank
WRI	World Resources Institute
WVE	World Vision Ethiopia

Figure 3.3 Interviewed actors, their position in the case study, characteristics, and abbreviations

with a good command of English. We inductively and cross-sectionally coded all interview and focus group transcripts using ATLAS.ti software. We used *scales*, *levels* and their temporal and spatial dimensions as sensitizing concepts to focus on cross-scale and cross-level interactions emerging from the data (Bowen, 2006; Charmaz, 1996).

We followed the path of analytical progression (Miles and Huberman, 1994) in which we first tried to clarify the actors and processes that make up the FLR governance context in Ethiopia, then analysed the characteristics of cross-scale and cross-level interactions, and finally elaborated the cross-scale and cross-level challenges that arise from these interactions. Data were condensed, clustered, sorted and linked (Miles and Huberman, 1994; Tesch, 1990) as different leads were followed in the data. Data segments were sorted, compared and re-categorised as necessary until a good fit between the data and the organising system was found. The specific content of data segments helped to further refine each category. Codes evolved from general governance characteristics such as project focus, unclear land tenure and lack of alternative livelihoods, until the final cross-scale and cross-level challenge categories were identified. As such, defining the categories was in itself a 'scholarly achievement' (Tesch, 1990). We use detailed interview quotes to strengthen the analysis of the different challenges, keep the human story in the forefront and make the analysis more accessible to a wider audience (Charmaz, 1996). In addition, when an argument is made in the results, we list all interviewees highlighting the specific argument, providing transparency about how broadly an argument is supported and by whom (Bazeley, 2009). We provide a detailed overview of the cross-scale and cross-level challenges that exist in Ethiopian FLR governance, which can be further refined and updated by other researchers (Charmaz, 1996).

3.4 Results

We took the temporal and spatial dimensions of the ecological and governance scales as a lens through which to detect cross-scale and cross-level challenges (Cash et al., 2006) in Ethiopia's FLR governance context. Before turning to the challenges however, it is important to give attention to two overarching issues that do not transcend scales and levels but that affect most cross-scale and cross-level interactions. First, the fact that poverty alleviation and food security have dominated Ethiopia's political agenda for decades (MEFCC, 2018b) has meant that sustainable land management efforts are strongly focused on increasing land productivity. This has diverted attention from a wider range of ecosystem functions and natural ecosystems. Second, important criteria determining the allocation of federal budget are population size and agricultural

land surface [ICSO5.1]. As a result, regions with more forest and thus lower population density, smaller farmland, and fewer livestock receive less federal budget [GIZ7]. Nevertheless, restoration potential is mainly found in areas with a lower population density. The fact that the budget allocation does not take into account the restoration potential may make it more difficult to achieve the restoration targets [CIFOR]. In general, there is a disconnect between the national restoration targets and the public resources available locally for sustainable forest management and area enclosure. Financial resources coming from higher levels are often just enough to cover civil servants' salaries, transportation costs and stationary expenses, leaving little for the implementation of restoration efforts [KZ-Woreda1, SGZ-Woreda1, SGZ-Woreda2]. This lack of funding is particularly problematic in *woredas* where international development projects are not being implemented or planned.

Turning to the theoretical focus of this article, we identified five cross-scale or cross-level challenges (SC) related to the implementation of FLR efforts in the *Kafa Biosphere* and/or *Mount Guna* landscapes (*table 3.1*). We provide a background analysis with evidence from the interviews and focus group discussions conducted at the federal, regional, zone, *woreda* and *kebele* levels.

Table 3.1 Overview of identified cross-scale and cross-level challenges and their scale challenge type

	Challenge	Description	Type (Cash et al. 2006)
SC1	Short-term tree planting campaigns and quota mismatch with long-term restoration timelines.	The fact that government actors only pay short-term attention to tree planting to meet restoration targets means that the temporal reach of governance processes does not fit the temporal reach of restoration processes. A lack of proper planting preparation and post-planting management has resulted in ineffective and unsustainable tree planting efforts.	B) Temporal mismatch between the governance scale and ecological scale
SC2	Planning horizons of restoration-related international development projects mismatch with long-term restoration timelines.	The heavy reliance of the government and civil society on short-term international development funds has compromised the sustainability of local governance arrangements that seek to sustain local restoration efforts and has resulted in stand-alone restoration efforts that neither build on previous projects nor create synergy with other projects at the local level.	B) Temporal mismatch between the governance scale and ecological scale

Table 3.1 Continued

	Challenge	Description	Type (Cash et al. 2006)
SC3	Federal and international budget allocation for alternative livelihoods mismatches with sustained local restoration processes	The federal government and international development partners have not allocated sufficient budget to create robust alternative local livelihoods to ensure sustained coexistence of rural communities with restoration-oriented land use and land management changes. However, local restoration processes are much more difficult to sustain without support from the rural communities.	B) Temporal mismatch between the governance scale and ecological scale
SC4	Federal forest and land policies have not created secure land tenure conditions to promote local restoration efforts	The general tendency of rural communities to simply use the land without efforts to conserve and improve the natural resource base has been attributed to communities not experiencing ownership over their lands and not being convinced that they will reap benefits of restoration efforts. The federal government has paid too little attention to addressing the negative effects that unclear land titles have on local efforts to maintain and restore communal forest and grassland.	A) Failure to recognise important interactions between federal and local governance levels
SC5	Misalignment of the forest and landscape restoration portfolio in the cascading government structure	Misalignment of forest and landscape restoration-related responsibilities between the environmental and agricultural agencies at the federal, regional and *woreda* levels has resulted in the ineffective implementation of restoration efforts. The mandate of environmental agencies at the regional level has not been streamlined to the federal structure, and the incomplete institutionalisation of environmental agencies at the *kebele* level has made it difficult to support forest-related activities at the community level.	B) Misalignment between federal and local governance levels

3.4.1 Short-term tree planting campaigns and quota mismatch with long-term restoration timelines

Lack of planting preparation: Tree planting efforts have been undertaken in Ethiopia for over four decades, and have received particular attention since the beginning of the Ethiopian Millennium in 2007. Since 2015, the federal government's attention has been set on reforesting an annual 1 Mha to meet the GTP II targets [EC2]. Over the years, however, federal attention for tree planting has usually only arisen during the tree planting season, and has not been preceded by proper preparation, nor by a clear strategy regarding identifying the exact locations where restoration targets can be achieved at the long term [AAU, SIDA]. "The tree planting campaign actually started twelve years ago with the Ethiopian millennium. Where are those twelve year old plantations now? For me, I wonder whether planting trees has not become a ritual exercise to show everyone we are committed, while we are not really seriously committed" [CIFOR].

The 2019 Green Legacy tree planting campaign, which has reportedly planted 4 billion trees, is an example of the short-term focus given to achieve policy targets [LCSO1, ICSO5.3, SR-EFCCP2]. The campaign was announced just months before the rainy season started [GIZ1, AAU] and the planting was done in late July, instead of early June, when the rainy season starts. This timeline did not give the planted seedlings sufficient time to grow and prepare for moisture stress during the dry season from September onward. "The Green Legacy campaign is an interesting one, but the issue emerged during April or May. It should have emerged starting in August last year" [SR-EFCCP2]. The eagerness of the federal and regional governments to meet the annual tree planting quota led to the planting of tree seedlings that did not reach the correct size and strength, just to count them as part of the ambitious quota. "The problem is that [nurseries] may not get the seed at the right time. [...] With delayed sowing you have weaker seedlings or seedlings that need to be kept in the nursery for the next planting season. But they don't keep those in the nurseries, they take them out and plant them anyway" [EEFRI].

Wanting to meet quota in a context of financial scarcity has also meant that local governments lack the resources to grow quality seedlings that have good chances of survival. An EEFRI inventory of 540 nurseries in Tigray, Amhara, Oromia and SNNP regions found that about half of the tree seedlings were bare-rooted, which means "you cannot really have success stories in the rehabilitation of degraded sites" [EEFRI]. "Currently we are using bare root seedlings, not potted seedlings. [...] Imagine what happens when you plant. The majority will die!" [EFCCC7].

Lack of post-planting management: The attention given to meet tree planting quota is in stark contrast to the attention and budget for follow-up after tree planting to ensure that planted seedlings grow into mature trees through maintenance efforts and by protecting them from free-ranging livestock [EEFRI]. For many federal and regional authorities "raising and planting the seedlings is like reaching the end goal" [AAU]. At the local level, too, little attention is paid to formulating management plans that guarantee long-term restoration gains [EFCCC4, EFCCC5, GIZ4, GIZ6, HU]. "If you are planning to plant in a given site there should be a purpose and follow-up management plan. But the focus is just to put the seedlings into the soil" [GIZ6]. "Tree planting is a one-time campaign for the government. Once trees are planted through mobilisation [of communities] there is no management and follow up from the government" [SGZ-Woreda2].

Rather than focusing on post-planting management, which is barely monitored by actors at higher governance levels, it has turned out more urgent for local governments to meet the tree planting quota, at least on paper, in order to satisfy the regional and federal government levels. "If you see their report, it is number of seedlings raised by type, then the number of seedlings planted, and then they indicate plan achievement in percentage. 60, 90 or 99% achieved! [...] no mentioning of the quality, how is the sustainability, whether the seedlings planted are really surviving" [AAU]. "If you really reported the reality against the quota you would be completely penalised, and everybody was adding zeros" [AAU]. With zone and *woreda* governments being pressed to meet unrealistically high and ill-informed tree planting quota [EEFRI], a dissonance arose between the numbers reported and what is being achieved and sustained within each jurisdiction [AREFWP1, WB3, LCSO2.2]. "If you drive around the region, even now, almost 80% of the landscape is not treated. And yet the report shows that it is 100% treated. That is the major challenge" [AAU].

3.4.2 Planning horizons of restoration-related international development projects mismatch with long-term restoration timelines

Short-term planning horizons: Unrealistically short planning horizons of restoration projects, usually of three to five years, and even shorter effective implementation periods, have put pressure on implementing actors to rush the process of creating local governance arrangements that seek to promote and sustain restoration processes [LCSO2.1, SR-EFCCP4].

For example, the short-term nature of CSO projects in *Kafa* caused a rush to establish participatory forest management groups, while creating such governance arrangements involves going through a social process of participatory forest boundary delineation,

and forest resource assessment and management plan preparation that requires repeated community discussions, training and convincing [LCSO1]. When such a process is rushed, the likelihood of failure at a later stage increase, for example when rural communities turn out to not fully understand or feel committed to the process [ISCO5.3]. "If you did quality work, the participatory forest management group can sustain, but if you rush things [...] and if you copy a management plan from another cooperative and simply collect signatures, it will fail in a short period of time. It needs time, especially to convince the community and create good understanding" [GIZ7].

Likewise, the planning schedules of donor-funded government projects do not take into account the challenges and delays associated with community work. "The REDD+ project has a project life of three years. As per the plan we had to establish the groups in the first quarter of the project period. However, only the resource assessment took us eight months until now. [...] we are way behind the original schedule and are currently going to the fourth quarter" [KZ-Woreda3]. Most CSOs in the *Kafa Biosphere* phased out immediately after the participatory forest management groups were created and protection, development and utilisation plans were developed, but before these plans could be implemented and groups were upgraded into cooperatives [KZ-Woreda1, KZ-Woreda2]. The standard exit strategy of CSOs has been to hand over responsibility for the groups to involved local governments or rural communities [KZ-EFCCP, KZ-Woreda2]. However, *woreda* follow-up and support to participatory forest management groups in *Kafa* has been limited [PFM-G1, PFM-G2] due to a lack of logistics, finance and skilled manpower [KZ-EFCCP, KZ-Woreda1, ICSO4, GIZ7].

Previous restoration efforts at *Mount Guna* also show that more time was needed to develop and strengthen newly introduced value chains that make restoration efforts viable in the long term [LCSO2.2]. When access the Community Conservation Area was restricted, the IFAD project organised the young people in the *woredas* surrounding the enclosure to work on alternative livelihoods (bamboo products, beekeeping and animal fattening) with the aim of reducing livestock pressure on the afro-alpine grasslands [LCSO2.1]. However, the project phased out and was handed over to the *woredas* and rural communities before IFAD could upgrade the youth groups into cooperatives. Subsequently, the benefits received by group members turned out to be too small to sustain the groups and complete the upgrade process without external support, as the group members switched to other income-generating activities. "The organised groups and associations are all gone now. They used to get incentives from IFAD, but the government was incapable to continue this. No one knows what happened to the equipment provided to the youth for bamboo processing. The project was not sustainable as it was a short-lived one" [SGZ-Woreda1]. Likewise, the creation of tourism facilities took much longer than the four to five year support that the IFAD project could provide [LCSO2.1].

Stand-alone restoration efforts: A heavy reliance on international development partners who define their own FLR objectives and workplans at higher level, and disburse funding to geographically-scattered locations [ICSO2, KZ-Woreda3, DTU] has led to little focus on building on past efforts and create synergy with other restoration efforts at the local level. "There is a thinking of 'our money' rather than thinking with a broader, comprehensive outcome at the local, national and international level" [ISCO5.3].

Public authorities and CSOs in *Kafa* wanted to leave their own mark and did so by establishing their own participatory forest management groups [ISCO5.3] or their own value chain activities rather than focusing on strengthening existing ones. "To fulfil standards of the international market is not easy. A lot of projects come with this idea. They provide training or something like that, but the real gap is fulfilling material needs and satisfying the international buyers with the right quality standard" [GIZ7]. Meanwhile, many participatory forest management groups established by previous projects have not yet reached the self-sustenance stage, nor are they strongly connected to non-timber forest product value chains.

With international development funds that are managed at the zonal government level, *woreda* governments in *Kafa* have not always had the flexibility to work on activities they feel are the most relevant to provide continuity to earlier restoration efforts or in places of their jurisdiction where they experience the greatest restoration-related needs [KZWoreda2, KZ-Woreda3]. "Most of the projects that come here have their own programme and tagged budget. This is a challenge for us if we want to respond to new developments and be flexible. The REDD+ project is funding activities in areas where little or no action is required while denying budget to other areas where much work is needed" [KZ-Woreda2].

In *Mount Guna*, several projects have undertaken similar capacity building activities to stimulate ecotourism without building on each other. "[Mount Guna] attracts many stakeholders, but they implement individually. [...] If they just integrate and work together, the amount of budget that they invest in the mountain may change the real situation of the area" [DTU]. For example, three different projects took one community leader on an experience sharing and awareness visit to another community conservation area. "He said 'okay, I am well aware about the importance of conservation. I have seen the effective conservation of Menz Guassa. Then, what shall I do? There should be some organisation who can help us to go directly to the activity'" [DTU]. In addition to an experience sharing visit, there was also a need to build ecotourism facilities on Mount Guna, such as a small restaurant and lodge, so that tourists can actually stay. However, as a result of stand-alone restoration efforts that do not build on previous

efforts, resources were repeatedly spent on experience-sharing visits, while no resources and technical assistance were devoted to building ecotourism facilities, which are still absent. The duplication of efforts, without implementing concrete activities on Mount Guna, ultimately failed to make ecotourism a reality, in order to help sustain restoration processes [GCCA2].

3.4.3 Federal and international budget allocation for alternative livelihoods mismatches with sustained local restoration processes

Livelihood benefits from participatory forest management: Public and civil society actors in *Kafa* have mainly focused on placing more forests under participatory forest management, as donor funding is mostly directed toward building forest management capacity in rural communities and developing management plans. Only limited financial, expert and material support have been provided to secure the benefits that participatory forest management groups derive from the forest by improving the quality and marketing of non-timber forest products such as coffee, honey and spices [LCSO1, GIZ7, ISCO5.3, KFHU]. However, shortly after participatory forest management efforts began, it became apparent that the benefits communities were getting from their sustainably managed forest were insufficient to compensate them for their forest management work and for the lost income opportunities of communities for not extracting timber products or converting the forest to other uses [PFM-G2, ICSO3, GIZ5, KZ-EFCCP, SR-EFCCP1, EFCCC4]. "We talk only about the carbon gains we make, not about the economic benefits that farmers lose. By degrading you get something. You have to make clear there is a cost. Who is going to bear that cost?" [CIFOR].

It has been indicated that forest benefits for participatory forest management groups are lower than expected, for example because groups are not allowed to replace fallen or old coffee stands in the forest with new seedlings [PFM-G2] and because groups had expected to receive REDD+ funds for better management of their forest. "As to the success [of participatory forest management] I have a big reservation because the communities are not yet generating enough income from the sector to keep on protecting the area. There is a big expectation. You live with expectation for a limited period of time" [HU].

Local governments currently do not specifically support forest management groups, neither in terms of expertise nor materials [PFM-G3, KFCU]. "It would have been great if the *woreda* supports us. We can say that we are clapping with one hand. It is the participatory forest management committee alone that is making efforts" [PFM-G3]. While CSOs such as Farm Africa, SOS Sahel and GIZ have made efforts to

strengthen non-timber forest product-based livelihoods, for example through the establishment of the forest coffee union, the forest honey producers union and the creation of value chains related to spices [ICSO5.2, KZ-EFCCP], they have faced a lot of funding problems in getting the quality of forest products up to export standards [GIZ7]. The feeling that alternative livelihood support is not receiving the necessary attention is problematic, given the increasing challenges posed by *Kafa*'s unemployed, landless youth, who are clearing the forest out of need to grow crops and earn a living [GIZ7, KZ-Woreda2].

Livelihood benefits from area enclosure: Also around *Mount* Guna, insufficient attention has been observed for the livelihood implications of past restoration efforts. When the 4,615 ha Community Conservation Area was declared and closed in 2013 to protect its important water sources, Guna was the main forage source for the livestock of more than 20,000 households in the area [DTU, SGZ-Woreda3]. Traditionally, farmers let their livestock graze freely on Guna's grasslands for three months, when the crop growing season would start in September. After the harvest in November, the cattle would be returned to the community. While surrounding communities agreed to delineate Guna's high-altitude, afro-alpine areas where frost conditions make it difficult to herd livestock anyway [Guassa-C1], the second delineation of Guna's lower-lying areas met fierce and violent community opposition [Guassa-C2, Guassa-C3, GCCA1]. "The upper part of Guna was delineated. What we saw within two years was a dramatic change. [...] We entered the Guassa [grassland] and could not find our way back because of the tall grasses. Walking on the top of the mountain was like walking on a sponge. Then came the second delineation and the whole thing went wrong. They wanted to extend the boundaries up to our doorsteps" [Guassa-C1].

The second delineation left no space on the mountain for livestock to stay during the growing season, with farmers being told not to go beyond the delineation year-round. At the same time, they were only allowed to use a cut-and-carry system to collect fodder from the mountain once every two years, which did not provide enough fodder for the livestock. For the communities, however, livestock is an important source of income and livelihood insurance when potato and barley harvests fail. A lack of livelihood alternatives fueled the conflict between the regional government and local livestock herders [GCCA1, GIZ6]. "Experts at the time failed to recognise this problem. They wanted ecology to be the focus, but on what do the farmers depend for their livelihood? The farmers said 'where shall we go? Unless you [...] create alternative livelihood options, we will not agree'" [AR-BoA].

The lower parts of Mount Guna were closed before the benefits of protecting the upper part could be seen, and before suitable alternative livelihoods, infrastructure to improve market links, or compensation payments were made for not using *Mount Guna* [Guassa-C1, Guassa-C3]. Since the enclosure of Guna, awareness raising sessions and experience sharing visits have been organised by different government authorities and a number of CSOs and universities to convince communities of the importance of protecting Mount Guna [GCCA1, AR-EFWP2]. "Several awareness raising and training sessions, and experience sharing missions were organized for influential people on the issue of Guna. [...] none of these efforts were fruitful. [...] Farmers should be provided with alternative livelihood options so that they are able to reduce their livestock number" [SGZ-Woreda2]. Awareness raising has had limited success as it has not been accompanied by initiatives to provide alternative feed sources and alternative livelihoods for community members who rely heavily on the mountain for fodder, despite the promise to receive these [SGZ-Woreda1, Guassa-C2]. "When the idea of delineating Guna first came, farmers were told that a road will be constructed, lodges build, and jobs created in the area. None of these materialised during the years that Guna remained protected. This caused resentment among farmers" [SGZ-Woreda2]. While some farmers received alternative grass species for animal feed from the zonal and *woreda* governments, the demand for fodder far outstripped the forage yield of the supplied species [Guassa-C2].

3.4.4 Federal forest and land policies have not created secure land tenure conditions to promote local restoration efforts

Use rights instead of ownership: Since the military regime nationalised all rural land in 1975, successive governments have kept all land under state ownership to prevent the concentration of land into the hands of a few (Gebrewold, 2016). The government feared that such a concentration would lead to the eviction of poor farmers, greater landlessness and rural-urban migration. To guarantee access to land, the federal constitution states that every Ethiopian peasant has the right to obtain land without payment (Gebrewold, 2016). This has been provided by periodic redistribution of land to landless people, after which farmers have user rights over their land. Such redistribution of land has taken place until the early 2000s. However, "even if this rotation stopped years ago, practically it is still in place. If you have some political complaints and are not aligned then the *woreda* administrator can take the land" [EC2].

The fact that rural communities have only had user rights and lack secure ownership of their private and communal lands has negatively impacted government-led restoration efforts. User rights alone have left community members reluctant to invest in their land and enforce local rules to ensure that communal lands are not

degraded. As a result, public efforts to reduce land degradation have had limited success (Cronkleton et al., 2017), despite successive governments launching massive soil conservation programmes and tree planting campaigns to this end (e.g. PSNP, SLMP and more recently REDD+ and NFSDP). "The government is currently going in a direction where there is very limited ownership. [...] establishing forests might not be possible because nobody thinks that they belong to them or nobody believes that, after some time, those people who restored can have a monetary return from the resource. [...] If that is not guaranteed I don't think community mobilisation work will have a big contribution towards achieving [restoration] commitments" [GIZ1].

The general tendency of rural communities to use land without efforts to sustain and further improve the natural resource base [WB3] is not attributed to a lack of awareness but to rural communities not experiencing ownership over their lands [AREFWP1, HU, GIZ1, SGZ]. "Poor survival rates are a major problem. That has a lot to do with land tenure, because people don't care about whether an animal gets into the planted area and destroys plants" [EFCCC5]. With clear ownership or utilisation agreements being absent, rural communities are not convinced they can reap the long-term benefits of restoration efforts, resulting in a lack of maintenance of planted trees and soil and water conservation structures [SGZ, CIFOR]. "They construct physical soil and water conservation structures in January and then they demolish them in June and July. They plant seedlings in June, but next December and January we will not see the planted seedlings" [AR-BoA]. "When we lose rehabilitated landscapes because we haven't determined who owns them, I don't think we should spend that much time in planting trees" [CIFOR].

The lack of policies guaranteeing secure land tenure has led to significant fear among rural communities that the land they depend on will be redistributed for other uses. In *Kafa*, the fear of losing access to the forest has had positive effects on the creation of restoration-oriented local governance arrangements, as it has motivated communities to organise in participatory forest management groups. "The main purpose of establishing the group was to save our forest from agriculture investments. Our fear was that we will not be able to utilize the forest once it is transferred to investors" [PFM-G1]. "People are worried that the government may come and give the forest to investors, so that there is nothing to inherit by their offspring" [ICSO5.1]. Although participatory forest management only gives user rights to communities and no forest ownership, groups see their forest's participatory forest management status as the best guarantee to maintain access to forest products and to ensure that their forest is not transferred to investors or destroyed through agricultural encroachment [GIZ7].

The rural communities around *Mount Guna* have the same fear of losing access to the grasslands on which they depend. Yet, no positive effects were observed in terms of creating restoration-oriented local governance arrangements. "Mistrust between farmers and the government arises from access to, and ownership, of Guna. Farmers have the suspicion that the government will stop them from herding their livestock on Guna" [Guassa-C2]. Farmers even refused alternative livelihood support from several development partners [DTU, GCCA1, Guassa-C2] as well as extension services from development agents [SGZ-Woreda2] thinking that the reason for support was to subsequently take away their rights to use Guna's grasslands.

Landlessness impeding sustainability of restoration efforts: Land scarcity, population growth and the termination of land redistribution policies have created a growing challenge related to landless youth [EEFRI, WB3, AR-BoA]. The landlessness of young community members, coupled with a lack of alternative livelihoods, has led to their reliance on communal forest or grassland resources. Charcoal production and livestock grazing have resulted in unsustainable exploitation rates, in addition to illegal conversion of forests and pastures into agricultural land [LCSO1, ICSO5.2]. Their reliance on communal lands has made it more difficult to find land for new restoration efforts and to sustain existing efforts [GIZ7, LCSO2.2, KZ-EFCC, KZ-Woreda2, PFM-G3, Guassa-C2]. "If you restore an area, and the landless and the youth do not get enough benefit in the watershed, the sustainability will be in question because they do not have land. Then they try to go and maximize their benefit in the communal lands, and destroy the area enclosure. [...] Especially the youth are now powerful everywhere, and the other members do not really have the power to convince them to maintain the watershed, because they do not benefit" [ICRISAT].

3.4.5 Misalignment of the forest and landscape restoration portfolio in the cascading government structure

Misalignment in the cascading federal structure: Ethiopia's federal structure has resulted in the misalignment of the FLR portfolio. Since regional states have the autonomy to shape their own governance arrangements, environmental agencies have not been uniformly replicated at the regional state level, nor have their mandates been streamlined to the federal structure. For example, in SNNP region, the Environment, Forest and Climate Change Protection (EFCCP) authority has set up its own structure down to the *woreda* level and is engaged in forestry efforts. However, in Amhara region, the Environment, Forest and Wildlife Protection Authority (EFWP) focuses on environmental protection and regulation, while the Amhara Bureau of Agriculture (BoA) is responsible for managing seedling production and mobilising communities to plant trees [ARBoA]. Despite its mere focus on regulation, the Amhara EFWP is still in the lead to implement internationally-funded forestry

projects that come from EFCCC at the federal level, including NFSDP. "Here at the regional level, what should be the role of our authority is unclear. In the context of Amhara region, we are not mandated to do afforestation. That is BoA. But there are projects like REDD+, NFSDP, Norwegian Forestry Group and others that are managed by our bureau. Regular afforestation activities, forest extension and watershed management are done by BoA. [...] now BoA says 'there are projects in your office. Why are they in the Environment bureau? They must have been in BoA'" [AR-EFWP2]. At the *woreda* level, Amhara's EFWP does not have an independent office but rather is a unit within the Land Administration & Use authority [SGZ], which is part of MoA at the federal level.

Incomplete institutionalisation: A major obstacle hindering the implementation of restoration efforts is that EFCCC does not have its own *kebele*-level extension services to provide in-depth forest management and forestry extension to communities [EFCCC6], including training on seed collection, raising seedlings, and planting, processing and selling trees [SIDA]. When the forestry mandate was still with MoA, development agents provided extension support to forest groups through training on forest conservation, development and utilisation [ICSO5.2]. However, after the split of the forest and agricultural authorities in 2013, the performance evaluation and promotion of development agents was no longer based on support for forest-related issues, but on support for increased crop production and soil and water conservation, resulting in little attention being given to forest-related activities [SR-EFCCP1, SGZ-Woreda1, ISCO5.2]. "Many of us prefer the old institutional structure over the new one. [...] The rate of forest destruction has increased since the new structure was introduced. The Natural Resource Management department does not give attention to forest-related issues as it responds to the agriculture office. We forwarded our complaints to the region time and again and the response we get is 'it is beyond our capacity'" [KZ-Woreda2].

Although environmental experts work at the zone and *woreda* level, it is logistically impossible for them to reach every *woreda* or *kebele* that falls within their mandate [SGZ, SGZ-Woreda1, GIZ5, ICSO5.2]. "In the *woreda* structure, only one expert is made responsible for the forest groups that are found in the *kebeles*, which are located at far distance from each other. It would be impossible for an individual to cover all the groups in the *woreda*" [KZ-Woreda2]. For example, in Kafa Zone, the lowest number of *kebeles* within one *woreda* is 22, all of which must be covered by one expert [ICSO5.3].

The absence of EFCCC-employed development agents has implications for restoration initiatives that are implemented by the environmental authority. EFCCC needs to make use of the MoA-employed development agents who are in charge of natural

resource management, which is not easy. "At the *kebele* level development agents are accountable to BoA. That is our problem. They are not accountable to us. So sometimes it is difficult to work with them" [SR-EFCCP3]. These development agents provide extension services to farmers on soil and water conservation in general, and have not received detailed training on forest management and forestry value chains [EFCCC4, EFCCC5, SIDA, SGZ-Woreda3]. Since these development agents are already over-burdened with agricultural extension duties, they do not have time to follow-up and ensure the survival of tree seedling. "I think it will be asking too much of agricultural experts to be in charge of forests. We see that forests are integrated as part of their annual working calendar, where they will be raising seedlings, planting them and then disappear. The experts go back to the harvesting and irrigation work, and no one takes care of the planted trees. As a result, there is planting year after year after year, but you don't see saplings" [CIFOR].

3.5 Discussion

In this section, we first discuss how the findings in Ethiopia relate to the cross-scale and cross-level challenges typology of Cash et al. (2006). We continue by comparing the findings with the results of other studies to determine the transferability of these challenges to other contexts. Subsequently, we reflect on the usefulness of the challenges typology and on what would be ways forward to deal with cross-scale and cross-level challenges.

3.5.1 Types of cross-scale and cross-level challenges identified

Cash et al. (2006) distinguished three types of cross-scale and cross-level challenges: A) the failure to recognise important scale and level interactions; B) the persistence of mismatches between scales and levels; and C) the failure to recognise heterogeneity in the way scales and levels are perceived and valued by actors at different levels.

We observed two of these three types in Ethiopia. First, SC1, SC2, SC3 and SC5 are examples of a type B challenge, with SC1-3 illustrating cross-scale mismatch between the governance scale and ecological scale. A temporal mismatch with the long-term character of restoration-oriented ecological processes can be seen in the short-term focus of governance actors on tree planting (SC1) and the short-term planning horizon of international development projects (SC2), both of which attempt to influence relevant ecological processes. Moreover, due to a lack of federal and international budget allocation for alternative livelihoods, sustained coexistence of rural communities with restoration-oriented land use and land management changes cannot be guaranteed in the long run (SC3). SC5 is also a type B example, but involves cross-level

misalignment rather than a cross-scale mismatch. Misalignment of the FLR portfolio between environmental and agricultural agencies has led to a cross-level misalignment in terms of restoration-relevant responsibilities and capacities along the multi-level government structure of authorities, preventing restoration efforts from being implemented effectively. Second, SC4 is a type A, cross-level misalignment challenge resulting from the failure to recognise important interactions between the federal and local governance levels. The federal government has paid too little attention to addressing the negative impact of federal forest and land policies on local restoration efforts, due to the policies' creation of insecure land tenure conditions. No type C heterogeneity challenge was identified in how actors at different governance levels perceive problems and solutions. While we found divergent views across the agricultural and environmental sectors as to which restoration benefits are most important and how they should be achieved, such heterogeneity was not found across governance levels. This does not mean that type C challenges do not exist in Ethiopian FLR governance and further research efforts could identify them. Still, they are not expected to be very prominent, compared to the type A and B challenges that we found.

The five challenges are a first exploration of the cross-scale and cross-level challenges that have emerged when implementing high-level restoration targets at the local level, and are not an exhaustive list of cross-scale and cross-level challenges in Ethiopian FLR governance. Additional research could further explore such challenges. More focus could be placed on the perception of different community-level subgroups regarding their relationship with higher-level actors. This would avoid a limitation that could arise when targeting only members of resource user groups directly involved in local restoration efforts, as was done in this study. In addition, further research with stronger ecological expertise is recommended to see if potential cross-scale challenges can be identified with respect to the tree species planted as part of FLR efforts and the tree species found in the natural ecosystem.

3.5.2 Comparison with other studies

Several studies provide evidence of similar challenges, indicating that the cross-scale and cross-level challenges we observed appear to be relevant to the Ethiopian highlands as a whole. Conducting research in two other Ethiopian regions, the Tigray and Oromia Regional States, Kassa et al. (2017) studied the strengths and weaknesses of participatory forest management and area enclosure. They found that community incentives to actively engage in participatory forest management and area enclosure were lacking due to land tenure insecurity on communal lands (similar to SC4). They also noted the extremely low economic benefits for rural communities to sustainably managed their forest, and an insufficient focus on income diversification accompanying

participatory forest management and area enclosure (similar to SC3). This was also described by Birhane et al. (2017) who found that communities recognise the regeneration of ecosystem functions after areas are closed, but such positive attitudes are increasingly being tested as bylaws for managing area enclosures place greater emphasis on protection than on use and better economic returns. Finally, Lemenih and Kassa (2014) noted that local governments approached communities with proposals for area enclosures, and instead of allowing proper community consultation, it was a rushed process as local governments had to meet quota in terms of hectares under enclosure, determined by high-level governments (similar to SC2). However, once the targets are met, follow-up and ownership by governments has been observed to be extremely low (Kassa et al., 2017) (similar to SC1). In this article, we clarified the cross-scale and cross-level interactions underlying the problems observed in other studies.

The cross-scale and cross-level challenges identified in this study show interesting similarities with the challenges identified as part of Ecuador's FLR governance context (Wiegant et al., 2020). These include a focus on short-term restoration results without sufficient attention for governance arrangements that fit the long-term nature of restoration processes. Both contexts also provide evidence that the short-term planning horizons of restoration-oriented policies and projects mismatch with restoration timelines. A cross-level challenge exists in both countries that is caused by a failure to recognise interactions between the national and local levels. While in Ecuador, it emerged out of a lack of attention by the national government to build the required local land use planning capacity (Wiegant et al., 2020), in Ethiopia the challenge arose from the federal government that paid too little attention to address the negative consequences of insecure land tenure conditions at the local level. In both cases, this led to an ineffective and unsustainable local implementation of restoration efforts. A notable difference is the fact that no type C scale challenge was identified in Ethiopia, while this was observed in the context of Ecuador. This challenge entails the failure to recognise heterogeneity in the way scales and levels are perceived and valued by different actors.

3.5.3 Reflection on the cross-scale and cross-level challenge concept

The cross-scale and cross-level challenges typology of Cash et al. (2006) has helped to draw attention to the challenges that arise when actors at multiple governance levels seek to influence relevant processes on the ecological scale. Most of the challenges we identified are anchored in systemic logic related to political processes, or how international development assistance is delivered. For example, the co-management arrangements that gave user groups new rights and responsibilities were created by projects with short-term planning horizons. As a result, delays and challenges that

arose during the implementation process often could not be accommodated and negatively impacted the quality and sustainability of the arrangements and the restoration processes they promote.

While the five challenges are an essential part of explaining discrepancies between federal restoration targets and local action, they add up to and are influenced by other governance challenges that require equal attention. In Ethiopia, these include the issue that the most degraded lands are usually allocated for forestry and restoration, hence compromising success rates and economic potential; the issue that restoration policy implementation is not matched with the technical skills, experience and finance needed at multiple levels to realise policy objectives; the issue of weak institutional memory due to high staff turnover at all levels, institutional reshuffling, and a loss of skills due to a lack of training [MoA, ICSO4]; the lack of monitoring and evaluation; the issue that allocated budgets are not always spend adequately in the absence of clear rules and accountability mechanisms [GIZ7, ICSO5.3, SGZ-Woreda3]; and the growing challenge of landless youth due to population growth. Only by addressing the different types of challenges can FLR governance be significantly improved. In particular, unequal access to land and the lack of alternative livelihood options are key issues, as high-level restoration commitments further increase the pressure on land. In Ethiopia, growing challenges with landless youth underscore that restoration efforts need to ensure an equal distribution of restoration benefits and place greater emphasis on creating alternative livelihoods to make such efforts sustainable in the long run.

Cash et al. (2006) noted that cross-scale and cross-level challenges are pervasive, making them intertwined and sometimes difficult to distinguish. Trying to address them in isolation is not likely to lead to better restoration outcomes. While clear land tenure provides the necessary preconditions to achieve FLR, it is not sufficient in itself to ensure that FLR occurs and is being sustained (Cronkleton et al., 2017). Creating more projects that provide alternative livelihoods for only four years may not sustain FLR processes either. Yet, when cross-scale and cross-level challenges seem overwhelming, alternatives must be found that offer partial solutions. A nuanced scale-sensitive governance approach is required that takes observed cross-scale and cross-level challenges as a starting point to identify the governance arrangements and strategies that are needed in specific locations and at specific phases of the restoration process, with the aim to create cross-scale fit and cross-level alignment (Wiegant et al., 2022b, 2022a). To make local restoration efforts effective, Ostrom (2009) highlighted that the analysis of interactions across multiple governance levels and across social and ecological systems can enhance efforts to effectively govern natural resources at the local level, and avoid simplistic 'one-size-

fits-all' solutions that frequently fail. Scale-sensitive governance could create more opportunities for actors at multiple governance levels to exchange and learn about local realities and prevent blind spots from arising. Scale-sensitive governance arrangements and strategies do not necessarily seek to eliminate systemic logics, as this might be hard to achieve, but rather look for ways to overcome the shortcomings of systemic logics, such as short-term planning horizons, to achieve successful local restoration action.

Gibson et al. (2000) emphasised that the types of patterns detected are greatly dependent on the choice of scale, the levels studied and the detail with which phenomena are observed. Buizer et al. (2011) therefore recommend being clear and transparent about the scales of observation, observation techniques and epistemological choices that are made. First, we prioritised getting acquainted with all restoration-relevant governance levels in Ethiopia, ranging from the federal, to the regional, zone, *woreda* and *kebele* levels, rather than focusing most attention on only one or two governance levels. While this affected the depth of understanding achievable at each level, it seemed the best way to understand the translation of national restoration targets into local action. It is likely that a more ambitious research design that allowed for more time to be spent at each governance level, or a stronger focus on ecological processes in the two landscapes, would have uncovered additional cross-scale and cross-level challenges. We therefore emphasise that this analysis of challenges in FLR governance needs to be further refined and updated by other researchers.

3.6 Conclusion

With numerous forest and landscape restoration targets set by national governments, the governance arrangements used at the national and subnational levels to translate high-level restoration commitments into local action require particular attention. This study focused on identifying the cross-scale and cross-level challenges faced in Ethiopian FLR governance by capturing the experiences and perspectives of Ethiopia's FLR community of practice at the federal, regional, zonal, *woreda* and *kebele* levels. We identified five challenges: 1) short-term tree planting campaigns and quota mismatch with restoration timelines; 2) planning horizons of restoration-related international development projects mismatch with restoration timelines; 3) federal and international budget allocation for alternative livelihoods mismatches with sustained local restoration processes; 4) federal forest and land policies have not created secure land tenure conditions to sustain local restoration efforts; and 5) misalignment of the forest and landscape restoration portfolio exists in the cascading government structure. Identifying cross-scale and cross-level challenges gives policy

makers a starting point to improve existing and future governance arrangements that are designed to promote and sustain local restoration efforts. In Ethiopia, particular attention is needed for governance arrangements that create temporal fit with restoration processes and that ensure that restoration processes generate livelihood benefits for rural communities.

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4

Cross-sector challenges in Ethiopian forest and landscape restoration governance

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The contents of this chapter are under review in a peer-reviewed journal.

Abstract

The federal government of Ethiopia set a national target to restore 15 million hectares of degraded and deforested lands by 2030. While forest and landscape restoration governance is intended to be a multi-actor process through which various land uses are coordinated, in practice it turns out to be difficult to bring specialised government agencies together to achieve restoration targets. We found three cross-sector challenges that influence the way in which national restoration targets are implemented at the local level in Ethiopia: 1) food security dominates the restoration policy frame and budgetary allocation at the expense of alternative restoration pathways that foster forestry livelihoods and biodiversity benefits, 2) agricultural and environmental policy objectives and targets, and restoration mandates at the sub-national level are incoherent, and 3) a siloed land use planning instrument makes it difficult to negotiate trade-offs and find synergies between sectoral policy objectives. Our results point out the need for an integrated land use planning instrument to achieve a wider range of restoration benefits. We posit that an independent integrated land use planning authority that can draw on hierarchical authority is required to better balance different sector interests and different forms of conservation and restoration.

4.1 Introduction

Forest, grassland and wetland degradation has become a pervasive, systemic phenomenon that has caused the loss of ecosystem functions on which human well-being depends (IPBES, 2018). To stop and reverse land degradation trends, forest and landscape restoration (FLR) has grown into a global approach to restore ecological integrity while providing social benefits (Mansourian et al., 2021). FLR entails a landscape-level land use planning process that aims to accommodate the ecological processes needed to generate ecosystem functions, while safeguarding food production and improving livelihoods (Chazdon et al., 2017). A mix of actions occurs under FLR, including passive and active management of natural regeneration, planting single or mixed species tree plantations using native or exotic species, and agroforestry systems (Lamb et al., 2005; Wilson and Cagalanan, 2016). Depending on the chosen form, FLR contributes to a greater or lesser extent to mitigate climate change, reduce biodiversity loss, improve soil stability and water regulation, and strengthen rural livelihoods (IPBES, 2018; Stanturf et al., 2019). By who and for what purpose FLR is implemented may significantly influence the final outcome (Djenont in et al., 2020; Mansourian, 2018; Wiegant et al., 2020).

In theory, FLR is intended to be a multi-actor governance process to negotiate trade-offs and maximise synergies between different land uses through a landscape approach (Mansourian et al., 2017a; Reed et al., 2017). This process is difficult to achieve in practice however, given the complexities associated with bringing together different government sectors and levels, rural communities and other actors. FLR has therefore often resulted in asymmetric outcomes that merely pursue the interest of one dominant actor (Mansourian and Parrotta, 2019). Siloed approaches to FLR are a challenge because they tend to focus on a few benefits while ignoring a wider diversity of benefits that more integrative restoration approaches can obtain (Carmenta and Vira, 2018; Parrotta and Mansourian, 2018).

The momentum for governments to set national restoration targets has grown globally over the past decade and recently culminated in the UN Decade on Ecosystem Restoration. By pledging to restore 15 million hectares of degraded land by 2030 (MEFCC, 2018a), Ethiopia is leading among African countries in terms of the size of land that is targeted for restoration. Since the final outcome of restoration is strongly influenced by the specific forms chosen, it is important to understand which agencies are involved in FLR, how land is found and allocated for restoration purposes, and who decides on the benefits this should yield. Despite having an ambitious restoration target, knowledge gaps exist in Ethiopia when it comes to land use policy development and the factors that influence land use decisions (Ariti et al., 2019).

Our research question is: what are the cross-sector challenges related to forest and landscape restoration governance in Ethiopia? In the theoretical framework we first explain the concepts that facilitate an understanding of the different types of cross-sector challenges. In methods, we give an overview of cross-sector dynamics and land use planning in Ethiopia, and explain our data collection and data analysis. In the results, we describe three cross-sector challenges we identified during our research, and elaborate on what this means for policy alignment efforts in the discussion.

4.2 Theoretical framework

In today's public governance system, societal problems are addressed by assigning tasks to specialised government agencies that design policies and instruments to deal with a problem within their own policy domain (Klijn and Koppenjan, 2016). Yet, some of the large problems that governments are currently confronted with, such as land degradation, biodiversity loss and climate change, cut across governance levels and the boundaries of policy domains and can rarely be solved by one agency alone (Candel and Biesbroek, 2016; Peters, 2018). To address global land use-related problems, inherent trade-offs need to be managed between meeting immediate human needs and maintaining the long-term ecological processes that generate ecosystem functions (Foley et al., 2005; Sayer et al., 2013). The greater the trade-offs are, the more explicit interactions have to be between agencies to address diverging interests (Scharpf, 1978). Ethiopia's FLR policy domain cuts across the agricultural and environmental sectors. Alignment is not a straightforward process however, given the inherently pluralistic character of public decision-making in which diverging interests co-exist. While the agencies of different sectors are formally independent, they are practically interdependent when policies in one sector influence those in another sector (Klijn and Koppenjan, 2016; Scharpf, 1978).

When the policies of different agencies are misaligned, cross-sector challenges may emerge that consist of unaddressed trade-offs and missed synergies. Unaddressed trade-offs exist when the negative effects of one sector's policy actions on another sector remain unresolved. Missed synergies exist when the potentially positive effects of policy actions of one sector on another sector are not realised. Agencies may not always want to proactively align their interests, and develop strategies that create coherence across policy domains since alignment also has its disadvantages. These include interaction costs, such as money, time and energy, and political costs associated with having to accept compromise (Klijn and Koppenjan, 2016). To identify what is required to achieve cross-sector alignment, we need to understand the

relationship between agencies and the ways in which different sectors misalign. Misalignment can emerge in five, not mutually-exclusive ways:

A) Policy frames: frames influence who is included or excluded in a policy process (van Lieshout et al., 2011). Agencies tend to see problems and solutions through their own particular policy frame, thereby neglecting views and ideas of other policy domains (Candel and Biesbroek, 2016; Peters, 2018). When different policy frames to define and solve a problem exist, it is difficult to pinpoint which agency is responsible for what, who is in the lead to offer a solution, and what specific issues are part of the problem and solution. Agencies can frame a problem in such a way that it places their own sector at the centre of power to offer the solution (van Lieshout et al., 2011).

B) Policy objectives: diverging interests often cause agencies to pursue incoherent policy objectives (Ansell and Gash, 2007; Klijn and Koppenjan, 2016; Scharpf, 1978). Objectives between sectors may be misaligned when achieving one sector's policy objectives makes the achievement of another sector's objectives unattainable. Van Oosten et al. (2018) gave the example of misalignment occurring between policy objectives that aim to achieve food security versus those that focus on the large-scale reforestation of agricultural land.

C) Policy instruments: to pursue their objectives, agencies may use different policy instruments that can be regulatory, voluntary or communicative in character. Misalignment may occur between legally-defined rules, financial incentives, awareness campaigns and procedures that build on different forms of knowledge and follow their own logics and assumptions (Young, 2006). Misalignment between instruments used by one agency can be resolved with relative ease since few trade-offs are expected. Misalignment between the instruments of different agencies are harder to solve however, since trade-offs will be more common and linked to politics (Visseren-Hamakers, 2015). In such cases, the policy instrument of one sector may clash with the assumptions of another sector to pursue its interests.

D) Implementation processes: even when policy frames, objectives and instruments are all aligned, misalignment may still occur in the policy implementation process when it results difficult to translate policy alignment intentions into local action (Hudson et al., 2019). When the interests of an agency are not properly represented or guaranteed when a cross-cutting problem is addressed locally, the agency may become alienated from the implementation process. When the agency tries to find alternative venues to pursue its interests, the policy's sustainability will be constrained (Ansell and Gash, 2007).

E) Policy actors: misalignment may occur between policy actors when they fail to establish common ground to constructively manage their differences (Hudson et al., 2019). When sector agencies are not on speaking terms in the first place, chances are substantial that cross-sector challenges emerge during policy design and implementation. Different reasons can cause misalignment between policy actors. An agency may choose not to interact with other agencies because it wants to govern a problem in line with its own logics and interests, or because it seeks to defend its budgets and personnel (Peters, 2018). An agency's motivation to collaborate may also be low or absent when the costs of a cross-cutting issue are not considered high enough, other priorities are more urgent or when an agency does not consider itself dependent on others to provide a solution (Klijn and Koppenjan, 2016).

The lack of cross-sector alignment may have different effects on how policy processes unfold:

- *Dynamic balance through mutual partisan adjustment*: a dynamic balance takes place when actors try to influence and persuade each other in a competition of ideas on how problems should be defined and what solutions need to be pursued. While mutual partisan adjustment may lead to more thoughtful policies that are influenced by a wide range of considerations (Lindblom, 1979), it is also a process of pushing and pulling between actors with uncertain results (Ansell and Gash, 2007; Klijn and Koppenjan, 2016).

- *Weaker sector losing out from a dominant sector*: Dominance may be based on an actor's ability to control a policy frame (Dewulf et al., 2007) or the resources that enable policy implementation. Weaker actors may be dependent on a dominant actor to obtain resources and have a greater interest to interact (Scharpf, 1978). When no measures exist to ensure a level playing field, dominant actors can exploit weaker actors by making them accept intrinsically unattractive policy proposals, since refusal may complicate the interaction upon which weaker actors depend. Exploitation may however motivate weaker actors to alter their relationship by looking for alternative resources and venues that change the interaction into one of mutual dependence or independence (Ansell and Gash, 2007).

- *Efforts to address cross-sector challenges*: There are three main efforts to create alignment between sectors. The cross-sector misalignment types we identified above are extrapolated from the following efforts:

    - *Policy integration to align policy frames, objectives and instruments*: processes of policy integration involve all relevant agencies in the design of policies that

minimise trade-offs and produce synergies to address a cross-cutting problem in an integrated way (Candel and Biesbroek, 2016). Integration creates alignment in the way a cross-cutting problem is perceived in a given policy context, and fosters coherence within the range of policy objectives and instruments that either drive a cross-cutting problem or aim to resolve it;

- *Policy coordination to align implementation processes*: policy coordination occurs when formally independent, but practically interdependent actors with differing policy frames, objectives and instruments choose to negotiate with each other to minimise trade-offs and realise synergies in policy implementation (Peters, 2018; Stephenson, 2013), even though they do not share any responsibility for a problem in formal terms (Young, 2006).
- *Collaborative governance to align policy actors*: collaborative governance comprises a constructive and inclusive process between public and non-state actors to discover common grounds and design co-produced solutions to fulfil a purpose which the actors could not accomplish alone (Emerson et al., 2011). The factors that increase the success of interaction include committed and impartial leadership (Ansell and Gash, 2007), clear incentives that drive collaborative action (Emerson et al., 2011) and the perception that actors are interdependent to solve a problem (Ansell and Gash, 2007; Scharpf, 1978).

It is important to understand what types of cross-sector misalignment prevail in a policy context before the most effective alignment efforts can be identified. We therefore mainly focus on the cross-sector challenges that emerge in forest and landscape restoration governance and touch upon several options to create cross-sector alignment in the discussion.

4.3 Methods

We conducted a document review, interviews and focus group discussions to understand the existing challenges in Ethiopian FLR governance. We used a subset of interviews to elaborate the cross-sector challenges that influence the ways in which national restoration targets are met locally. First, we explain our data collection and analysis process, and then provide a brief overview of FLR-related sectoral dynamics and the land use planning context in Ethiopia.

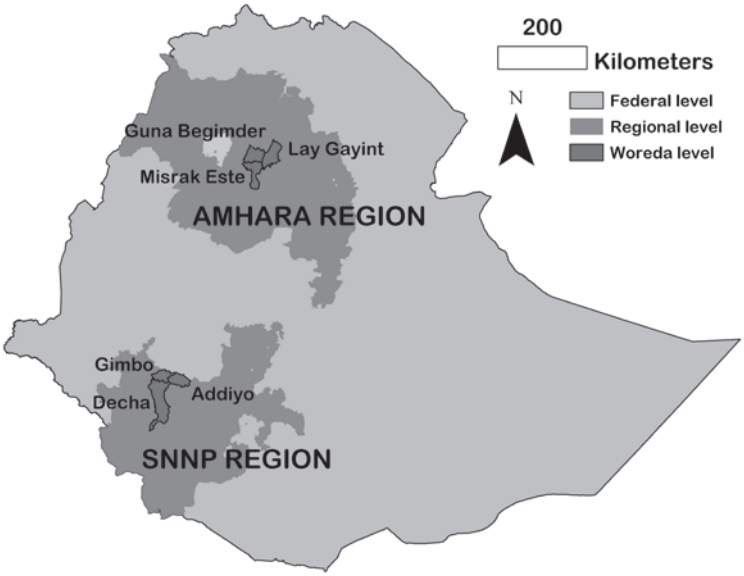
4.3.1 Data collection

To analyse challenges that emerge in Ethiopian forest and landscape restoration governance, we adopted an exploratory case study design focused on two landscapes: Mount Guna in Amhara region and Kafa in the Southern Nations, Nationalities and

People's (SNNP) region. We conducted FLR-related multi-level governance research at the 1) federal level, 2) regional level in the Amhara and SNNP regional states, 3) zone level in South Gonder and Kafa zones, and 4) district (*woreda*) level. In South Gonder zone we studied the Lay Gayint, Guna Begimder and Misrak Estie districts and in Kafa zone the Gimbo, Decha and Addiyo districts (*Map 4.1*).

First, to understand the national FLR context and inform our interview checklists, we assessed several policy documents (e.g. FDRE 2011, 2016). Second, 56 semi-structured interviews and 14 focus group discussions were conducted between October and December 2019 by our research team, consisting of an Ethiopian and Dutch national. *Figure 4.1* gives an overview of the interviewed actors, their affiliation and position in the case study. We used a purposive sampling strategy to identify FLR actors. Our decision to interview persons was based on their perceived centrality in federal, regional, zone and district-level FLR policy processes and local FLR efforts. We also convened community-level natural resources user groups, and district-level natural resource management and environmental experts for focus group discussions.

Interview checklists included questions on implementation mechanisms of restoration policies and projects, local restoration practices, underlying motivations to restore,



Map 4.1 Location of the studied districts (*woredas*) in Ethiopia. (source: elaborated by the authors, with geographical data from WLRC).

cross-level and cross-sector interaction, land use planning practices, and the links between restoration and rural livelihoods. The semi-structured nature of the checklist provided sufficient openness to discuss other FLR-related issues that arose and were considered important by interviewees.

In the results, we use organisational codes to link viewpoints to organisations rather than to individuals. The promise of anonymity was needed to facilitate a candid discussion of potentially sensitive governance issues. The codes that are used to support the evidence are listed in *Figure 4.1*. Given existing sensitivities in Ethiopia, civil society organisations were further anonymised to ensure that viewpoints cannot be traced to a specific organisation. In case only one person of a specific organisation was interviewed, only the organisation's code is used while in cases where multiple persons of the same organisation were interviewed, a specific number is added to the code. Hence, GIZ7 refers to the seventh interview with an employee of the German Society for International Cooperation, and ICSO5.1 refers to the first interview with a staff member of an International Civil Society Organisation that received '5' as code. *Figure 2* shows all civil society organisations that were interviewed in alphabetical order.

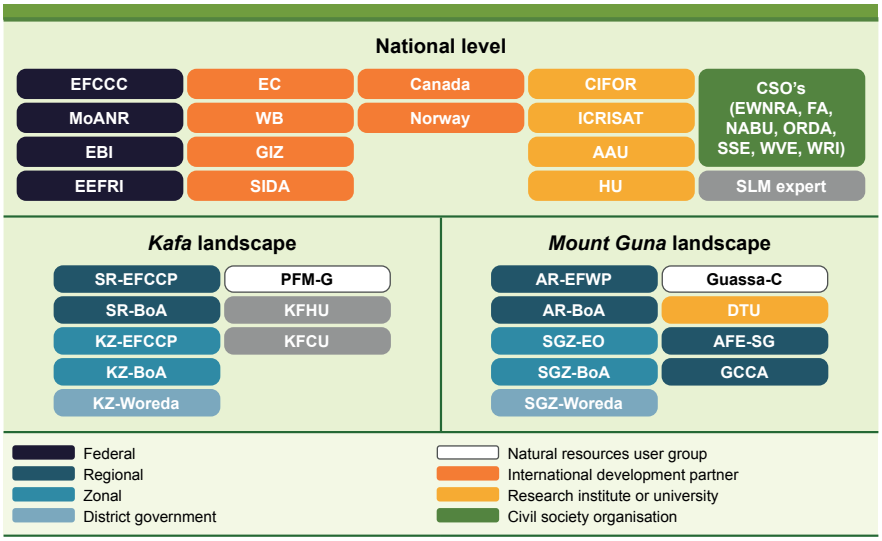
4.3.2 Data analysis

Interviews were recorded and fully transcribed, to create a thick description (Geertz, 1973) of FLR governance dynamics and concerns that are perceived by actors who comprise Ethiopia's FLR community of practice. We used grounded theory-informed exploratory methods to inductively analyse the qualitative data (Charmaz, 1996) and complemented these methods with deductive sensitising concepts, such as *scales*, *levels* and *sectors* to analyse the data. The interview transcripts were coded using ATLAS.ti software.

We followed the path of analytic progression (Miles and Huberman, 1994) in which we first tried to understand the multi-level nature of FLR governance in Ethiopia, and then analysed its elements more closely to shape a narrative that indicates how various elements are connected. We condensed, clustered, sorted and linked the data (Miles and Huberman, 1994; Tesch, 1990) and followed different leads. In this way, we identified three cross-sector challenges. With our analysis, we aim to contribute to theory building that is related to FLR-specific cross-sector challenges (Charmaz, 1996).

4.3.3 Sectoral dynamics and land use planning in Ethiopia

Over the past decades, widespread land use changes have occurred in Ethiopia as the result of cropland expansion (Ariti et al., 2019). Growing population and consumption demands, in combination with a lack of land use planning, have caused a steep decline



AAU	Addis Ababa University
AFE-SG	Amhara Forest Enterprise, South Gonder branch
AR- BoA	Amhara Region Bureau of Agriculture
AR-EFWP	Amhara Region Environment, Forest and Wildlife Protection Authority
Canada	Canadian Embassy
CIFOR	Centre for International Forestry Research
CSO	Civil society organisation
DTU	Debre Tabor University
EBI	Ethiopian Biodiversity Institute
EC	European Commission
EEFRI	Ethiopian Environment and Forest Research Institute
EFCCC	Environment, Forest and Climate Change Commission
EWNRA	Ethio Wetlands and Natural Resources Association
FA	Farm Africa
GCCA	Guna Community Conservation Area office
GIZ	German Society for International Cooperation
Guassa-C	Guassa Committee members from communities of the Estie, Guna Begimder and Lay Gayint districts of South Gonder Zone
HU	Hawassa University
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICSO	International civil society organisation
KZ- BoA	Kafa Zone Bureau of Agriculture
KZ-EFCCP	Kafa Zone Environment, Forest and Climate Change Protection Authority
KZ-Woreda	Environment and NRM experts of the Adiyo, Decha and Gimbo districts of Kafa Zone
KFCU	Kafa Forest Coffee Farmers Cooperative Union
KFHU	Kafa Forest Honey Producers Cooperative Union
LCSO	Local civil society organisation
MoANR	Ministry of Agriculture and Natural Resources
NABU	German Nature and Biodiversity Conservation Union
Norway	Norwegian Embassy
ORDA	Organisation for Rehabilitation and Development in Amhara
PFM-G	Participatory Forest Management Group members from communities of the Adiyo, Decha and Gimbo districts of Kafa Zone
SGZ-BoA	South Gonder Zone Bureau of Agriculture
SGZ-EO	South Gonder Zone Environment Office
SGZ-Woreda	Environment and NRM experts of the Estie, Guna Begimder and Lay Gayint districts of South Gonder Zone
SIDA	Swedish International Development Cooperation Agency
SNNPR	Southern Nations, Nationalities and People's Region
SR- BoA	SNNP Region Bureau of Agriculture
SR-EFCCP	SNNP Region Environment, Forest and Climate Change Protection Authority
SSE	SOS Sahel Ethiopia
WB	World Bank
WRI	World Resources Institute
WVE	World Vision Ethiopia

Figure 4.1 Interviewed actors, their position in the case study, characteristics, and abbreviations

in natural forests, woodlands and grasslands. Land degradation due to soil erosion is no longer a local problem, but threatens food production and water security, and negatively affects rural livelihoods in many parts of the country (Providoli et al., 2019). In recognition of the development challenges land degradation poses, the federal government committed itself to restore 15 million hectares of degraded and deforested land by 2030 (MEFCC 2018a). Meanwhile, the federal government intends to reach middle-income status by 2025 and is convinced that "boosting agricultural productivity [...] will be essential to reach this goal" (FDRE 2011, p.7). The federal agencies chiefly dealing with the cross-cutting problem of land degradation are the Ministry of Agriculture (MoA) and the Environment, Forest and Climate Change Commission (EFCCC). Past MoA-led programmes that included restoration efforts were the Productive Safety Net Programme and Sustainable Land Management Programme that were both funded by the World Bank, GEF and other partners (MEFCC, 2018b). Current MoA-led programmes that include restoration components are the World Bank's Resilient Landscapes and Livelihoods, and Climate Action through Landscape Management programmes. Large EFCCC-led restoration programmes are the Norway-funded REDD Investment Plan and Sweden-funded National Forest Sector Development Programme (MEFCC, 2018b).

Ayana et al. (2013) have shown how the relationship between the forest and agriculture sectors has been one of competing policy frames that have existed throughout Ethiopia's modern history and which have had considerable effects on the ability of the forest sector to implement policies. During the 1970s and 1980s, the ruling socialist government established a strong and autonomous Forest and Wildlife Conservation and Development Authority, and large donor funds drove the development of production forests with fast-growing exotic tree species. After the 1984 drought and famine however, government attention gradually shifted from production forests to multi-functional forests that favoured indigenous tree species. This was the result of a problem frame that directly linked the famine to environmental degradation, and put more emphasis on the role of forests and woodlands to generate ecosystem functions such as erosion control and water regulation (Ayana et al., 2013). Most government and donor attention went to the construction of physical and biological soil and water conservation measures that were implemented by MoA to tackle short-term food shortages and enhance long-term crop productivity. Shifting priorities towards food security put an end to the autonomous forest policy field and institutional setup.

To accelerate economic growth, a process of agricultural intensification was initiated by the new government stepping to power in the early 1990s, and a dominant agricultural frame increasingly overshadowed the forest sector and environmental

conservation issues (Ayana et al., 2013). Although short-lived, the new government gave attention to natural resources conservation by establishing a Ministry of Natural Resources Development and Environmental Protection between 1992-1995. Nonetheless the 2001 Rural Development Policy and Strategy implied a further shift away from forest development, towards agricultural intensification. The policy only gave marginal attention to forestry and conceptualised it as an agroforestry intervention where trees are grown on agricultural land to improve soil conditions and boost crop production or to serve as livestock fodder. The forest department of the Ministry of Natural Resource Development and Environmental Protection was downgraded to a subsection within MoA (Ayana et al., 2013; MEFCC, 2018b). While the government claimed to create cross-sector alignment by integrating forest development and agricultural production, opponents argued that crop production was greatly overemphasized at the expense of forests and woodlands (Ayana et al., 2013).

The federal government launched the Climate Resilient Green Economy strategy in 2011, to counter the critique that it was making few efforts to deter domestic deforestation while it was assuming an active role in international climate negotiations. Contrary to the marginal role of the forest sector in the 2001 Rural Development Policy and Strategy, forests made up one of four pillars in the 2011 strategy. A new Ministry of Environment and Forests was established in 2013 (Kassa et al., 2017), following the request of international development partners to have an agency through which REDD+ and climate finance could be channelled. It was expanded to become the Ministry of Environment, Forests and Climate Change (MEFCC) in 2015 and led the development of forest sector policies, strategies and guidelines (MEFCC, 2018b). As part of its soil and water conservation measures however, MoA kept on implementing agroforestry measures. In 2018, the forest sector lost its seat in the federal and regional cabinets when the MEFCC was downgraded to the Environment, Forest and Climate Change Commission (EFCCC).

Meanwhile, a weak institutional set-up has largely hampered progress on establishing a land use planning policy that supports the sustainable management of land, forests and water. A harmonised, comprehensive and enforceable national land use policy that coordinates different sectors has not yet emerged, even though such a plan and policy was already called for in both the 2005 Rural Land Administration and Land Use Proclamation and 2011 Climate Resilient Green Economy strategy. The latter strategy highlighted that changes in regulatory frameworks should focus on better coordination of land use planning (FDRE, 2011). Ariti et al. (2019) found that existing land use policies are fragmented across multiple agencies and not visible on the ground, due to a lack of financial and human resources, commitment and law enforcement, and an absent institutional set-up at lower administrative levels to

guide land use planning (Ariti et al., 2019). As a result, land rezoning is not practiced with public participation to minimise trade-offs and find synergies between agriculture, forestry and nature conservation (Gebrewold, 2016). This is problematic, given the evidence that the land on which ecological functions are generated, such as forests, wetlands and wildlife reserves, has been diverted for other uses, primarily due to large-scale agricultural investments and small-scale agriculture encroachment (Gebrewold, 2016; Providoli et al., 2019).

4.4 Results

In this section, we elaborate the three cross-sector challenges we identified in Ethiopian forest and landscape restoration governance (*Table 4.1*). The challenges influence the ways in which the country's national target to restore 15 million hectares of degraded and deforested lands are met locally. We provide a background analysis of the challenges with evidence from the interviews held at the federal, regional, zone and district level and the focus group discussions.

4.4.1 Food security dominates the restoration policy frame and budgetary allocation at the expense of forestry livelihoods and biodiversity benefits

A first cross-sector challenge emerges from the fact that food security and poverty alleviation have been the federal government's dominant policy frame for decades (MEFCC, 2018b). As a result, improving agricultural productivity has been a main driver to engage in land restoration for both the federal government and development partners [WB1]. With most international development funding flowing through MoA, it has greatly influenced the forms of restoration that are promoted. Alternative restoration forms that are proposed by the environmental sector, such as forest management and reforestation, received less attention and resources compared to those of the agricultural sector. This can be seen in the way that land and resources are allocated.

The dominance of agriculture in land allocation and the emphasis that is placed on soil and water conservation measures has reduced the options for the environmental sector to exploit the economic potential of forests, and create livelihoods in the forestry sector. While the most fertile land is allocated to agriculture, land that is allocated for forestry and tree planting tends to be highly degraded and often unsuitable [EFCCC2]. The marginal nature of designated planting sites in terms of water availability, soil nutrients and soil depth greatly compromises the success of tree planting efforts and results in tree seedlings showing poor survival rates

Table 4.1 Cross-sector challenges in Ethiopian FLR governance

	Cross-sector challenge	Description	Type
CSC1	Food security dominates the restoration policy frame and budgetary allocation at the expense of forestry livelihoods and biodiversity benefits	A dominant policy frame that is geared towards improving crop production has resulted in both land allocation and budget allocation practices that hamper the success of the restoration forms that are proposed by the environmental sector (i.e. that include strengthening the economic importance of forestry livelihoods and safeguarding biodiversity benefits)	A) Misaligned policy frames
CSC2	Agricultural and environmental policy objectives and targets, and restoration mandates at the sub-national level are incoherent	Coherence is lacking between policy objectives that promote crop production and reforestation. In addition, there is unclarity about the mandate of agricultural and environment agencies to lead restoration efforts at different levels	B) Misaligned policy objectives
CSC3	A siloed land use planning instrument makes it difficult to negotiate trade-offs and find synergies between sectoral policy objectives	The only land use planning process that occurs in Ethiopia is implemented by MoA at the watershed level, following MoA guidelines. A land use planning process that integrates the policy objectives of multiple sectors has not yet come off the ground	C) Misaligned policy instruments

[Norway]. "We know we are planting our seedlings in harsh and inhospitable sites, but we don't have a choice, because the productive land is usually used for agricultural purposes. So what is available for tree planting are the more degraded areas not suitable to practice agriculture" [EFCCC4]. In addition, adequate attention to facilitate tree growth is often lacking, although it is needed given the harsh conditions at planting sites.

Besides land allocation, the neglect of the forest sector is reflected in federal budget allocation, which is based on criteria that include population and agricultural land size [ICSO5.1]. Regions with more forests tend to receive less budget from the federal government, as they have lower population density, a smaller agricultural land surface and less livestock [GIZ7]. Since forestry has not been a federal budget allocation criterion [SR-EFCC1], having more forest in a region has translated into less budget. However, forestry and forest management require budget to develop their

economic potential and safeguard ecosystem functions. It is felt that forestry's economic potential has not been fully understood by policy-makers [GIZ4, CIFOR, HU].

How this is a missed opportunity is illustrated by rural communities in regions like Amhara where people have started planting trees without government support, albeit mainly plantations of eucalyptus and several charcoal-producing tree species. A reason is that the economic returns from wood and charcoal have become higher and more certain compared to the returns from crop cultivation [AR-BoA, SGZ, SR-EFCC1] due to erratic rainfall and expensive chemical fertilisers [LCSO2.2]. "People are now understanding that they can sometimes make a better livelihood with forestry than with agriculture, because some places are not suited for agriculture but those same lands can be productive for forestry" [GIZ1]. Forestry value chains could yield higher value timber products if forestry extension services would be provided that ensure the proper management of tree plantations and develop their economic potential. Instead, MoA's development agents discourage farmers to establish tree plantations on their agricultural land, given that this has repercussions for agricultural productivity [GIZ1]. "Farmers are changing agricultural croplands to forestry because they simply calculate the economic return. [...] Even where there is a restriction by the land use bureau, they are now changing their land into forestry. [...] The problem emanates from the experts. Their thinking is simply a cereal kind of thinking" [AR-EFWP1].

Besides forestry value chains lagging behind, little attention is placed on biodiversity benefits in restoration efforts, including in the country's protected areas. As part of its soil and water conservation measures, MoA focuses on growing trees that produce crops, livestock fodder or construction materials. It is noted that professional understanding is lacking to distinguish monoculture tree plantations and restoration that also places attention on the biodiversity that remains in the afro-montane forests [LCSO2.2]. On average, tree nurseries grow 5-6 tree species with 85-90% of the seedlings being exotic species [EBI], which does not do justice to the genetic diversity that is found in Ethiopia's remaining natural forests. Only a few native species are grown, because they have longer growing periods in tree nurseries and lower survival rates resulting from a lack of knowledge on how to grow them. "Focus was on soil and water conservation and planting exotic multipurpose trees, like different species of Acacia. From my perspective, I do not consider that restoration because in that degraded area there were species that have already been lost and that should be placed back" [EBI].

4.4.2 Agricultural and environmental policy objectives and targets, and restoration mandates at the sub-national level are incoherent

A second cross-sector challenge deals with the incoherence of policy objectives between MoA and EFCCC. To meet the target of becoming a middle-income country by 2025 Ethiopia's Climate Resilient Green Economy strategy formulated growth targets for agricultural commodities like teff, wheat and maize, and higher export value targets for coffee and livestock (FDRE, 2011). To reach these, the agricultural sector's main strategies have been to increase productivity and expand the area under cultivation [GIZ1, ISCO5.3, CIFOR]. Meanwhile, the same Climate Resilient Green Economy strategy set the target to bring 4 million hectares under forest management and 3 million hectares under afforestation and reforestation to increase carbon sequestration in the forest sector (FDRE, 2011). These targets were later expanded to 15 million hectares. However, the targets to increase productivity and the area under cultivation that local MoA offices have had to meet show little coherence with existing forest management and reforestation targets [SIDA, AR-EFWP2]. "In terms of agriculture there is the goal to increase the coffee sector export a number of times. Where do you produce it? They go and clear the forest to achieve the coffee export objective. You talk about 15 million hectares to be restored while you are destroying natural resources for agriculture" [CIFOR].

MoA and EFCCC do not have mechanisms to coordinate policy objectives, and instead set priorities and make plans in isolation [EFCCC5, EBI]. This siloed way of working creates contradictions and tensions [GIZ1, GIZ4, CIFOR]. It is for example not possible to ensure that deforestation for agriculture does not take place in one area while reforestation is promoted in an adjacent area [EFCCC2, ICSO2]. "Within the same government we have different ideas. Agriculture says to expand agriculture and intensify so that you get more production, even by clearing forest. [...] We as the forest sector want to maintain what we have and expand forest cover further. The policies are totally incompatible" [EFCCC5]. A particular challenge for the forests has been the federal government's tendency to consider forestland as being available for agricultural investments [HU], by both domestic and foreign actors. "They even invite investors by saying that we have ample lands. Where is that ample land? It is the forestland in Southwest Ethiopia! We do not have a land use plan so forestlands are resources to expand agriculture and investment" [SR-EFCC2].

In addition, it is also unclear which agency is mandated to implement restoration efforts at the sub-national level since the restoration roles of sub-national agencies that fall under MoA and EFCCC differ between regions. In South Gonder zone, raising tree seedlings in nurseries and tree planting are the mandate of the agriculture

office, while the environmental protection department prepares forest use and management plans [SGZ]. Meanwhile in Kafa zone, both the agricultural office and environment office are responsible for planting tree seedlings, with some nurseries belonging to the agricultural office and others to the environment office [KZ-Woreda1]. With regard to land allocation for restoration purposes, in South Gonder zone it is the Bureau of Agriculture's land administration office that identifies areas for tree planting, while in Kafa zone the responsibility to delineate and protect forest areas lies with the environment office [SGZ, KZ-Woreda1]. "The Ministries of Agriculture, Water and Environment all say they are in charge and mandated by law. These three never talk to each other. It is very clear evidence of sectoral gaps and overlapping institutional mandates across sectors" [CIFOR].

The blurry restoration responsibilities of different sectors are attributed to a culture of resource competition [SIDA]. "There are some zones where the Bureau of Agriculture says that forestry is their task. [...] For the sake of resources, they claim the seedling production extension we [the environment sector] have. It was under the Bureau of Agriculture and they do not want to give the seedling production station to us. Still not" [SR-EFCCP3]. When MoA or EFCCC obtain international development funds to implement restoration efforts they implement all aspects of their projects without involving other agencies, even where that would be adequate. It has also been noted that donor funded projects are not designed to stimulate agencies to collaborate, by providing common funds that need to be shared by multiple agencies [ICSO2]. "The sectors need to talk to each other, but in the end it just becomes a fight for resources [...] We could have done better with the Sustainable Land Management [programme] and forced the sectors to work together, because you have the resources" [CIFOR].

4.4.3 A siloed land use planning instrument hampers negotiating trade-offs and finding synergy between sectoral policy objectives

The third cross-sector challenge relates to land use planning practices, which in their current set-up make it hard to balance sectoral policy objectives. Land use planning and rezoning efforts are not yet guided by a national framework. The only land use planning effort that is now implemented is a participatory land use planning process, which is managed by MoA's Land Administration and Use Directorate and which has received funding from the multi-donor Sustainable Land Management and Agricultural Growth programmes [EFCCC8]. Land use plans are created with community participation by MoA-employed development agents and follow MoA guidelines. The planning process is based on a capability classification that is given to individual plots of land, and a soil and water conservation measure prescription for specific land uses and slope classes to increase land productivity [KZ-BoA2,

AR-EFWP1]. "The guideline only guides the development agents to identify the land uses and slope classes, and based on these they use the menu of different technologies for that land use and slope class" [ICRISAT]. The land use plans are made at the watershed level and are later aggregated at the district and zone level [MoA, EC2]. There are however concerns that the MoA-employed development agents lack the skills to identify what is needed in a specific watershed, causing land use plans to often lack specificity [KZ-BoA1, WB4]. For example, plans tend to not consider the configuration and characteristics of a wider landscape and ecosystem [ICRISAT]. "They don't see all the perspectives, such as ecological functions. Simply they look for the existing land use initially. Usually agriculture is prioritised" [AR-EFWP1].

Another concern relates to the enforcement of land use plans [EC1, WB4]. While development agents may give recommendations to communities not to cultivate steep slopes, water sources or wetlands, they are not paired with enforcement or compensation instruments, which causes recommended and actual land use not to align [AAU, ICSO3, ICSO5.1, KZ-BoA1]. "The land use planning exercise ends with formulating a plan that does not deal with development planning to assure that the land use plan is implemented" [KZ-BoA1]. For example, the rule that agriculture is not allowed within 50 meters of water bodies is often not respected in practice given that no one is responsible to check compliance [ICSO5.3]. In addition, government actors are hesitant to implement land use planning rules since these may affect agricultural land use patterns on which rural communities depend, and create conflict [EEFRI, GIZ2, CIFOR]. "You may say 'slopes above 30 percent inclination should be protected', but actually people are already using those areas for farming" [EEFRI].

While MoA's Land Administration and Use Directorate is responsible to develop land use plans at the watershed level and follows MoA guidelines to do so, EFCCC currently hosts the National Integrated Land Use Policy secretariat [EFCCC8]. A national integrated land use plan and policy process was started by the Prime Minister in the early 2010s, after he declared this a top priority within Ethiopia's development agenda (Providoli et al., 2019). The policy was envisioned to be part of the third Growth and Transformation Plan (2020-2024) and the intention was that it would develop land use plans at the federal, regional, zonal and district levels to coordinate cross-sector land use trade-offs [WB4]. After being initially managed by the Prime Minister's office, MEFCC (and later EFCCC) was assigned to host the secretariat that leads the policy's design. In recent years however, the process has received little attention in terms of political support, human resources and finance [EFCCC8, WB4, AAU]. Therefore, the only land use planning process that currently takes place predominately works towards realising the agricultural sector's objectives rather than towards balancing policy objectives of a diversity of agencies.

4.5 Discussion

Our results provide evidence of three cross-sector challenges that influence the ways in which Ethiopia implements its national restoration target. The challenges we identified fall in different cross-sector challenge types.

First, misalignment exists between the policy frames of MoA and EFCCC (type A). MoA is the dominant actor in the FLR policy domain, causing restoration to be mainly interpreted through a narrow rural development lens (Mansourian, 2018). Through this lens, land degradation is a crop productivity problem that predominately falls within the agricultural sector's mandate and which can be solved by implementing physical and biological soil and water conservation measures. However, a focus on narrow restoration objectives has been criticised (Bond et al., 2019; Veldman et al., 2015) and there is a risk that a narrow focus on improving crop productivity overlooks the benefits that other forms of restoration like forestry and biodiversity conservation bring (Holl and Brancalion, 2020). Techel et al. (2019) also identified that the governance of FLR across sectors in Ethiopia is a major impediment to successful implementation. The alternative livelihood potential of forestry remains unobserved or misunderstood by policy-makers. As a result, Ethiopia now imports wood products at a high cost, despite the country having a diversity of agroecological zones that facilitate the growth of a wide variety of tree species. Second, the tree planting efforts that do occur are mostly geared towards growing crop, livestock fodder and construction material-producing tree species. Little to no attention is paid to conserving the tree biodiversity of Ethiopia's dwindling afro-montane forests. This is in contrast to restoration efforts in other parts of the world, such as Colombia (Murcia et al., 2016) and Ecuador (Wiegant et al., 2020), where biodiversity objectives supersede social ones.

Second, misalignment exists between the policy objectives of MoA and EFCCC (type B). The policy objectives that aim to increase agricultural productivity by expanding cultivated land contradict other objectives that are geared towards forest management and reforestation to realise national restoration targets. Also in Ghana, reforestation efforts are underway while agriculture continues to encroach remaining forest areas (Acheampong et al., 2019). As a way of reducing pressure on these forest areas while meeting food security objectives, agricultural intensification has been proposed. This however requires simultaneous improvement of forest protection laws, and hence alignment between the objectives of agricultural and environmental agencies. In Ethiopia, policy misalignment is also a result of the agricultural and environmental agencies not closely communicating with each other, and hence has characteristics of a type E misalignment.

Third, misalignment exists between MoA and EFCCC, given that the current land use planning instrument leads to an asymmetrical dependence of EFCCC on MoA (type C). MoA largely determines which forms of restoration are implemented locally, given that its development agents at the grassroots level are involve in guiding the land use planning process. EFCCC does not have this local presence. Although EFCCC attracted significant donor funding to develop the forestry sector and improve forest management in recent years, it depends on the MoA-led land use planning process to get access to the land it needs to achieve its restoration objectives. However, the MoA-led land use planning process allocates the most fertile land to agriculture and pushes forestry to degraded areas, thereby hampering EFCCC's objective to build strong forestry value chains that generate significant revenue. Some restoration efforts are implemented on degraded land through area enclosure and assisted natural regeneration but many of these efforts are unsustainable and characterised by poor tree seedling survival.

To better align restoration efforts by the agricultural and environmental policy domains, tailored policy processes are needed that can minimise trade-offs and reconcile competing land use claims between meeting immediate human needs, and maintaining the long-term ecological processes that generate ecosystem functions (Foley et al., 2005; Sayer et al., 2013). Actors have more incentives to interact with each other when there are no alternative venues to realise their policy objectives or when the use of such venues is made less attractive (Ansell and Gash, 2007). The current participatory land use planning process constitutes an alternative venue for MoA to regulate land use in such a way that it does not need to interact with other sectors to achieve its agricultural productivity objectives. However, this occurs at the expense of the environmental sector meeting its own objectives.

Governments can draw on various mechanisms to achieve policy alignment (Peters, 2018). Two examples are a dedicated agency at the centre of government that uses hierarchical authority to keep oversight over interactions between sector agencies, or a cabinet committee that brings together various ministers to shape collective policies (Peters, 2018; Scharpf, 1978). To attempt balancing interests and setting cross-sector priorities, it is first important that central government actors acknowledge the relevance of having a diversity of viewpoints. Then, the local institutional context will determine what mechanisms are most effective to promote policy alignment (Peters, 2018).

Klijn and Koppenjan (2006) emphasized that broad support for institutional change is crucial though, since the power relations between actors will determine the effectiveness of new institutional structures. Even when Ethiopia's land use planning

process is opened up to other agencies and the resistance of agencies who have a vested interest in maintaining the status quo is overcome, new land use planning practices will have to be interpreted and internalised by agencies involved, causing unforeseen and unintended effects that actors must cope with (Klijn and Koppenjan, 2016).

4.6 Conclusion

While forest and landscape restoration governance is intended to be a multi-actor process through which various land uses are coordinated, in practice it turns out to be difficult to bring sectoral policy objectives together. We found three cross-sector challenges that influence the way in which Ethiopia's federal government meets its national target of restoring 15 million hectares of degraded and deforested land by 2030. The results raise the need for integrated land use planning as an instrument to achieve a wider range of restoration benefits that also include forestry livelihoods and biodiversity conservation. A dedicated land use planning agency that draws on hierarchical authority could contribute to better balance sector interests.

Ethiopia's federal government has however shown no strong drive to establish a level playing field to reconcile competing land use claims. An integrated land use plan and policy process was initiated by the Prime Minister's office in the early 2010s. Being located at the centre of government and able to use its hierarchical authority, it was well-placed to create a dedicated government agency that could find ways to make different sectors coordinate and reconcile their land use claims. However, the process was taken out of this central government office and placed under EFCCC that currently does not even have a seat in the federal and regional cabinets. Hence, the required authority and resources now seem absent to lead an policy process that has to address systematic under-representation of actors, viewpoints or interests in land use planning and land allocation. Given the emphasis that is now placed on FLR by international development partners, an alternative could be that multilateral and bilateral partners provide common funding to multiple agencies in a bid to better balance various forms of restoration. This could help solve the competition for donor funds that causes the agricultural and environmental agencies to both claim restoration tasks.

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5

Scale-sensitive governance in forest and landscape restoration: a systematic review

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Abstract

Building on different bodies of the governance literature, we propose a conceptual framework specifying nine scale-sensitive governance arrangements that aim to 1) create cross-scale fit between the governance and ecological scales, and/or 2) foster cross-level alignment between different governance levels. To understand how scale-sensitive governance has played out in practice, our systematic review builds on 84 peer-reviewed empirical journal articles, which represent 84 cases of forest and landscape restoration governance. In the case studies, we identified eight out of nine scale-sensitive governance arrangements: moving tasks to other governance levels; task-specific organisations; polycentric governance; multi-level coordination; multi-level collaboration; multi-level learning; bridging organisations; and multi-level networks. These arrangements constitute important elements of the multi-level environmental governance landscape, and we analysed their role in promoting forest and landscape restoration. By using the proposed conceptual framework, a better understanding is created of how different scale-sensitive governance arrangements can support existing and future restoration efforts that are implemented as part of the UN Decade on Ecosystem Restoration.

5.1 Introduction

Forest and landscape restoration (FLR) has been hailed as the solution to various intertwined crises, including climate change, biodiversity collapse, land degradation, water crises, food insecurity and rural poverty (Pörtner et al., 2021). FLR entails the restoration of multifunctional landscapes that, depending on local circumstances, may include large natural forest, grassland, peatland and coastal ecosystems, as well as smaller forest patches, riparian zones, agroforestry and remnant trees in non-natural landscapes (Chazdon et al., 2016; Temperton et al., 2019). In recent decades, FLR has gone from a process that focused mostly on biophysical aspects to one that deals with social and livelihood dimensions as well (Ota et al., 2020). A main focus of many restoration efforts has become the simultaneous improvement of ecological integrity and connectivity, and the strengthening of nature's contributions to people (Díaz et al., 2018) at landscape level (Holl, 2017). Restoration at the landscape level, where a mix of land uses and competing claims exists, is arguably more challenging than conservation alone, and requires active interaction between actors across governance levels to identify and implement restoration pathways (Mansourian et al., 2019; Wilson and Cagalanan, 2016).

Global momentum to restore hundreds of millions of hectares of deforested and degraded land has recently culminated in the declaration of the UN Decade on Ecosystem Restoration (2021-2030). This unprecedented attention for FLR calls for a careful examination of the governance arrangements that are used to translate high-level restoration targets into local action. To make sure that restoration efforts are locally viable while simultaneously meeting higher-level climate and biodiversity objectives, engagement of actors at different governance levels is important (Holl, 2017; Wilson and Cagalanan, 2016). This is not a straightforward process, as has been highlighted by recent studies that describe cross-scale and cross-level governance challenges that emerge when restoration policies and initiatives are implemented (Chazdon et al., 2020; Wiegant et al., 2020). To overcome such challenges, more evidence is needed of how 'scale-sensitive' governance arrangements that create better cross-scale fit and cross-level alignment play out in practice. A better understanding of cross-scale and cross-level governance options may broaden the set of implementation pathways that FLR governance actors have at hand.

The main question of this review is: what scale-sensitive governance arrangements have been used in forest and landscape restoration, and how have they played out in different cases? Given that the scale-sensitive governance concept is still in its infancy and the FLR governance literature is also relatively young, we divided the main question into two sub-questions that have an exploratory character: 1) what evidence

of scale-sensitive governance can be identified in the FLR literature; and 2) how have scale-sensitive governance arrangements played out to create fit between the governance and ecological scales or create alignment between governance levels?

In the theoretical framework, we briefly elaborate on the concepts of scales and levels, and conceptualise nine scale-sensitive governance arrangements that we identified from different bodies of the governance literature. In the methods section, we outline the steps that were followed during data collection, data management and interpretation. Subsequently, in the results we provide evidence of the scale-sensitive governance arrangements we identified in 84 restoration-related case studies, and how they played out to create cross-scale fit or cross-level alignment. Lastly, in the discussion we reflect on the review's key merits and implications for future FLR governance.

5.2 Theoretical framework

In this review, we refer to governance as "the process of steering society [...] through collective action and in accordance with some common objectives" (Torfing et al., 2012). Governance has become increasingly multi-level over the past decades, due to the diffusion of decision-making authority from the national government towards international actors, local governments and non-state actors (Hooghe and Marks, 2003). In addition, global environmental change has made interactions between governance and ecological processes so complex and multi-level in nature that national governments require the expertise and resources of other actors at different levels to implement public policy (Cash, 2000; Gray and Purdy, 2018). This makes it needed to study how actors aim to influence ecological processes, and how actors at different governance levels interact to translate high-level policies and programmes into local action. We use scale theory (Cash et al., 2006; Cash and Moser, 2000) and scale-sensitive governance theory (Padt et al., 2014) as a framework to study cross-scale and cross-level interaction. A scale is a dimension with multiple levels that can be used to measure and study biophysical and social phenomena (Padt and Arts, 2014). We distinguish the ecological and governance scales. While the ecological scale comprises the various levels at which an ecological phenomenon plays out, the governance scale entails the levels at which governance arrangements are positioned in relation to a particular issue (Termeer and Dewulf, 2014). In the case of FLR, actors at multiple governance scale levels aim to influence relevant processes on the ecological scale (Wiegant et al., 2020).

Scale challenges emerge when different scales mismatch, or governance levels misalign with each other (Cash et al., 2006). Scale mismatches occur when actors do not address restoration processes at the most appropriate governance level. Cross-level misalignments happen when actors at one governance level do not properly consider limitations or conditions at another governance level. In both cases, the quality or sustainability of restoration processes are adversely affected. Scale-sensitive governance may facilitate dealing with scale challenges by addressing the interconnectivity between the ecological and governance scales, and between governance levels (Termeer et al., 2016). Governance arrangements that strengthen this interconnectivity help actors to find cross-scale fit and cross-level alignment.

To further develop the scale-sensitive governance concept (Padt et al., 2014), we present a framework of governance arrangements that facilitate cross-scale fit and cross-level alignment (*Figure 5.1*). We do so by building on four different bodies of governance literature: collaborative (Ansell and Gash, 2007; Emerson et al., 2011; Gray and Purdy, 2018), adaptive (Cumming et al., 2013; Folke et al., 2005; McLain and Lee, 1996), multi-level (Hooghe and Marks, 2003; Marks and Hooghe, 2004; Stephenson, 2013) and polycentric governance (Carlisle and Gruby, 2019; Cash, 2000; Ostrom, 2010). We identified nine scale-sensitive governance arrangements, which are divided into a cross-scale (A,B,C,D) and a cross-level (D,E,F,G,H,I) category:

1. *Governance arrangements that create fit between the governance scale and ecological scale by redesigning the governance scale*

A. Adding, removing or moving a general-purpose jurisdiction: general-purpose jurisdictions are nested public entities that are durable and located at a limited number of levels – from the international to the national, regional and local level (Marks and Hooghe, 2004). Examples are the provincial and municipal governments. They bundle together multiple functions including a range of policy tasks, and focus on the representation of, and legitimacy towards constituents who live in their jurisdiction. The boundaries of these jurisdictions do not overlap and are intended to be stable for many decades or longer. As part of jurisdictional modification however, it is possible to add a new jurisdictional level that did not exist before, like the region level (Vrangbæk, 2010). Similarly, a general-purpose jurisdiction can be dismantled altogether, such as the county level. Lastly, the boundaries of general-purpose jurisdictions can be changed, by amalgamating or splitting them to better fit a governance level to the biophysical boundaries of an ecological unit.

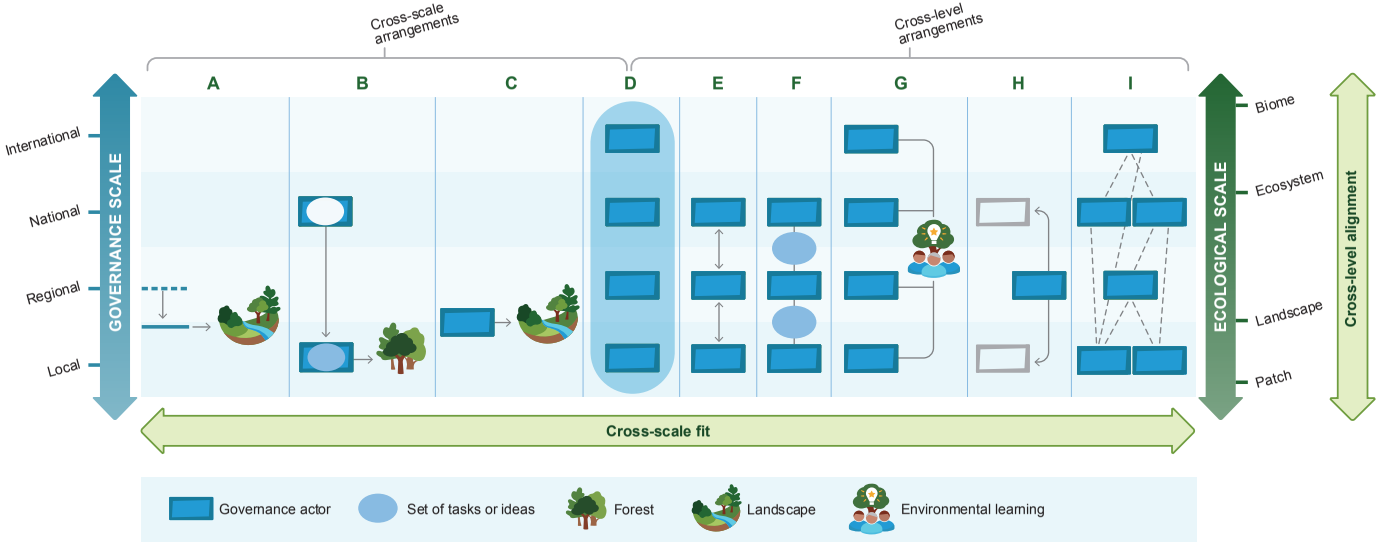

Figure 5.1 Nine scale-sensitive governance arrangements are visualised in relation to the governance and ecological scales. Specific arrangements aim to create fit between the governance scale (left) and ecological scale (right), and/or alignment between different governance levels (e.g. international, national, regional and local levels). While arrangements **A**, **B**, and **C** aim to create cross-scale fit, **D** aims to create both cross-scale fit and cross-level alignment, and **E**, **F**, **G**, **H** and **I** aim to create cross-level alignment. An example is visualised for each arrangement: **A.** Adding, removing and moving a general-purpose jurisdiction; **B.** Moving tasks to higher or lower governance levels; **C.** Task-specific organisations; **D.** Polycentric governance; **E.** Multi-level coordination; **F.** Multi-level collaboration; **G.** Multi-level learning; **H.** Bridging organisations; and **I.** Multi-level networks

B. Moving tasks to other governance levels: while modification of general-purpose jurisdictions tends to be costly and unusual, the reallocation of policy competencies or tasks across existing jurisdictions is easier (Hooghe and Marks, 2003). Moving tasks can occur as part of decentralisation or centralisation processes. Decentralisation refers to the transfer of competencies for planning, management and allocation of resources from the national to lower government levels, non-public organisations or local communities (Agrawal and Ribot, 1999). It may improve policy efficiency and responsiveness at local level by enabling local governments – who are more familiar with local conditions and needs – to govern natural resources (Andersson and Ostrom, 2008). This process would be in line with the subsidiarity concept, which entails the political desirability of policy action at the lowest possible level (Stephenson, 2013). However, the outcomes of decentralisation may be limited when the moving of tasks is not accompanied with sufficient power and financial resources to make meaningful local decisions, or when local governments are upwardly instead of downwardly accountable to local communities (Ribot et al., 2006). Tasks can also be centralised from local to higher levels. This can be done to strengthen government control over natural resources, facilitate the achievement of policy objectives and encourage consistency in the way natural resources are governed. Moving tasks between governance levels can create fit between the ecological and governance scales by enabling actors at the most appropriate governance level to comprehensively govern an ecological unit, like a forest or a landscape.

C. Task-specific organisations: these organisations are created to fulfil distinct functions at the most appropriate level, such as providing a public good or solving a common pool resource problem (Marks and Hooghe, 2004). Examples are a watershed council that makes water management decisions at the watershed level or a national park authority conserving habitat at the landscape level. As opposed to general-purpose jurisdictions that are small in number and nested, task-specific organisations can be large in number and operate across jurisdictional boundaries (Marks and Hooghe, 2004). In this way, a large number of relatively self-governing organisations with a specific function overlap with the smaller number of nested general-purpose jurisdictions. Task-specific organisations are often lean and can respond flexibly to changing functional requirements and actor preferences. They can be created and abolished relatively easily, compared to general-purpose jurisdictions. However, as creating a new organisation is quite costly, this is mostly done to manage a complex issue for which ongoing dialogue is needed between a large number of actors over a longer period of time (Gray and Purdy, 2018).

2. *Governance arrangements that create alignment between governance levels by facilitating multi-level interaction*

D. Polycentric governance: this arrangement is characterised by a multiplicity of overlapping centres of decision-making that have some degree of autonomy in governing a resource, but that choose to act in ways that take each other into account through processes of cooperation, competition, conflict and conflict resolution (Ostrom, 2010). A national government orchestrates polycentric governance when it commits to a restoration target and creates policy frameworks that enable actors at lowers levels to work towards achieving this target. These coexisting centres of decision-making may constitute diverse types of public, private and civic actors at multiple governance levels, and include both nested general-purpose jurisdictions as well as task-specific organisations (Carlisle and Gruby, 2019). Polycentric governance tolerates redundancy between actors by giving space to overlap and blurred responsibilities between multi-level actors. This redundancy allows polycentric systems to better adapt to social and ecological change compared to centralised governance systems (Carlisle and Gruby, 2019). By working at different levels each actor is able to study or address different aspects of a common environmental problem (Cash, 2000; Cumming et al., 2013), and thereby a good cross-scale fit with the respective ecological system is established. While high-level actors can exploit economies of scale, internalize policy externalities and facilitate effective redistribution, local actors are more sensitive to context-specific conditions at the local level and can therefore produce place-specific responses (Hooghe and Marks, 2003). An actor can try to orchestrate a polycentric governance landscape to reduce fragmentation and improve coherence.

E. Multi-level coordination: this arrangement touches on the process of continuous negotiation by formally independent, but practically interdependent actors at various governance levels to design and implement policies (Stephenson, 2013), without sharing any authority or responsibility in formal terms (Young, 2006). Multi-level coordination, or vertical interplay, is omnipresent, and occurs when international and national policy frameworks, or international development projects are implemented at the local level. It occurs when the decisions made by one actor consider the decisions made by other actors, and both attempt to avoid conflict and find ways to cooperate on solutions that all actors can benefit from (Peters, 2018). Coordination between governance levels can generate positive outcomes and synergy when actors at various levels align in their values and objectives. However, since multi-level coordination is not consensus-oriented per se, outcomes are not necessarily positive for all actors. Finding trade-offs may be necessary when diverging objectives and knowledge systems exist (Folke et al., 2005). Multi-level coordination may be

characterised by the dominance of one actor over others, as result of the allocation of authority and resources at one specific governance level. Dominance may also stem from an actor's ability to control a discourse or frame (Dewulf et al., 2007) on which a governance system is based and which defines 'what it is all about'.

F. Multi-level collaboration: through this arrangement, multi-level actors engage in a collective, consensus-oriented and deliberative decision-making process (Ansell and Gash, 2007) to "carry out a public purpose that could not otherwise be accomplished" (Emerson et al., 2011). Such collaboration may occur between local governments and rural communities to govern natural resources in locally-appropriate ways. The inclusion of all relevant actors from different governance levels that affect or are affected by an issue is a crucial condition for successful collaboration. It implies two-way communication and influence so that all relevant actors are directly engaged in problem and direction-setting and share responsibility for policy outcomes (Ansell and Gash, 2007; Gray and Purdy, 2018). The main objective is to achieve better informed, and more responsive and implementable solutions by developing a more comprehensive approach to planning, policy and implementation than one actor could achieve by itself (Emerson et al., 2011; Gray and Purdy, 2018). A concept that is used synonymously with collaborative governance is co-management. It refers to a continuum of arrangements through which public and non-state actors negotiate and define a sharing of management functions, entitlements and responsibilities to govern a territory or set of natural resources (Cash et al., 2006; Gray and Purdy, 2018). In this way, collaboration negotiates a kind of hybrid regime between multiple levels that allocates recognised roles to involved actors, and establishes mutually agreed rules and procedures related to responsibility and authority sharing (Young, 2006).

G. Multi-level learning: learning happens when actors at multiple levels jointly engage in an iterative reflection process that occurs when experiences and ideas are shared (Dyball and Keen, 2005). Exposure to experiences and ideas that exist at multiple levels can facilitate the convergence of actors' perspectives related to a particular problem and possible solutions. Multi-level learning can for example occur through joint knowledge acquisition by actors at multiple levels. This can subsequently give way to shared understandings and integrated solutions that depend on the concerted action of multiple actors (Gonzales-Iwanciw et al., 2019). A structured learning process can be facilitated with experimentation and monitoring to produce experience through trial and error, and by exchanging the knowledge obtained (Cumming et al., 2013; McLain and Lee, 1996). Knowledge exchange and the deliberation between actors that follows determines their adaptive capacity to govern natural resources (Carlisle and Gruby, 2019).

H. Bridging organisations: Intermediary or bridging organisations are important to catalyse and facilitate linkages between different governance levels and deliver different services that enable cross-level interaction (Berkes, 2009; Olsson et al., 2006). These services include providing access to resources, building trust and resolving conflict between actors, and are often provided by civil society organisations. Since actors at different levels have their own ways to generate and store knowledge (Cash et al., 2006), bridging organisations can provide a forum in which these different knowledge types are translated and exchanged, and knowledge co-production, sense-making and learning are advanced (Berkes, 2009; Folke et al., 2005). The leadership that is provided by bridging organisations can significantly reduce the otherwise high transaction costs of collaboration (Folke et al., 2005). Bridging organisations are different from collaborative governance arrangements because they constitute a separate organisation with its own objectives, rather than a platform that other organisations use to collaborate.

I. Multi-level networks: networks constitute trust-based relationships between actors who are located at various governance levels. Informal networks, shadow networks (Olsson et al., 2006) or communities of practice (Pahl-Wostl, 2009) offer a forum where experience, values and information are shared, and where the rules and norms are set that shape governance (Cumming et al., 2013; Folke et al., 2005). Multi-level networks often aim to promote the implementation of specific natural resource management practices. By sharing a common set of understandings, viewpoints and passions, and by demonstrating their shared skills and techniques, network members cultivate a sense of belonging to their micro-cultures of values and meanings (Goldstein and Butler, 2010). Their informality and flexibility in membership makes networks important arrangements to foster learning and change (Pahl-Wostl, 2009), and facilitate the flow of different kinds of knowledge. By focusing on learning they can generate alternative approaches to emerging problems (Olsson et al., 2006).

5.3 Methods

Systematic literature review is a method that facilitates the comprehensive assessment of a large body of scientific literature by applying rigorous and transparent steps and criteria to draw conclusions about the reviewed literature (Petticrew and Roberts, 2006). The purpose of this systematic review is to find and define scale-sensitive governance arrangements in the forest and landscape restoration governance literature. With this aim, we systematically searched and selected scientific publications that focus on this theme. In this section, we provide details on how the literature was collected, managed and analysed.

5.3.1 Data collection

To find relevant scientific literature, we created a broad list of governance, restoration, cross-level and natural resource-related search terms (Annex B). While compiling the list of terms, we intended to be sensitive to the diversity of notions that are used in different sub-bodies of the restoration governance literature, including in the fields of biodiversity, climate change, forest, landscape and water. To direct our search to scale-sensitive governance, we included a number of scale-related terms. Inclusion of a diversity of notions allowed us to obtain the maximum variation sample needed to capture the multiple ways in which restoration-related, scale-sensitive governance processes can play out in practice, and further elaborate scale-sensitive governance theory (Bazeley, 2013).

To obtain an initial body of literature, as a *first step* we inserted the terms in the search engines Scopus and Web of Science. This yielded an initial sample of 1,735 articles. After merging both databases and excluding duplicates in the *second step*, the number was reduced to 1,344. To make sure that the main focus of the articles was on restoration governance, as a *third step* we read the title and abstract of each article and subjected these to inclusion and exclusion criteria (Annex C). This yielded 196 articles for full-text review. We only included peer-reviewed, empirical articles and excluded theoretical articles without case study descriptions or conceptual articles, given that our aim was to find and describe evidence of existing scale-sensitive governance arrangements in FLR literature. Articles that were focused on urban, marine and pollution remediation contexts were excluded due to their distinct features that are different from the review's focus on rural forest and landscape restoration governance. Articles focused on coastal ecosystems, such as mangroves and tidal marshes, were included. As a *fourth step*, we applied the criteria to the full-text of the remaining articles, which brought the number down to 84 articles that focused on scale-sensitive governance arrangements in FLR. The articles were imported into the qualitative data analysis software ATLAS.ti (version 8.4.24) for analysis.

5.3.2 Data analysis

To analyse our review articles, we went through a data management phase, followed by an abstraction and interpretation phase (Spencer et al., 2014). Firstly, we coded the literature with deductively-created codes that we derived from the scale-sensitive governance arrangements (Miles and Huberman, 1994) and which we applied cross-sectionally, across the entire dataset. Since relevant segments related to governance arrangements appear with different lengths in the text, we used 'idea, regardless of length' as segmentation criterion (Coffey and Atkinson, 1996). After coding all 84 articles, a dominant scale-sensitive governance arrangement was

Table 5.1 Steps to define the final sample

Steps	Number of articles
Step 1: literature search using governance, restoration, cross-level and natural resource-related terms	Initial scoping of literature through *Web of Science* and *Scopus* on October 6th 2020 (1,735 articles)
Step 2: merging of databases and exclusion of duplicates	Primary body of literature (1,344 articles)
Step 3: applying inclusion and exclusion criteria to title and abstract	Secondary body of literature (196 articles)
Step 4: applying inclusion and exclusion criteria to full text	Tertiary body of literature (84 articles)

determined for each article to extract the strongest examples. In each case, dominance was decided based on the number of meaning units that were coded for a specific arrangement. A higher number of meaning units tended to facilitate shaping a thicker description, and hence better understanding, of the governance context in which the arrangement played out.

Cases were clustered according to their dominant arrangement and location, and based on the coded meaning units the main author wrote a short narrative in table format for each case to capture the essence of the scale-sensitive governance arrangement. We undertook data management and interpretation simultaneously through an iterative process in which the data was compared and recombined (Tesch, 1990). The summary tables facilitated discussion among the authors to see whether cases were properly categorised. Every case was assessed by at least one other author. The summary tables provided a basis for analysis in which meaning patterns were searched (Spencer et al., 2014). Cases were compared to detect and display recurring evidence of similarities and differences within each governance category. While writing the narratives and comparing cases, the dominant scale-sensitive governance arrangement of 13 case studies was changed. For cases in which two interconnected governance arrangements could be substantiated, we selected one dominant category while highlighting this connection in the results chapter.

In Annex D we ordered cases according to dominant scale-sensitive governance arrangement. Within each arrangement, cases were ordered alphabetically according to continent, and within each continent, according to country. For each specific case, codes were developed that start with the letter of the arrangement and the number of the case within the arrangement. We added a two-letter internet country code to

cases that are limited to one country, and a three-letter regional code to cases that are international. In this way, B14ec refers to the fourteenth case of the 'moving tasks to other levels' arrangement and is based in Ecuador. H3*ehi* refers to the third case of the 'bridging organisations' arrangement and focuses on the East Himalaya.

5.4 Results

In this section, we indicate how the scale-sensitive governance arrangements played out in the 84 FLR governance case studies (Annex D). Although not completely representative for all possible scale-sensitive governance variations, the cases facilitate an improved understanding of existing scale-sensitive governance arrangements.

Case studies of scale-sensitive FLR governance have been found on all inhabited continents (*Map 5.1*). Some geographies, most notably the United States with 14 cases, are strongly represented in the dataset, while others are underrepresented or absent, like the former Soviet Union, Middle East and Northern Africa, the Sahel, Southern Africa and Canada. This does not mean that no restoration efforts took place in these geographies, but rather that such efforts were not reported in the peer-reviewed literature that was retrieved with our scale-sensitive governance-oriented search

Map 5.1 Locations of the case studies that are described in the 84 articles (national level case studies are positioned at national capitals, and one global case is positioned in the city where the reported initiative's secretariat is located). Green dots refer to forest-related case studies, blue dots refer to water-related case studies, and yellow dots refers to cases with a multiple ecosystems or biodiversity focus

terms. What can also be observed from Figure 2 is a divide between the global South and the global North. A larger share of forest-related restoration governance is seen in the global South (Africa, Central and South America, and South, East and Southeast Asia), while in the global North (United States, Europe and Australia) a larger share of water, and ecology and biodiversity-oriented restoration cases were found.

With regard to the occurrence of scale-sensitive governance arrangements across resource types and continents (*Figure 5.2*), a number of observations can be made. While cases that focus on forest resources make up the lion's share of cases that describe moving tasks to other levels, the other scale-sensitive governance arrangements show a more or less equal division between the different resource types. This could indicate that the governance arrangements are relevant to a diversity of restoration processes, regardless of the resource they target. Differences are clearer though when it comes to the continents in which scale-sensitive governance arrangements were found. While type B and F are mostly found in Asia, type E is mainly found in Europe. Type D is mostly found in South America, while North America takes up most of type G and I. A fairly equal spread of governance arrangements can be found

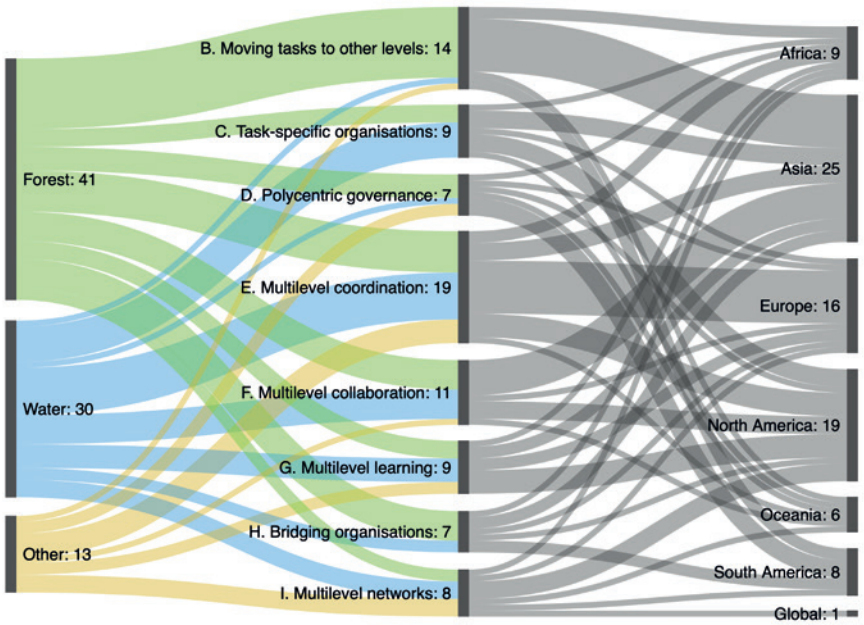

Figure 5.2 Occurrence of scale-sensitive governance arrangements in articles, across resource types and continents

in Africa and Oceania. In the following sections, evidence is presented of how the different scale-sensitive governance arrangements played out in the context of forest and landscape restoration.

A. Adding, removing or moving a general-purpose jurisdiction

No evidence of adding, removing or moving a general-purpose jurisdiction was found in our FLR literature set. A possible explanation is that forest and landscape restoration is not a core task of general-purpose jurisdictions, and would hence not justify such a drastic governance measure.

B. Moving tasks to higher or lower governance levels

Evidence for moving tasks to higher or lower governance levels was found in 14 case studies. Of these cases, 13 described processes of decentralisation from the national government level to sub-national governments at the regional (state, province) and local level (county, municipality, township), and to rural communities. One case study focused on task centralisation from the sub-national state level to the national level.

Restoration-related tasks were decentralised from national to regional level in four cases [B5in, B7ir, B10vn, B11vn], and decentralised even further to local government level in four other cases [B1cm, B3cn, B4cn, B14ec]. In six cases decentralisation occurred as part of national restoration programmes, to double the area for afforestation and ecological restoration [B5in]; regreen 12 million ha of barren lands and establish 5 million ha of new forest [B10vn, B11vn]; convert over 13 million ha of farmland to forest or grassland [B3cn, B4cn]; and restore 500.000 ha of native forest [B14ec]. In addition, decentralisation of restoration tasks happened as part of wider forest management tasks transfer to the local level [B1cm] or following a national plan that was prepared to the UNCCD [B7ir]. Decentralisation of restoration tasks from the national to sub-national government level was often done with the idea to better engage local actors, respond to local preferences and needs, and increase local benefits. However, the cases also describe a list of new challenges that emerged after tasks were moved. National governments imposed unfeasible restoration targets on local governments or formulated forest management rules that did not consider local conditions and interests [B10vn, B11vn, B14ec]. In some cases, local governments receiving restoration tasks remained primarily accountable to high level governments and could not always ensure meaningful community participation to select restoration sites and tree species [B3cn, B4cn, B5in]. Conversely, when national level checks-and-balances and monitoring was absent or inadequate following decentralisation, this opened the door for local governments to deviate from approved restoration

plans [B1cm]. It also happened that local government capacity was not enhanced by national actors to ensure adequate restoration-related extension services, or to meet biodiversity and water-related restoration objectives at the local level [B10vn, B11vn, B14ec].

In five cases, restoration-related tasks were decentralised from the national government level to rural communities [B2ke, B6id, B8kp, B9ph, B13br]. This happened by establishing community forest associations [B2ke], community forest groups [B9ph], and sloping land user groups [B8kp], by reforming forest tenure that introduced social forestry [B6id], and by tasking rural landowners to restore native vegetation on their property [B13br]. While decentralisation to the community level often gave communities collective land rights and better options to reap ecosystem benefits and improve livelihoods, several challenges were also highlighted in these cases. Decentralisation was not accompanied with clear indications of how local actors with restoration tasks would be financially and technically supported, or how groups could engage with international efforts to promote reforestation and avoid forest degradation [B2ke]. In other cases, the decentralisation process was i) contested because local groups would not recognise government authority over ancestral land [B6id]; ii) incomplete because the government would retain tasks related to tree species selection and land use planning [B8kp] or only involve local groups to implement tree planting activities, not to plan them [B9ph]; or iii) weak due to the low quality of extension services [B13br].

One case describes centralisation of restoration-related tasks from the regional to the national level [B12au]. This occurred to better deal with water scarcity, water pollution and salinity concerns in a river basin. Failure of state level governments to handle growing water-related challenges within their jurisdiction led to the transfer of basin management tasks to a Basin Authority, which became a national government agency in the process. This created a new restoration-related task-specific organisation. Centralised management ensured state level water plans were aligned to an overarching and enforceable integrated basin plan. However, imposing a technocratic solution also came at the cost of reduced legitimacy among land and water management groups at regional and local level, and an increased implementation deficit.

The cases indicate that decentralisation of restoration tasks played an important role to create local ownership, respond to local preferences and needs, and increase the benefits that local actors obtained from FLR. On the other hand, the cases sum up a diverse list of challenges that emerge following the moving of restoration tasks to other levels. Their prevalence may be the result of a difficulty for national governments to anticipate or control new challenges. It indicates that moving tasks to other levels alone is not enough to improve FLR governance.

C. Task-specific organisations

Evidence of task-specific organisations was found in 9 case studies. Six water cases dealt with lake habitat, river habitat and watershed restoration. Three forest cases focused on plantation forestry, reforestation and natural regeneration. While several organisations were specifically created for restoration purposes, others were established for natural resource management purposes and received restoration tasks later. The organisations were found at various levels.

International level task-specific organisations were found in three cases [C2*cas*, C5*eeu*, C6*cam*]. In these cases, task-specific organisations united multiple national governments to prevent desiccation and promote rehabilitation of a transboundary lake [C2*cas*], rehabilitate former floodplains and create river connectivity for barrier-free fish migration [C5*eeu*] and promote sustainable forest management and restoration in a transboundary biosphere reserve [C6*cam*]. While the international level organisations enabled national governments to work on transboundary restoration efforts, they mainly had convening and proposal-writing roles, with national or sub-national actors being in charge of implementation. Meeting restoration tasks has been difficult as a result, due to differing attitudes and communication challenges among countries [C5*eeu*], and because of difficulties with attracting national and international funds [C2*cas*, C6*cam*].

National level task-specific organisations were found in two cases [C1gh, C4ir]. At this level, a national development fund worked on expanding forest plantations at landscape level [C1gh] and a national committee sought to reverse water level decline of a lake and achieve minimal ecological flows to revive its biodiversity [C4ir]. Establishment of both organisations increased the attention that was given to restoration efforts. despite the increased attention to fulfil restoration tasks however, they both failed to achieve their objectives. The plantation development fund [C1gh] lacked transparency and accountability because it did not have a system in place to communicate eligibility criteria and information on funding cycles to intended beneficiaries. Meanwhile, the national committee [C4ir] fell short of its restoration goals since it was unable to control illegal water withdrawals, and because it did not plan non-agricultural livelihoods to decrease local dependence on agriculture. Neither organisation was sensitive to the needs of local actors.

Sub-national level task-specific organisations were found in four cases [C3cn, C7us, C8us, C9nc]. At the watershed level, organisations played a role in reversing water level declines [C3cn] and restoring instream fish habitat and riparian habitat [C7us, C8us]. At the ecoregion level, a task-specific organisation played a role in restoring

parts of a fragmented dry forest [C9nc]. Two organisations created positive impact by providing financial [C7us] and institutional [C9nc] stability to local actors to plan and implement restoration efforts. A state level watershed enhancement board provided long-term support and competitive project grants to watershed groups, and soil and water conservation districts to manage watersheds and recover salmon in the state [C7us]. Similarly, the creation of a legally-recognised natural areas conservancy gave more institutional and financial stability to an informal partnership of government and civil society actors, as it brought actors from various jurisdictions across an ecoregion together under the same umbrella [C9nc]. Conversely, in two other cases challenges emerged with local actors, either because task-specific organisations did not show downward accountability and imposed restoration targets from the top-down [C3cn], or because of a perception of restoration targets being imposed from the top-down [C8us]. In conclusion, while there may be clear benefits to create restoration-oriented task-specific organisations, their existence alone does not guarantee a smooth restoration process.

D. Polycentric governance arrangements

Evidence of polycentric governance arrangements was found in 7 case studies. Four forest cases focused on reforestation and natural regeneration, one water case dealt with river habitat restoration, and two other cases focus on ecosystem restoration. Polycentric governance arrangements typically span a variety of governance levels and types of actors, both public and non-state. What makes the cases differ from each other is the level at which they are orchestrated or catalysed. In all cases, public actors orchestrated polycentric governance.

One internationally orchestrated polycentric governance arrangement was found [D2*weu*]. An international river basin commission that united national governments adopted a programme to bring back salmon and other indigenous species to the river. The governments decided that intergovernmental agreements concerning the programme would be executed by the lowest possible government level in each country, and that countries could decide for themselves on the measures to achieve improved water quality and habitat connectivity. A similar governance logic was later followed to restore the river's floodplains and habitat.

Nationally orchestrated polycentric governance arrangements were found in two cases [D7co, D6br]. National governments created enabling policy frameworks by making zero-deforestation and restoration pledges [D7co] and by creating federal action plans that improve forest cover monitoring [D6br]. The policy frameworks enabled public and non-state actors at other levels to implement and monitor zero-de-

forestation and restoration efforts, pioneer new policy instruments, and create synergy between levels [D7co, D6br]. A sub-national policy instrument that was catalysed is the Rural Property Registry that delineates private properties and monitors whether legal forest cover requirements are met. The Registry, which was later expanded to the national level, enabled federal public actors to strengthen law enforcement in high-deforestation municipalities, and embargo properties with illegal deforestation until restoration measures were taken [D6br].

Sub-nationally orchestrated polycentric governance arrangements were found in four cases [D1ne, D3us, D4au, D5br]. Regional and local public actors enabled rural communities [D1ne, D4au], watershed groups [D3us] and municipalities [D5br] to play relevant roles in local restoration efforts. Both a regional government and a river basin commission worked directly with rural communities to help them create their own bylaws to guide farmer-managed natural regeneration [D1ne], and encourage them to engage in restoration efforts following awareness activities about local environmental problems [D4au]. A regional estuary management agency created and funded watershed organisations to strengthen the capacity of local actors to work on local ecosystem recovery priorities [D3us]. Lastly, a municipality created a legal framework that made it possible to use municipal funds to provide technical assistance and payments to landowners to conserve and restore private property [D5br]. This framework is now replicated by other interested municipalities throughout the country.

Government actors at different levels have been instrumental to give direction to restoration processes. By setting targets, raising awareness or creating enabling policy frameworks, public and non-state actors at lower or the same governance level were stimulated to play relevant roles in restoration efforts, while retaining their autonomy.

E. Multi-level coordination

We found evidence of multi-level coordination in 19 case studies. Six forest cases dealt with reforestation, natural regeneration and forest landscape restoration, while nine water cases focused on wetland, estuary, mangrove, river habitat and floodplain restoration. The remaining four dealt with ecological restoration where forest and river habitat are targeted simultaneously. Multi-level coordination differed from case to case in terms of the number of governance levels and actors involved. While in three cases coordination occurred exclusively between public actors [E3cn, E13*nor*, E14se], in the other 15 cases coordination took place between a mix of public and non-state actors.

Multi-level coordination to implement international policy frameworks was observed in seven cases [E6fr, E7it, E9it, E10nl, E11nl, E13*nor*, E16mx]. In European Union member states, cases referred to the implementation of the EU Water Framework Directive [E6fr, E9it, E10nl, E11nl, E13*nor*] and Habitat Directive [E9it, E10nl, E11nl, E13*nor*]. The cases touch on the role of public and non-state actors at different levels to implement the directives for wetland restoration [E9it] and floodplain restoration [E10nl, E11nl]. One case referred to how Integrated Coastal Zone Management principles, which are adopted at the EU level, are followed by governments at multiple levels to restore the ecological balance and improve productivity of shellfish farming in a lagoon [E7it]. In other countries, multi-level coordination occurred to implement UNFCCC frameworks that promote carbon sequestration through revegetation, reforestation and wetland restoration [E13*nor*, E16mx]. Implementation of international policy frameworks resulted challenging when trade-offs had to be found, such as when reconciling hydropower interests with restoring minimum flows and creating better conditions for migratory fish [E6fr]. Another challenge related to difficulties to bring together multiple planning efforts of federal, state and municipal actors to reduce and reverse deforestation and forest degradation emissions, and which were implemented in isolation from each other [E16mx].

Multi-level coordination occurred to implement national policy frameworks in six cases [E3cn, E5th, E14se, E15gt, E17us, E19au]. One case described how a national government actor engaged in both upward and downward coordination, to mobilise resources from global funding mechanisms, and implement restoration projects and build capacity of local natural resource management collaborations [E15gt]. In five other cases, national government actors engaged in downward coordination with regional and local governments [E3cn, E14se], rural communities [E5th] and indigenous communities [E17us, E19au] to implement restoration efforts. Coordination of national governments with regional and local governments has often not resulted in stronger local competence and expertise because of the high-paced, campaign-style character of restoration efforts [E3cn] or because of the short-term planning horizon of restoration projects, without guarantee for follow-up funding [E14se]. This has made it difficult for local governments to build their capacity to design appropriate restoration projects. As a result, national funds were mainly disbursed to local public actors that already had the ability to write successful restoration project proposals [E14se]. In one case, the national government overcame the capacity challenges of local public actors by coordinating directly with rural community associations and making sure that the associations could meet national mangrove tree planting targets with corporate social responsibility funds [E5th]. Meeting national targets with private funding caused a selection bias however, in which corporate finance mainly

flowed to communities with strong informal institutions that guaranteed success, while communities with weak informal institutions were neglected. In two other cases, national policy frameworks enabled indigenous communities to develop tribal visions to land management and restoration. The visions are based on indigenous values and holistic land management practices that are in line with traditional law, customs and culture, while also being consistent with national environmental requirements [E17us, E19au].

Multi-level coordination occurred to implement sub-national policy frameworks in three cases [E8it, E12nl, E18us]. Coordination occurred to promote reforestation in historically deforested plains at the regional level [E8it], develop and maintain a multi-functional floodplain [E12nl], and restore fish stocks and species diversity, unhealthy forest stands and habitat connectivity in a river basin [E18us]. In one case, a river basin council was instrumental to coordinate both a federal level restoration plan focused on public land, as well as a state level restoration plan that focused on private land [E18us]. Since the plans created a complex institutional structure, watershed councils and federal agencies established the council to coordinate both plans at the basin level. In another case however, actors at the national, provincial and local level could create a development plan that integrated both nature management and flood prevention functions in a floodplain, but then disagreed on how and through which actors the floodplain should be maintained [E12nl].

Multi-level coordination as a result of international development projects was observed in three cases [E1gh, E2mg, E4id]. The development projects provided funds to implement national restoration mechanisms, being an agroforestry system to interplant crops with timber trees [E1gh] and an Ecosystem Restoration Concession [E4id]. Funds were also provided to implement a restoration project in a landscape that was prioritised by a national working group [E2mg]. The international development projects produced both positive and negative vertical interplay. A donor-funded agroforestry scheme established positive interplay by investing in the social organisation and capacity of farmers. This improved farmers' negotiation skills to accommodate their interests in the scheme, while a nationally-funded scheme gave farmers little space to select tree species and establish interplanting rules [E1gh]. Negative interplay emerged from a project financing the establishment of an Ecosystem Restoration Concession. The project gave rise to strong disputes between the donor-funded company that managed the concession and indigenous groups who claimed customary rights over parts of the concession [E4id]. The dispute made development actors aware that they cannot delegate responsibility for adhering to environmental and social standards to implementing parties, if they want to prevent negative vertical interplay.

Concluding, multi-level coordination was mostly found in cases that describe how international, national and sub-national policy frameworks are implemented locally, besides cases that describe the implementation of international development projects. Both positive and negative vertical interplay was found, with positive interplay emerging when coordination expanded the human and financial capacity of local actors, while negative interplay emerged when high-level actors were not aware of the dynamics, interests and lack of capacity at lower levels.

F. Multi-level collaboration

Evidence was found of multi-level collaborative arrangements in 11 case studies. Five forest cases revolved around reforestation and natural regeneration, while five water cases dealt with estuary, wetland, mangrove and river restoration. One case focused on meadow restoration. Three different actor constellations were found: eight collaborations between governments and rural communities; two between governments at multiple levels; and two between governments at multiple levels, civil society organisations and private actors.

Multi-level collaboration between governments and rural communities occurred in seven cases [F1bd, F2in, F3id, F4np, F5ph, F6vn, F7pt]. Four cases in the global South described co-management arrangements that were established by international development projects to restore natural resources and concurrently improve livelihoods. To improve forest conservation and increase tree cover in protected areas, forest and environment departments [F1bd, F2in, F5ph] and a National Park authority [F3id] established community forest conservation and patrolling groups [F1bd, F3id], created micro-watershed management partnerships with rural communities [F2in] and issued mangrove stewardship contracts [F5ph]. These collaborations detailed the respective roles and responsibilities of public and community actors, and focused on the sustainable management and restoration of public lands, and on alternative livelihoods to reduce local dependence on the forest. In three other cases, co-management arrangements were not part of development projects but embedded in national policy frameworks. These included forest user groups through which communities can manage and restore forests, based on a negotiated and approved management plan with district forest offices [F4np], and community mangrove management that allows communities to use planted and protected mangroves for livelihood activities, based on ownership contracts with local governments [F6vn]. However, co-management did not always work out well [F7pt]. One case describes the dissatisfaction of a community group with the lack of intervention by the National Forest Service in a co-managed forest that was degraded by fires, tree diseases and invasive species. The community ended the co-management status and initiated its own forest recovery plan.

Multi-level collaboration between governments was found in two cases [F8us, F9us]. Both focus on efforts to restore coastal ecosystems, and involve both state level governments and federal agencies. In one case, a bay-wide management structure was created by three state level governments, a federal level agency and a task-specific organisation, to develop and implement multi-jurisdictional plans to improve water quality, and restore seagrass areas, oyster beds and wetlands in an estuary [F8us]. Similarly, five state level governments founded an alliance to implement an action plan for healthy and resilient coasts, which was supported by 13 federal agencies. The plan included coastal ecosystem conservation and restoration as a priority, and involved federal, state and local governments to implement related efforts [F9us].

Multi-level collaboration between governments, civil society organisations and private actors was found in two cases [F11au, F10us]. In both cases, governments at the federal and regional level collaborated with civil society and private actors to engage in restoration efforts covering both public and private lands. In one case, a degraded meadow was restored through a commercial timber harvesting and meadow restoration plan that was initiated by corporate members of a Community Forest and Watershed Collaborative Group. By including the goals and concerns of state and federal level agencies at an early stage, a coherent, large-scale timber production and meadow restoration plan was created that encompassed both private and federal land [F10us]. A similar public-private collaboration took place to restore threatened species in a river basin [F11au]. A federal agency, which was tasked with buying back water entitlements from private actors and undertaking environmental watering events, created water delivery partnerships with civil society and private actors. The aim of these partnerships was to recover threatened plant and fish communities in wetlands and on floodplains that are both publicly and privately owned.

Most multi-level collaboration cases occurred between governments and rural communities who shared responsibilities to sustainably manage and restore natural resources, and improve livelihood benefits. The collaborations were established by international development projects and by national policy frameworks. In addition, collaboration between governments at different levels, and between public, private and civil society actors has facilitated tapping into capacities that exist at different levels, and creating coherent restoration projects that cover both public and private land. Few challenges were reported in cases where multi-level collaboration was a dominant arrangement.

G. Multi-level learning

Evidence was found of restoration-related multi-level learning in 9 case studies. Three forest cases focused on reforestation, while four water cases dealt with river habitat, coastal habitat and wetland restoration. One case focused on ecological restoration, and another on invasive species eradication. Three forms of multi-level learning were distinguished: joint knowledge acquisition, experimentation and knowledge exchange.

Joint knowledge acquisition by actors at multiple levels occurred in three cases [G4fr, G5se, G7us]. Joint knowledge acquisition helped building trust, positive relationships and create common understanding in cases where actors at different levels had diverging interests related to river habitat restoration [G4fr, G5se]. In one case, a national water agency brought watermill owners, local elected officials and flood management experts together with scientists. Through interactive modelling of human and natural systems and role-playing games, the scientists created an understanding of the effects that certain decisions have, helped to find compromises, and encouraged actors to elaborate a shared watershed vision [G4fr]. While multi-level learning helped actors in this case to converge flood management and restoration goals and redefine problems on common ground, similar learning-based efforts in another case failed to overcome power imbalances between hydropower companies and government actors when trying to reconcile different river uses and functions [G5se]. Joint knowledge acquisition has been used to shape new restoration practices, such as when federal and state agencies, and civil society organisations engaged in blue carbon assessments and pilot projects to learn how to integrate blue carbon sinks, such as salt marshes, seagrass and mangroves, in national carbon accounting [G7us].

Experiments involving actors at multiple levels occurred in three cases [G3ph, G6mx, G9us]. Experiments were conducted to eradicate invasive mammals from biodiverse islands [G6mx], reintroduce grey wolves in a declining ecosystem [G9us] and identify attractive agroforestry practices for farmers near a natural park [G3ph]. In the case of invasive mammals eradication, experiments helped public, scientific and civil society actors to build experience and skills on small islands, and leverage success for eradication campaigns on larger, more complex islands. In another case, federal agencies reintroduced grey wolves in a National Park under experimental conditions, which meant that the wolves would not be protected under the Endangered Species Act in case they would cross the park's boundaries. This made ranchers surrounding the park accept the reintroduction, since wolves that would attack their livestock could be taken care of [G9us].

Knowledge exchange between actors at multiple levels was found in three cases [G1tz, G2ph, G8us]. Knowledge and best practices were exchanged between national government officers and district extension officers to improve the delivery of soil conservation knowledge and promote farmer participation at the community level [G1tz], between development project staff and a rural community to improve forest restoration [G2ph] and between national wildlife refuge managers and scientists to guide native habitat restoration [G8us]. While joint knowledge acquisition enabled building trust and creating common understanding to introduce new restoration practices, experiments helped to gain experience and skills, and reduce uncertainty associated with new restoration practices. Lastly, knowledge exchange helped to improve local restoration practices by tapping into knowledge that is present at other levels.

H. Bridging organisations

Evidence was found of 7 bridging organisations, operating at different levels. The organisations appeared in five forest cases focused on natural regeneration and reforestation, including of riparian zones and forested corridors, and two water cases dealing with wetland and river habitat restoration. Three types of bridging roles were found: organisations bridging between international ideas or frameworks and local conditions; organisations bridging between national policy and private land users; and organisations bridging between rural communities and higher-level actors. In all cases, the bridging organisations were civil society organisations that engaged in knowledge sharing, agenda setting and brokering between governance levels.

Organisations bridging between international ideas or frameworks and local conditions were found in three cases [H1gh, H2cn, H4*eeu*]. Conservation and development-oriented civil society organisations played an important role in translating global REDD+ frameworks to local contexts. At the same time, they also transformed global frameworks by highlighting local conservation-related challenges and the need for social safeguards in REDD+ [H1gh]. In two other cases, the World Wide Fund for Nature linked international ideas related to integrated river basin management [H2cn] and floodplain conservation and restoration [H4*eeu*] to national policy processes. Through successful local demonstration projects, the Fund gained credibility among policy-makers and considerably contributed to the high-level acceptance of both ideas.

Organisations bridging national policies and private landowners were described in one case [H5cr]. Associations, cooperatives and district centres in the agriculture, forestry and conservation sector were instrumental to connect a national payment for ecosystem services scheme to private landowners [H5cr]. They recruited landowners and facilitated agreements between landowners and the National Forestry Fund to promote land management practices for which payment could be obtained, such as conservation, natural regeneration, reforestation and agroforestry. Additionally, they supplied complementary services that made landowners benefit economically from land management, beyond the payment for ecosystem services.

Bridging organisations that function as intermediaries between rural communities and higher-level actors were found in three cases [H3*ehi*, H6bo, H7br]. In all cases, bridging organisations aimed to strengthen the role of rural communities in higher level restoration and land use planning processes. As part of an initiative to restore forested corridors between protected areas, a multilateral organisation advocated a multi-level approach and organised numerous participatory planning processes to involve rural communities, besides working with high-level actors [H3*ehi*]. Similarly, civil society organisations connected previously excluded indigenous communities to local governments [H6bo] and agribusiness actors [H7br] to work on land use planning and reforestation. In conclusion, while playing different roles in different contexts the various organisations have been instrumental in promoting restoration efforts by tapping into ideas and linking to actors that are located at different governance levels.

I. Multi-level networks

We found evidence of 8 networks composed of actors at multiple levels. Two forest cases dealt with reforestation and forest landscape restoration, three water cases focused on a floodplain, river and river delta, and three other cases focused on addressing diverse ecoregions, fire-dependent ecosystems and native ecosystems. The identified networks comprised only public actors [I1rw, I7au], a mix of public and civil society actors [I2hu, I8ar, I5us, I6us, I3*glo*] or only civil society actors [I4us]. Five networks had formal institutional structures, fixed events, set goals and budgetary support, while three others were informal groups with no fixed activities. While some networks emerged at local level, others were initiated at a higher level.

Formal networks were found in five cases [I3*glo*, I2hu, I8ar, I5us, I6us]. One network had global outreach, bringing together national governments, multilateral actors and conservation-oriented civil society and research actors to exchange knowledge and strengthen conditions for forest landscape restoration to meet public restoration

commitments [I3*glo*]. Two networks were established at the national level by both civil society and public actors, to promote landscape restoration efforts in different sub-national ecoregions [I8ar] and to develop and implement fire-dependent ecosystem restoration plans across administrative and managerial boundaries [I5us]. The latter network received federal funding and involved over 650 actors, united in 150 landscape collaboratives and 14 regional communities of practice, to design and implement restoration plans. Lastly, two formal networks emerged at the local level and were convened by civil society actors [I2hu, I6us]. One network started by protecting and restoring biodiversity in one specific watershed, and later expanded its scope to the regional level and facilitated the launch of a multitude of local clusters involving landowners, community groups, conservation organisations, scientists, and tribal, municipal, state and federal agencies [I6us]. In another case, a coalition of municipalities, civil society organisations and scientists emerged in a river basin to advance the integrated floodplain rehabilitation concept among national policy-makers and achieve flood prevention, rural development and nature conservation at the local level [I2hu].

Informal networks were found in three cases [I1rw, I4us, I7au]. Two networks were formed to exchange information. This varied from a WhatsApp group of national level and district level civil servants exchanging information on forest landscape restoration and reforestation policy challenges [I1rw], to state level scientific experts and catchment level extension staff informally exchanging information on recovery-based river management after staff and budget cuts had ended formal relationships between the two groups [I7au]. Lastly, scientific and civil society actors formed a network to address water overallocation and restore environmental flows to restore bird habitat in a transboundary river delta [I4us]. The network helped to shape public programmes and policies, and managed to establish a water trust that acquired permanent water rights to restore habitat.

All eight networks were instrumental to build skills, exchange knowledge and experiences, and create a professional identity. Often through informal face-to-face interaction, they facilitated a shared understanding of challenges and the pursuit of common restoration goals.

5.5 Discussion

First, we identified nine scale-sensitive governance arrangements that aim to create cross-scale fit and cross-level alignment. Second, we started this review to find evidence of these arrangements in the FLR literature. We wanted to understand their characteristics and how they have played out in practice. Based on 84 peer-reviewed, empirical articles we found that eight of the nine types of scale-sensitive arrangements are used in FLR governance. The eight arrangements occurred in cases that targeted different natural resource types, indicating their prevalence in a wide variety of landscape restoration efforts. In addition, arrangements that are part of the same category were found at different governance levels or spanning different levels, which underlines the relevance of the arrangements from the international to the local level.

Evidence of cross-scale arrangements (B,C) showed how better fit can be created between the governance and ecological scales, by changing governance arrangements in such a way that ecological phenomena are governed at appropriate levels. When it comes to moving tasks to other levels (B), we found that for most cases restoration tasks had been decentralised from the national level to regional and local governments, and down to rural communities, while only one case reported the centralisation of restoration tasks. It turned out to be difficult for national governments to anticipate or prevent new challenges and difficulties from emerging after such drastic governance measures. Still, decentralisation played an important role in engaging local actors, responding to local needs and preferences, and increasing local benefits. Meanwhile, centralisation of tasks enabled stronger government control in a context where this was judged to be required. We found task-specific organisations (C) at the international, national and sub-national levels. It shows that this type of arrangement is seen as having an added value at multiple governance levels, to provide a public good or solve a common pool resource problem. However, similar to moving tasks to other levels, we found a number of challenges associated with task-specific organisations, suggesting that their existence alone does not guarantee a smooth restoration process.

Due to its comprehensive nature, polycentric governance (D) is an arrangement that has both cross-scale and cross-level characteristics. We found that government actors at different levels have been active in orchestrating restoration processes that involve multiple actors at different levels. By setting targets, raising awareness and creating enabling policy frameworks, government actors stimulated other public and non-state actors at lower or similar governance levels to play relevant roles in restoration efforts while retaining their autonomy.

Evidence of cross-level arrangements (E,F,G,H,I) showed how increased alignment can be created between different governance levels by enhancing human and financial capacities to restore at other levels, sharing restoration responsibilities, and by connecting actors at different levels to facilitate learning, and share ideas and experiences. Multi-level coordination (E) mostly occurred in cases that focused on implementing international, national and sub-national policy frameworks, next to cases focused on international development projects. Cases highlighted both positive and negative interplay between actors at different governance levels, with the latter emerging when actors at one level were unaware of the dynamics, interests or lack of capacity that exist at other governance levels. In most cases, multi-level collaboration (F) has enabled governments and rural communities to share responsibilities to sustainably manage and restore natural resources. We found that different forms of collaboration facilitated tapping into capacities that are present at different levels and in some cases enabled creating coherent restoration projects that comprise both public and private land. When it comes to multi-level learning (G), joint knowledge acquisition among actors at multiple levels built trust and created a common understanding to introduce new restoration practices. Meanwhile, experiments that involved actors at multiple levels helped to gain experience and skills, and reduce uncertainty associated with new restoration practices, while knowledge exchange facilitated tapping into knowledge that is present at other levels. Lastly, bridging organisations (H) and multi-level networks (I) were instrumental to promote restoration efforts by tapping into ideas and linking to actors at different governance levels, and by exchanging experiences, facilitating learning and building skills.

Although we identified one dominant scale-sensitive governance arrangement for each case, the arrangements are not necessarily mutually exclusive but rather overlap in several cases. Different arrangements may occur simultaneously or sequentially. For example, a multi-level network of civil society organisations successfully lobbied for the establishment of a water trust, which is a task-specific organisation, to acquire permanent water rights to restore habitat in a river delta [I4us]. In another case, a task-specific organisation that managed an estuary created a polycentric governance arrangement by establishing and funding watershed organisations that empowered local actors in different watersheds to work on local restoration priorities.

The scale-sensitive governance framework, which we elaborated and specified further based on the original notion (Padt et al., 2014), turns out to be well applicable to the FLR governance literature. The only arrangement that was not found is 'adding, removing or moving a general-purpose jurisdiction' (A). General-purpose jurisdictions,

such as municipalities and provincial governments, fulfil a multitude of tasks that have no relation with the implementation of FLR, including education, healthcare, infrastructure maintenance and waste collection. Given the low priority that is generally given to environmental management by public actors, it is unlikely that a measure like category A would be justified to reach ecological objectives. The impact that this governance arrangement would have on other tasks of a jurisdiction makes this option impractical. Such a drastic measure might also not needed, given that there are other options to aim at creating better fit with ecological processes that do not impact the functioning of other government departments.

For each of the other eight governance arrangements, a minimum of seven and a maximum of nineteen cases was found, giving a rich picture of how FLR has been advanced by different scale-sensitive governance arrangements. While some of the arrangements, such as task-specific organisations or multi-level networks were easily recognisable, others were harder to distinguish, given that the way in which they play out in practice is relatively similar. An example is polycentric governance and multi-level coordination that represent fairly loose interactions between different governance levels, and hence require a relatively thick description of the governance context to be distinguished.

In *Table 5.2* we summarise the contributions and related challenges of the eight arrangements we found in the FLR literature. Different suggestions can be made to overcome the challenges. First, the presence of governance arrangements that aim to create fit with ecological processes seems to be not enough to guarantee smooth restoration efforts. The high prevalence of cross-level challenges suggests that additional governance arrangements are needed that are aimed at cross-level alignment; so that actors at multiple levels can interact and provide feedback about the challenges that follow a redesign of the governance scale. Second, it seems crucial that restoration governance efforts take a long-term perspective in which there is room to acknowledge and balance the needs and interests that exist at different levels, and iteratively manage challenges that arise. To overcome cross-level challenges, it is necessary that both higher level as well as lower level restoration actors show genuine willingness to work together to make restoration efforts a success.

While the 84 cases offer a comprehensive overview of how scale-sensitive governance arrangements have played out in practice, this review does not give an exhaustive overview. More examples can likely be found in both the scientific and gray literature that fell outside our search terms' reach. In addition, to obtain the dataset for this review, we selected search terms that capture arrangements that create better spatial fit between the governance and ecological scales, and arrangements that better align

different governance levels. While also relevant, we did not focus on cases that specifically create better temporal fit between the governance and ecological scales.

When it comes to the cases that are reported in the literature, there is a bias towards countries in the global North where strong restoration-related policies exist (e.g. the United States and European Union member states) and relatively safe countries in Latin America, Sub-Saharan Africa and Southeast Asia where international development partners implement FLR efforts. There are few reported cases from the former Soviet Union, the Middle East and Northern Africa, or from conflict regions like Afghanistan, the Sahel, Horn of Africa and the Congo Basin. Nevertheless, it is important to also capture lessons from these regions related to how FLR is governed. When efforts of civil society organisations or international actors are studied, it is possible that most emphasis is placed on the achievements, positive impact and future potential of the restoration strategies they implement, while less attention is given to the challenges associated with these strategies. This could explain the lack of challenges reported as part of some governance arrangements, like bridging organisations and multi-level networks. Furthermore, underlying motivations are likely to influence how restoration efforts are carried out. Actors will make different choices when they primarily have soil and water conservation, ecological connectivity, carbon sequestration or rural livelihoods in mind. This will not only influence their restoration strategies but also the spatial and temporal reach of their strategies. In arid regions soil and water conservation are likely to be a main motivation, while in tropical regions ecological connectivity and carbon sequestration are more prominent.

The governance arrangements that are used across multiple governance levels to promote FLR at the local level, as well as the challenges these arrangements face, have often been overlooked in the FLR literature (Wiegant et al., 2020). By presenting evidence of how scale-sensitive governance arrangements were used to promote FLR, we aim to give practical ideas to improve ongoing and future environmental governance efforts, while informing actors about the challenges that are found as part of specific arrangements. However, a better understanding of the scale-sensitive governance arrangements that aim to create cross-scale fit and cross-level alignment to promote FLR is not enough. Our review shows that new mismatch and misalignment can follow the establishment of a scale-sensitive governance arrangement. This suggests that it can be hard to create sustainable cross-scale fit and cross-level alignment. Hence, future research efforts need to focus on the governance strategies that are implemented by governance arrangements to overcome new challenges that emerge in the FLR implementation process. Exploratory case study research could help in identifying such governance strategies and clarify their relationship to the challenges they aim to address.

Table 5.2 Summary of the main contributions of, and challenges related to, the identified scale-sensitive governance arrangements in the FLR literature

Arrangement	Main contribution	Challenges encountered
B. Moving tasks to higher or lower governance levels	Decentralisation: ▪ Increased local ownership; ▪ Improved response to local preferences and needs; ▪ Strengthened local land rights; ▪ Increased local options to benefit from ecosystem functions and improve livelihoods. Centralisation: ▪ Increased consistency and control to deal with natural resource management challenges.	Decentralisation: ▪ High-level targets and rules lacked consideration for local conditions, capacities and interests; ▪ Impeded community engagement because of upward accountability; ▪ Caused inadequate local practices because of absent national monitoring and support mechanisms, as well as checks-and-balances. Centralisation: ▪ Reduced local legitimacy and enlarged implementation deficit.
C. Task-specific organisations	▪ Facilitated transboundary efforts; ▪ Increased public attention for environmental governance; ▪ Created financial and institutional stability to plan and implement environmental governance.	▪ Lacked effectiveness when missing transparency and accountability towards local actors, and when not being sensitive towards local needs. ▪ Lacked impact when being in a convening instead of an implementing role;
D. Polycentric governance	▪ Higher-level policy frameworks, awareness raising and target setting encouraged implementation of locally-appropriate measures, new policy instruments and cross-level synergy.	*No challenges were identified in the polycentric governance cases.*
E. Multi-level coordination	▪ Facilitated the implementation of policy frameworks and international development projects across levels; ▪ Facilitated synergy between public and private efforts at various levels.	▪ Resulted challenging when trade-offs between economic and ecological uses had to be found, planning efforts occurred in isolation, or disputes arose about legitimacy or maintenance; ▪ Did not result in stronger local implementation capacity, when it was short-term.

F. Multi-level collaboration	▪ Facilitated tapping into capacities at different levels to promote environmental governance and strengthen livelihoods; ▪ Facilitated synergy between public and private efforts at various levels.	▪ Resulted challenging when the efforts of one actor did not meet the expectations of another actor.
G. Multi-level learning	▪ Created trust, positive relations and common understanding between actors at different levels, through joint knowledge acquisition; ▪ Created experience and skills, and reduced uncertainty through experimentation; ▪ Facilitated tapping into knowledge at other levels through exchange.	▪ Failed to overcome power imbalances when actors sought ways to reconcile economic uses and ecological functions.
H. Bridging organisations	▪ Connected international ideas and frameworks to local conditions; ▪ Connected higher-level policy frameworks and actors to rural communities and landowners.	*No challenges were identified in the bridging organisation cases.*
I. Multi-level networks	▪ Facilitated building skills, exchange knowledge and experiences, and creating a professional identity by bringing actors together; ▪ Facilitated shared understanding of challenges and pursuit of common goals among actors at different levels.	*No challenges were identified in the multi-level network cases.*

5.6 Conclusion

We proposed a conceptual framework of nine scale-sensitive governance arrangements that are relevant for the wider natural resource management community. By applying the scale-sensitive governance framework to the FLR literature, we obtained evidence for how eight of these scale-sensitive governance arrangements played out in practice, to create better fit between the governance and ecological scales, and/or better alignment between governance levels. The 84 case studies on which this review builds gave a grounded understanding of how cross-scale fit and cross-level alignment can be created in forest and landscape restoration governance. For several scale-sensitive governance arrangements, we identified a number of related challenges, indicating that the presence of scale-sensitive governance arrangements is not enough to guarantee a smooth restoration process. Rather, continuous effort and follow-up action is needed to address new challenges that emerge when governance arrangements are altered. Our comprehensive overview of the different governance arrangements can be helpful to improve environmental governance across scales and levels, and could contribute to make the UN Decade on Ecosystem Restoration a success.

6

Ecuadorian water funds' use of scale-sensitive strategies to stay on course in forest and landscape restoration governance

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Abstract

Water funds are task-specific organisations that conserve and restore watersheds. The funds provide sustained finance and a collaborative space for actors at different levels to improve the water regulation functions of upstream ecosystems, safeguard water quality, and establish ecological connectivity with the aim of ensuring downstream water quantity and quality. However, while implementing conservation and restoration efforts at the local level, water funds encounter scale challenges, consisting of mismatches between the ecological and the governance scale and misalignment between governance levels. This study's aim is to identify and unravel both the scale challenges with which two Ecuadorian water funds (FONAG and FORAGUA) were confronted and the scale-sensitive governance strategies that they planned and deployed to overcome them. We collected data through a document review, 48 semi-structured interviews, and participatory observation, and used content analysis methods to analyse the interview transcripts. Consequently, at both funds, we identified a blind spot towards rural livelihood realities, a temporal mismatch between short-term election cycles and long-term restoration timelines, and a spatial mismatch between the reach of restoration efforts and degradation processes. At FORAGUA, we also identified heterogeneity across levels regarding the purpose of restoration, with different spatial implications. We identified a total of 12 tailored strategies that the two water funds deployed or aim to deploy in reaction to these challenges in an attempt to re-create fit with ecological processes and alignment with other governance levels. Some of these strategies caused new scale challenges to emerge. By observing and acting on emerging scale challenges, water funds try to stay on course to achieve restoration objectives. We conclude that the water funds, which are governance arrangements designed to create spatial and temporal fit with ecological processes, have to continuously adapt their governance strategies to maintain cross-scale fit and cross-level alignment.

6.1 Introduction

Mountain forests and humid grasslands (*páramos*), as found in the Ecuadorian Andes, fulfil important ecosystem functions such as water regulation and water quality improvement, habitat provision, and carbon sequestration (Buytaert et al., 2006; Martín-López et al., 2019; Rolando et al., 2017). The ability of these forests – and particularly the *páramo* – to store, infiltrate, and slowly release large quantities of water reduces the adverse effects of drought and flooding, and their ability to retain sediments and nutrients ensures excellent water quality. *Páramo* water is used intensively for consumption, irrigation, and hydropower generation, and some Andean cities depend almost completely on it (Buytaert et al., 2006). In addition, the region is home to two biodiversity hotspots – the Tropical Andes and the Tumbes-Chocó-Magdalena Corridor (Mittermeier et al., 2011) – which enjoy high levels of endemism. Lastly, numerous rural communities rely on the rich soils and abundant grasslands of the highlands to sustain their agricultural livelihoods (Goldman-Benner et al., 2012).

The conversion of mountain forest and grassland ecosystems to make way for agriculture and livestock grazing has greatly jeopardised their water regulation and habitat provisioning functions (Buytaert et al., 2006; Magrin et al., 2014; Ochoa-Tocachi et al., 2016). The degradation of *páramos* through increased sedimentation, livestock manure, and pesticide use has lowered their water quality. Mountains are among the most vulnerable ecosystems, with low rates of recovery after disturbance (Rolando et al., 2017). Besides these land-use changes, biodiversity and water security will be increasingly affected by the potentially very high impact of climate change in the Andes region (Espinoza et al., 2020; Ilbay-Yupa et al., 2021; Kleemann et al., 2022). When this is combined with population growth, Ecuador faces growing challenges regarding adequate water quantity and quality and meeting urban water consumption and irrigation demands (Buytaert and De Bièvre, 2012; Kauffman, 2014). Given their importance in terms of hydrology and biodiversity, degraded *páramos* and mountain forests have become the target of landscape restoration efforts (Bremer et al., 2019, 2016).

In Ecuador, and Latin America more broadly, water funds have been on the rise since 2000 as a mechanism that links downstream water users and upstream land users. These funds are user- and externally funded mechanisms that invest in the conservation and restoration of natural ecosystems and sustainable land management in upstream areas (Bremer et al., 2016; Goldman-Benner et al., 2012; Joslin, 2020; Kauffman, 2014; Raes et al., 2012). Bremer et al. (2016) found that the primary objectives of water funds in Latin American relate mostly to water quantity and quality,

including securing baseflows and reducing sediments. In addition, many funds explicitly pursue social and biodiversity objectives, in which conserving and restoring natural ecosystems is seen as a means to achieve water quality and quantity objectives. Three organisational models conceptualised in the context of water funds influence the governance strategies that water funds deploy to achieve their restoration objectives (Bremer et al., 2016). Water funds may follow an agency model, in which case they implement activities by themselves. An outsource model is followed when a water fund contracts third parties to carry out activities that it designed. Lastly, a grant model is followed when water funds review and fund proposals designed and submitted by other actors.

Their explicit focus on watershed conservation and restoration makes water funds task-specific organisations (Marks and Hooghe, 2004). The funds foster multi-level collaboration by providing an institutional space for actors at different governance levels to promote restoration processes (Emerson et al., 2011). Lastly, water funds function as bridging organisations (Berkes, 2009) by linking actors who aim to safeguard mountain ecosystem functions for upstream rural communities and private landowners. In these ways, water funds aim to create cross-scale fit and cross-level alignment and can hence be termed scale-sensitive governance arrangements (Wiegant et al., 2022b).

Previous research has focused mainly on water funds' financial mechanisms and institutional structures (e.g. Goldman-Benner et al., 2012; Raes et al., 2012; Kauffman, 2014; Bremer et al., 2016). However, there is little empirical evidence confirming how water funds implement their restoration strategies and what the effects of these strategies are on creating fit with ecological processes and alignment with the needs and preferences of actors at other governance levels (Bremer et al., 2016; Joslin, 2019). This is crucial information, as the long-term success of restoration efforts depends both on the ability of governance strategies to fit the spatial and temporal reach of ecological processes and on the degree to which rural communities are willing and able to sustainably adapt their livelihoods to conservation-oriented land-use practices (Erbaugh and Oldekop, 2018; Kauffman, 2014).

Governance arrangements created to implement landscape restoration objectives are likely to be confronted with scale challenges (Cash et al., 2006) consisting of mismatches with the ecological processes that the arrangements aim to influence or misalignment with actors at other governance levels (Wiegant et al., 2020). Mismatches refer to challenges that play out across the ecological and governance scales, and misalignment refers to challenges that play out across governance levels. Both threaten to undermine the resilience of a human–environment system.

To effectively deal with scale challenges that emerge in implementation processes, actors need to deploy governance strategies that aim to create cross-scale fit and cross-level alignment (Wiegant et al., 2022b). Such scale-sensitive strategies can help actors to stay on course to achieve their restoration objectives in a context in which scale challenges continuously emerge. By analysing two Ecuadorian water funds – the Water Protection Fund (FONAG) and the Regional Water Fund (FORAGUA) – we obtained an understanding of the scale challenges that emerge in different institutional settings and the scale-sensitive strategies deployed to try to overcome these.

The research question that we pose is: what scale challenges do water funds encounter in the process of implementing their restoration strategies at the local level and what scale-sensitive governance strategies do the funds and their implementing partners deploy to pursue their objectives? To answer this question, in section 2 we explain the scale challenge and scale-sensitive governance concepts in the theoretical framework. In section 3, we describe the two water funds and their restoration strategies, and we explain our data collection and data analysis process. In section 4, we present the scale challenges and the scale-sensitive governance strategies that we identified. In section 5, we focus on the meaning of our findings and their implications for future restoration efforts.

6.2 Theoretical framework

6.2.1 Scale challenges

Many of the pressing problems that society faces today, such as land degradation, biodiversity loss, and climate change, are cross-scale and cross-level in character (Termeer et al., 2010). These problems result from interactions between social and ecological systems (Cumming et al., 2006) and manifest themselves from global to local levels. Scale theory facilitates the structured analysis of complex cross-scale and cross-level interactions that occur between and within ecological and social systems. Padt and Arts (2014) defined scale as an analytical tool with a graduated range of values that can be used to measure and study ecological and social phenomena. The demarcation of a scale and its levels is an attempt to order inherently fuzzy and fluid ecological and social phenomena by fitting them within its boundaries (Padt and Arts, 2014). Levels are the units of analysis that exist at different positions on a scale (Cash et al., 2006). They are not quantitative units but rather a qualitative order of measurement, which can sometimes be ordered hierarchically (Padt and Arts, 2014).

We distinguish the ecological and the governance scale given that, in forest and landscape restoration (FLR), actors at various governance levels aim to influence relevant processes on the ecological scale (Wiegant et al., 2020). In our research, the ecological scale comprises the different levels at which processes of land degradation and restoration unfold, influencing the provision of ecosystem functions. The governance scale captures all relevant elements for governing the processes (Termeer and Dewulf, 2014) and facilitates the analysis of how tasks are distributed among actors at different levels. We identified the national, municipal, and community levels as the relevant governance levels regarding the restoration efforts of Ecuadorian water funds. Ecological phenomena and governance arrangements have a spatial and temporal dimension, that is, their spatial and temporal reach (Cash et al., 2006).

Scale challenges emerge as a result of a mismatch between scales or misalignment between levels and lead to undesirable situations for ecological or social systems, or both (Cumming et al., 2006). Such challenges may be caused by diverging spatial or temporal dimensions of ecological processes on the one hand, and the arrangements governing them on the other (Wyborn and Bixler, 2013). Cash et al. (2006) defined three types of scale challenges (A, B, and C):

A) Blind spot: refers to a failure to recognise crucial cross-scale and cross-level interactions, and hence comprehend the complexity of a social-ecological system. This scale challenge can emerge from inexperience, neglect of phenomena at other scales and levels, or an over-simplified understanding of the functioning of ecological or social phenomena. When part of the problem is isolated and focus is placed on only one level, while interactions of a phenomenon across scales and levels are left unquestioned, solutions may be ineffective.
B) Mismatch: refers to a persistent mismatch between the governance and the ecological scale. This typically emerges when a governance arrangement mismatches with the ecological process that it is meant to govern. A spatial mismatch emerges when the spatial reach of a governance arrangement does not fit the spatial reach of an ecological problem, and a temporal mismatch means that the arrangement does not fit the temporal reach of the problem (Termeer and Dewulf, 2014).
C) Plurality: refers to a failure to recognise and support heterogeneity in how problems are perceived by actors at different levels. It emerges from the flawed assumption that there is one single correct way – which is the same for all actors involved – to analyse or tackle a problem. Such a simplification has great consequences when it leads to the inclusion or exclusion of certain actors and places dominant actors at the centre of power (van Lieshout et al., 2011). This may result in ineffective decision making and unsustainable outcomes for those whose interests were not considered (Cash and Moser, 2000).

6.2.2 Scale-sensitive governance arrangements and strategies

Scale-sensitivity describes the ability of actors to observe and act upon cross-scale and cross-level challenges when these emerge (Termeer and Dewulf, 2014). In FLR, scale-sensitivity is based on understanding the spatial and temporal requirements of ecological processes and on actively listening to and observing the needs of actors at different levels. Scale-sensitive governance can reduce the adverse effects that cross-level misalignment and cross-scale mismatches can produce. For example, it can draw attention to the needs and priorities of local actors who were previously overlooked by higher-level actors as a result of a blind spot. To increase policy effectiveness, scale-sensitive governance can also aim to better fit an existing policy to the spatial or temporal dimensions of the ecological process that it aims to influence.

Scale-sensitive governance can manifest itself in creating new arrangements or in deploying new strategies. Wiegant et al. (2022) showed that different governance arrangements have the potential to create cross-scale fit. Moving tasks between governance levels or creating task-specific organisations can create fit between the ecological and governance scales by enabling actors at the most appropriate governance level to comprehensively govern an ecological phenomenon, such as a forest or a landscape. Polycentric governance arrangements can create cross-scale fit when actors at multiple governance levels address a common ecological problem (Cumming et al., 2013). In addition, there are various arrangements that can create alignment between governance levels. These are coordination, collaboration, and learning that take place between actors at different governance levels, as well as between bridging organisations and multi-level networks (Wiegant et al., 2022b).

However, even when governance arrangements are in place that have the potential to create cross-scale fit and cross-level alignment, actors are likely to encounter unforeseen mismatches or misalignments that emerge when they implement their policy objectives. These challenges reveal the adverse side-effects of the actors' initial strategies, which hamper the attainment or sustainability of their policy objectives. Governance actors will then have to deploy different strategies that create cross-scale fit or cross-level alignment to stay on course in a context of emerging scale challenges. We term governance strategies designed to create cross-scale fit and cross-level alignment as scale-sensitive. This starts with observing the interdependencies between scales and across levels to tackle a blind spot, understanding possible mismatch and misalignment, and – to tackle challenges relating to plurality – identifying cross-level issues that influence the inclusion of actors at other levels whose views have not been sufficiently considered (Termeer and Dewulf, 2014). Scale-sensitive governance arrangements and strategies are two components of an iterative governance process in which fit and alignment are continuously created and recreated.

6.3 Methods

6.3.1 Research approach

Our research builds on an exploratory case study design to ascertain perceptions about how restoration strategies are implemented, the cross-scale and cross-level challenges that emerge in the process, and the strategies that water funds deploy to overcome them. Bennett (2016) argued that perceptions are particularly valuable evidence to gain knowledge on conservation outcomes. In our fieldwork, we focused on understanding the multi-level context of landscape restoration governance by building on the lived experience of actors involved in, and affected by, water funds' landscape restoration efforts. By analysing governance strategies in two case studies, we generated practical and contextually rich knowledge that aligns closely with the level of conservation and restoration action and builds an understanding of governance processes from the ground up (Wyborn and Evans, 2021). To ensure comparability, in both cases we followed the same research design and methods and applied the same sensitising concepts regarding scales, levels, scale challenges, and scale-sensitive governance.

6.3.2 Case selection

With the aim of studying the interaction of scale challenges and scale-sensitive governance strategies in differing institutional contexts, we selected two water funds that follow different institutional models. FONAG follows the agency model, meaning that it implements restoration efforts by itself. This requires the water fund itself to have substantial technical and human resources. Following its establishment, FONAG gradually expanded its capacity in terms of technology, tools, expertise, and knowledge (FONAG, 2019). Restoration efforts are implemented by its technical secretariat consisting of around 65 staff members. FORAGUA follows the grant model, meaning that it reviews and approves restoration proposals made by partners or members. In the FORAGUA case, restoration projects are planned and implemented by the environmental management departments of member municipalities. To become a member, municipalities need to pass a municipal ordinance that institutes an environmental tax on water use (Kauffman, 2014), which is then transferred to the fund. Members submit annual investment plans to the fund in which they propose conservation and restoration projects and which they implement with technical support from FORAGUA.

To study the local implementation of FONAG's and FORAGUA's restoration strategies, we identified rural communities and member municipalities that represent typical cases in terms of interaction between the funds and local actors (Lichtman, 2014). Given the scant documented history of restoration efforts, verbal recommendations

by the funds' technical secretariats and other actors were important for identifying local restoration efforts. For FONAG, we focused on the indigenous Oyacachi community, where the water fund has worked since 2004 and negotiated a voluntary conservation agreement that promotes sustainable land use in the upper parts of the *páramo*. The long-term relation between the community and the fund and the establishment of a conservation agreement were important selection criteria because they point to a rich collaboration history that can be studied. In the FORAGUA case, we selected five member municipalities with which the water fund implements restoration efforts – Celica, Loja, Palanda, Pindal, and Zamora. Municipalities were selected with the aim of representing municipalities that demonstrate different types of interactions with FORAGUA, ranging from constructive to conflictive. In Loja municipality, a watershed was identified that involved multiple landowners and purchased land with the aim of understanding the local impact of the fund's restoration efforts, and in which a FORAGUA member had conducted restoration efforts for over 10 years.

6.3.3 Data collection

We base our results on three data collection methods. We conducted a review of documents related to the two water funds, 48 semi-structured interviews, and participatory observation during fieldwork between August and December 2019. One researcher was embedded at the technical secretariat of each water fund for several months; this helped in accessing relevant documents, such as strategic and action plans, proposals, conservation agreements, and data sheets. The extent to which the restoration efforts were well documented differed per water fund. We conducted semi-structured interviews to capture the lived experience of actors involved in, or affected by, the two water funds' restoration strategies. In this way, we created a thick description of the implementation process for restoration efforts.

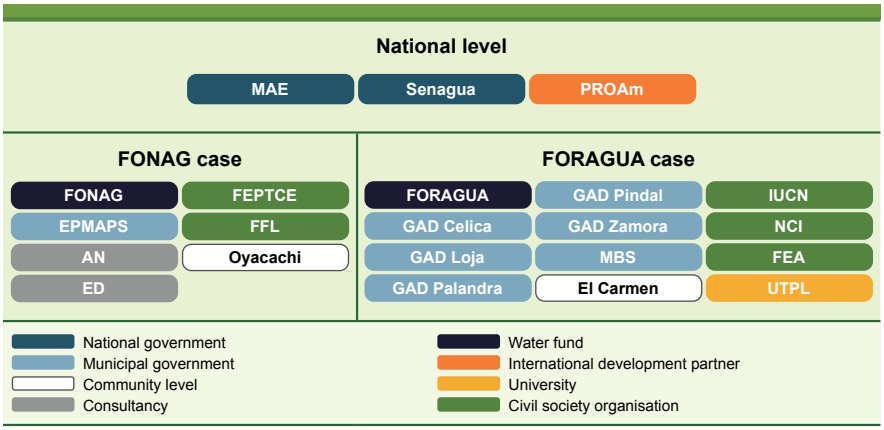
We used purposive and respondent-driven sampling to find relevant respondents (Russell Bernard, 2011). Purposive sampling is based on the researcher's judgement of who can best provide important knowledge and critical perspectives, whereas respondent-driven sampling is based on a chain-selection of respondents, with one respondent recruiting others. We applied the latter method in local contexts where it was more difficult to find respondents. Such respondent-driven sampling (Russell Bernard, 2011) can create bias, as it can lead to the researcher being referred to a respondent's family members and acquaintances who share similar opinions and experiences. The ways in which this possible bias was overcome include a large sample size comprised of different groups and perspectives in the community, gender and age balance, and cross-checks of information to verify respondents' answers where possible.

Figure 6.1 indicates the affiliation and position of respondents. To guarantee anonymity, we gave respondents a code consisting of the abbreviation of their organisation or the name of their community, as well as a number when more than one person from an organisation were interviewed. For example, FONAG2 refers to the second person interviewed at the Water Protection Fund. In the results, references to respondents are indicted by initials or by community (see *Figure 6.1*) between brackets [...].

Interviews were semi-structured, using interview checklists (Berg, 2001; Russell Bernard, 2011). Space was given to respondents to expand on the restoration-related topics that were most relevant to them. Interviews were recorded with informed consent and transcribed by an Ecuadorian national to increase data accuracy (MacLean et al., 2004). Spanish was the primary interview language, which only changed for respondents who were native English or Dutch speakers. We transcribed the English and Dutch interviews ourselves. Participatory observation (Russell Bernard, 2011) occurred while the researchers were embedded at the technical secretariats and in interactions with rural community members. We accompanied water fund employees to social events and monitoring activities in the field, joined in discussions at landscape restoration conferences, and participated in community events. This helped to build trust relationships and rapport with respondents, shaped intuitive understanding of what was occurring, and gave meaning to the interview data (Russell Bernard, 2011).

6.3.4 Data analysis

We used content analysis methods (Salkind, 2010) and analysed the transcribed texts using ATLAS.ti software (version 8.4.24). In line with the exploratory character of our study, content analysis lets the data recount a narrative, rather than viewing the data through fixed themes (Russell Bernard, 2011). We adopted an inductive approach and used open coding to systematically search for themes and patterns in the interview transcripts (Bowen, 2006), while deductively using *scales*, *levels*, *scale challenges*, and *scale-sensitive governance* as sensitising concepts to guide the analysis. Sensitising concepts are interpretive devices that facilitate seeing, organising, and understanding lived experience (Bowen, 2006; Charmaz, 1996). As themes and patterns are usually abstract and difficult to identify in interview transcripts, our sensitising concepts were an important point of departure to think analytically about the data and develop the scale challenges and scale-sensitive governance strategies. Perspectives were identified and compared to determine commonalities and differences, and short memos were written to summarise the main points and understand patterns. Codes were compared, and related codes were merged under an umbrella code. Interview data were not always coherent, especially when respondents referred to numbers and hard facts. Statements were generally assessed against



AN	AquaNature
ED	EcoDecisión
El Carmen	Current and former landowners in the El Carmen catchment
EPMAPS	Public Water Utility Company of Quito
FEA	Arcoíris Foundation
FEPTCE	Plurinational Community Tourism Federation of Ecuador
FFL	Futuro Latinoamericano Foundation
FONAG	Water Protection Fund
FORAGUA	Regional Water Fund
GAD Celica	Celica municipality
GAD Loja	Loja municipality
GAD Palanda	Palanda municipality
GAD Pindal	Pindal municipality
GAD Zamora	Zamora municipality
IUCN	International Union for the Conservation of Nature
MAE	Ministry of Environment
MBS	Association of Municipalities of the Southwest of Loja Province
NCI	Nature and Culture International
Oyacachi	Rural community members of Oyacachi
PROAmazonía	Integrated Programme for the Amazon for Forest Conservation and Sustainable Production
Senagua	National Water Secretariat
UTPL	Private Technical University of Loja

Figure 6.1 Interviewed actors, their position in the case study, characteristics, and abbreviations

what other respondents said but also compared to information found in available documents. We aimed to ensure data reliability by triangulating documents, interviews, and observations (Carter et al., 2014; Russell Bernard, 2011). In November 2021, we conducted a validation workshop at the FONAG and FORAGUA offices to discuss their scale challenges and the scale-sensitive governance strategies that they deployed. The discussions that followed facilitated reflection on, and refinement of, the results.

6.4 Results

We analysed FONAG's and FORAGUA's implementation of restoration efforts through time to understand the scale challenges that emerged and the scale-sensitive governance strategies deployed to overcome them. We start by listing four scale challenges that we identified in both cases. This is followed by an analysis of how emerging scale challenges and the funds' scale-sensitive governance strategies are temporally linked.

6.4.1 The water funds' scale challenges

We identified four scale challenges that emerged as part of the FLR implementation process, comprising the three types of scale challenges conceptualised by Cash et al. (2006). Three of the four identified challenges applied to both water funds, although the way in which the challenges manifested themselves differed. In *Table 6.1*, we briefly explain how the scale challenge types unfolded at FONAG and FORAGUA.

In response to these scale challenges, the funds planned or deployed different governance strategies to address them. Some scale-sensitive strategies have already been implemented, but others are only planned. In sections 4.2 and 4.3 respectively, we show how the identified scale challenges and scale-sensitive strategies are chronologically linked in the FONAG and FORAGUA cases. This increased our understanding of how the water funds react to emerging scale challenges and try to stay on course in the implementation of their FLR efforts.

6.4.2 FONAG's strategies to stay on course to realise its restoration efforts

To meet urban water needs, Quito Metropolitan District has depended on *páramo* ecosystems that surround the city and are often located in protected areas or their buffer zones (Buytaert et al., 2006; FONAG, 2019). In the 1990s, various international development projects underlined the importance of protecting the *páramo* to safeguard water supply and, although plans were created to improve protected-area management, these were not backed by sizeable funding. Quito's municipal water utility company (EPMAPS) had specific projects to protect the water catchments it used to extract water but lacked the capacity to implement larger initiatives. The Nature Conservancy (TNC) and Antisana Foundation therefore proposed to EPMAPS the joint creation of a funding mechanism with enough capacity to undertake the specific task of conserving the *páramo* ecosystems surrounding Quito (Goldman-Benner et al., 2012). TNC saw the ecosystems' importance for water supply as an opportunity to generate funding for biodiversity conservation by instituting a water consumption tax (Joslin, 2020).

Table 6.1 Scale challenges linked to FONAG's and FORAGUA's restoration efforts

No.	Scale challenge	FONAG	FORAGUA
1.	**A blind spot related to alternative livelihoods has led to local discontent with restoration efforts and made it harder to sustain restoration processes** Type A: failure to recognise crucial cross-scale and cross-level interactions	FONAG underestimated the time it took, and the input it required, to go from traditional livestock-dependent livelihoods to alternative livelihoods. As a result, its restoration efforts caused short-term livelihood losses for particularly the most vulnerable groups at the community level: older people, women, and less-educated community members.	FORAGUA and member municipalities neither acknowledged nor addressed the livelihood dependence of some rural landowners on private properties targeted for restoration. The adverse livelihood impact of restoration efforts that focused on declaring municipal reserves or on land acquisition has caused (former) landowners to actively counter the water fund's efforts.
2.	**Short-term municipal election cycles created instability in the funds' relation with constituents or members and impeded long-term restoration processes** Type B: temporal mismatch between the governance scale and the ecological scale	Municipal elections caused a replacement in the leadership of Quito's water utility company and created subsequent instability in the relation with FONAG. A shift in priorities from biodiversity to water supply ended the water fund's restoration efforts in the buffer zone of protected areas.	Because of the electorate's lack of interest in, or resistance to, restoration, municipal elections made mayors hesitant to invest in new restoration efforts. Elections also led to new mayors terminating ongoing restoration contracts that their predecessors had established and halting the transfer of tax revenues to FORAGUA.
3.	**The limited spatial reach of restoration efforts mismatches with the extent of landscape degradation processes** Type B: spatial mismatch between the governance scale and the ecological scale	The limited spatial reach of FONAG's conservation agreement displaced livelihood-related land degradation drivers to an area located beyond the water utility company's water extraction area and could therefore not be addressed by FONAG.	The lack of human and financial capacity in FORAGUA's technical secretariat and member municipalities to regulate and monitor land-management practices in municipal reserves resulted in a limited spatial reach of restoration efforts to protect water sources and create ecological connectivity.

Table 6.1 Continued

No.	Scale challenge	FONAG	FORAGUA
4.	**Heterogeneity regarding the purpose of restoration, with different spatial implications** Type C: failure to recognise and support plurality in how problems are perceived at different levels		Whereas FORAGUA's development partners see landscape restoration as a solution for climate change and biodiversity loss, member municipalities see it as a solution for local water quantity and quality challenges. This creates diverging views about the spatial dimension at which solutions need to be sought.

In 2000, FONAG was created with the task of conserving and restoring the *páramo* (Kauffman, 2014). TNC and EPMAPS, FONAG's founding constituent members, were later joined by the municipal electricity company, two beverage companies, and a development partner (FONAG, 2019). The fund was created with the idea of generating long-term funding and was hence established for a period of 80 years to match restoration timelines. Thus, multiple actors were involved in creating a task-specific organisation designed to create spatial and temporal fit with ecological processes. Despite this intention, we identified various scale challenges that emerged since FONAG's establishment, and to which the fund has reacted or plans to react with strategies to create cross-scale fit and cross-level alignment. We depict FONAG's scale challenges and scale-sensitive governance strategies chronologically in *Figure* 6.2 and then describe their connection.

Dealing with the temporal mismatch of short-term election cycles that created instability in the relationship with EPMAPS and impeded long-term restoration processes (SC2)

For the first 10 years after its establishment, FONAG enjoyed relative autonomy from EPMAPS to grow and develop its mission and focused mainly on biodiversity conservation [FONAG1]. The fund worked mostly in rural communities located in the buffer zone of protected areas to ensure sustainable land-management practices. From 2010 onwards however, EPMAPS exerted more influence on the trust board [FFL; FONAG1]. In line with a municipal ordinance of 2007, the water utility company

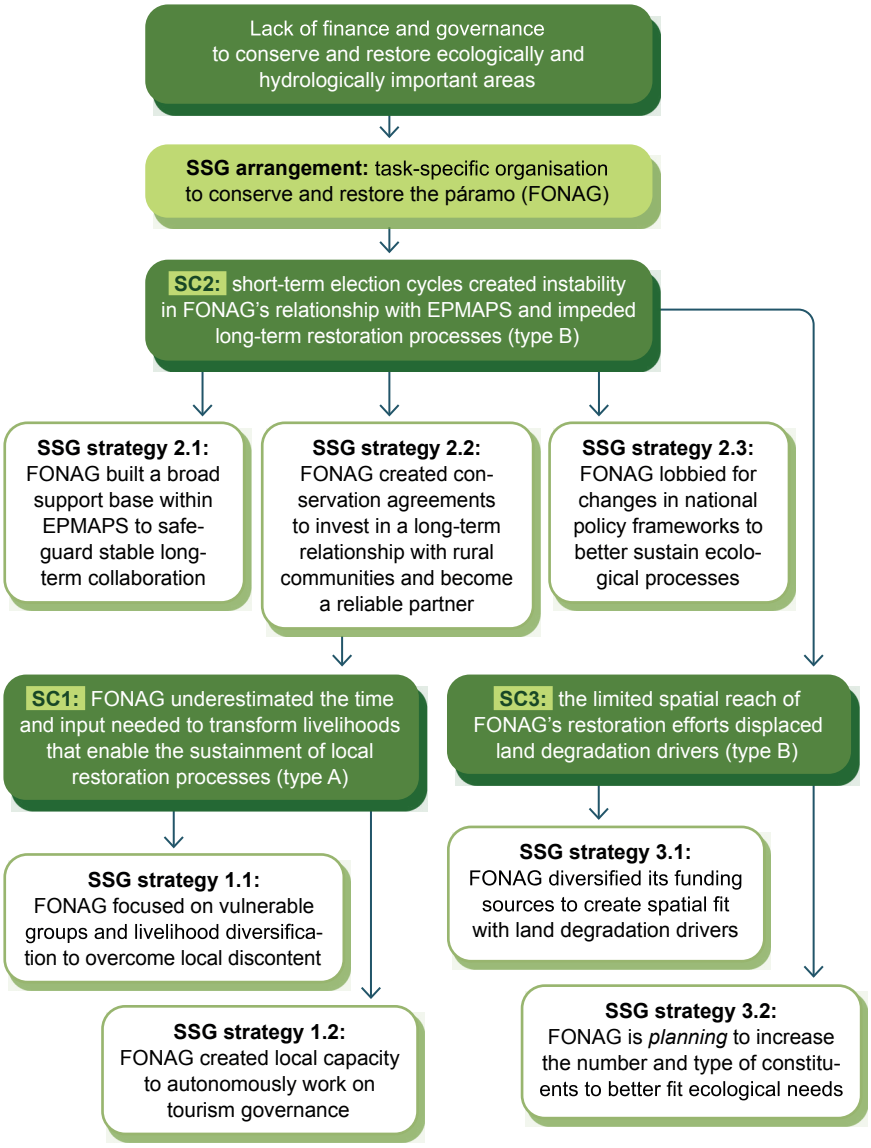


Figure 6.2 Scale challenges (SC) and scale-sensitive governance (SSG) strategies at FONAG

had been transferring 2% of its collected water fees to FONAG and has currently contributed over 90% of the total financial investment in the fund (Bremer et al., 2016; Joslin, 2019). Quito's municipal elections of 2009 proved to be an important turning

point in FONAG's development, as they led to the replacement of EPMAPS' leadership [FONAG1; FONAG2]. Incoming staff expressed serious doubts about FONAG's protected area focus and questioned its relevance for managing water supply, given that some communities with which FONAG worked were located far away from the water supply infrastructure [EPMAPS]. In addition, overlap had emerged between FONAG's and EPMAPS' efforts relating to restoration and community engagement that had to be resolved.

To create a complementary relationship between the two actors, EPMAPS demanded rigorous restructuring of FONAG's mission and restoration efforts and insisted that financial resources should be strictly invested in protecting catchments that were important to Quito's water supply, rather than maintaining a focus on protected areas [FFL; AN]. FONAG became absorbed in a process of building trust and aligning its activities with EPMAPS' demands [FONAG2]. During this period, the fund discontinued almost all its community-level activities [AN]. This harmed its trust relationship with rural communities and affected the continuity and sustainability of restoration processes. Only in 2016 were restoration efforts resumed in some communities, started in communities located in EPMAPS' priority catchments, and terminated in communities that were no longer a priority [AN].

The temporal mismatch between short-term municipal election cycles and long-term restoration processes made FONAG aware that it had to be more resilient to the changes in EPMAPS leadership that resulted from municipal elections [FFL]. First, FONAG built a broad support base within EPMAPS to safeguard and stabilise its long-term cooperation (SSG strategy 2.1). It built connections and complementarity with technical staff in different departments, besides maintaining narrow contact with the EPMAPS leadership [FONAG1]. In addition, the fund conducted a 'return on investment' study in 2018 to analyse the economic benefits of conservation and restoration efforts in one intervention area. The study found that each US$1 invested in watershed protection generated US$2.15. The study is meant to convince future leaders of EPMAPS that water extraction and treatment is more costly in the long run when the *páramo* is degraded. The strategy strengthened FONAG's reputation within EPMAPS and augmented the fund's visibility within the water company [FFL].

Second, FONAG created conservation agreements with rural communities as a way to invest in a long-term relationship with those communities and become a reliable partner for them (SSG strategy 2.2). The internal crisis and subsequent unstable relation with rural communities highlighted the value of creating such agreements, which formalise FONAG's involvement in a community for a 10-year period [AN]. The agreements are based on hydro-social diagnostics that map local natural-resource

problems, conflicts, opportunities, and priorities [FONAG1]. Annual action plans are then created with that rural community to reduce existing ecosystem pressures, such as livestock grazing, which affect water quantity and quality [FONAG2]. To promote more conservation-oriented land-use practices and livelihoods, investments are made in selected productive activities for the first three years of the agreement (Joslin, 2020). Since 2017, FONAG has so far signed 10 conservation agreements, providing a longer-term perspective for the rural communities (FONAG, 2020).

Third, to further facilitate the long-term continuity of restoration processes in its intervention areas, FONAG made efforts to establish supportive national policy frameworks (SSG strategy 2.3). FONAG assisted the National Water Secretariat (Senagua) to give the Water Protection Area (*Área de protección hídrica*) legal status [FONAG1]. These areas can be created on the initiative of actors at the sub-national level, on the condition that those who promote their creation can also contribute to maintaining the areas. FONAG elaborated a large part of the guidelines that stipulate how the areas should be declared. FONAG's rationale for promoting this policy is that a water-oriented conservation area with national recognition and a legal character can better protect the fund's conservation areas and hence safeguard water supply in the long term. Currently, the Water Protection Area is integrated in the Water Resources Law, and 14 of these areas have been created at the national level since 2018 [FONAG1].

Dealing with the blind spot that caused FONAG to underestimate the time and input needed to transform livelihoods that enable the sustainment of local restoration processes (SC1)

The productive activities that FONAG has promoted as part of its conservation agreements aim to promote alternative livelihoods that reduce pressure from the ecosystem and enable natural regeneration; re-introduction of native tree, shrub, and grass species; and wetland restoration to recover *páramos*' water regulation function. Projects have provided materials for pasture improvement, guinea pig husbandry, and community tourism (FONAG, 2019). Oyacachi is one of the communities with which FONAG created a conservation agreement. Here, community members used to rely on dairy farming and keep some of their cattle in the *páramo* as a financial insurance. However, the same *páramo* is important for supplying water to Quito. As part of the conservation agreement that FONAG negotiated with the community, almost all families significantly reduced the number of cattle held in the *páramo* and therefore needed alternative income sources. When FONAG started working in Oyacachi, it observed an existing transition towards community tourism that had been started by civil society organisations who assisted the community in the

construction of thermal pools [Oyacachi6]. The fund therefore committed to further strengthen community tourism by facilitating gastronomy workshops for family-owned restaurants and handicraft workshops for community members to cater better for the tourism market and by constructing hiking paths, signposts, and hanging bridges [FONAG2].

FONAG's rationale was that more income from tourism would reduce Oyacachi's livestock dependence and remove grazing pressure from the *páramo*. However, the transition time and input needed to go from livestock-dependent livelihoods to alternative livelihoods turned out to be longer and more than what FONAG was providing. As a result, community members faced short-term livelihood losses between when they sold their livestock and when they could start reaping the fruits from new livelihood activities. Some in Oyacachi raised the concern that the investments in tourism infrastructure and capacity building made as part of the conservation agreement would not be sufficient to guarantee income for all families [Oyacachi6]. This was particularly the case for vulnerable groups in the community, such as older people, women, and less-educated community members, who felt less prepared to deal with the changes that FONAG's intervention provoked [Oyacachi4; Oyacachi7]. At the time of this research, tourism was a main livelihood for about one third of the community [Oyacachi7; FEPTCE], as a restaurant or family hostel owner, guide, handicraft artist, ticket seller, or maintenance worker. Consequently, some community members developed strong feelings of injustice. They felt insufficiently compensated for protecting the *páramo* to deliver clean water to Quito [Oyacachi2].

Following years of experience with working in rural communities, FONAG staff became aware that the transition from traditional to alternative livelihoods caused income loss for vulnerable groups. To deal with this existing blind spot, FONAG firstly started setting specific livelihood targets to better include and address the needs of vulnerable groups [FONAG1] (SSG strategy 1.1). In Oyacachi for example, FONAG promoted the role of women in community tourism [FONAG2]. Despite the prevalence of traditional gender roles, FONAG insisted on incorporating a clause in its conservation agreement that secured women's participation in tourism activities, in both decision making and income generation. FONAG staff also observed the need to have a more diversified portfolio of activities, with the idea that, if one livelihood is not sufficiently developed to generate substantial income, other income-generating activities can fill the gap [FONAG1]. However, investments in other activities are still marginal and the main focus is still on community tourism. Second, FONAG has worked to create local capacity to better organise the local tourism sector (SSG strategy 1.2) by providing assistance to establish a legally registered tourism office led by community members. The office is directly linked to the Ministry of Tourism

and has helped the community to get more exposure at the national level through promotional materials [FONAG2]. This strategy shows FONAG's strong focus on enabling community members to build their own capacity and income-generating opportunities, to become less and less dependent on external actors for support. However, community engagement has been challenging for FONAG – with steps forward being followed by steps backward – for example in terms of women's empowerment and the prevalence of traditional roles.

Dealing with the spatial mismatch that caused the spatial reach of FONAG's restoration efforts to displace land degradation drivers (SC3)

A third scale challenge emerged following the municipal elections when FONAG's restoration mandate became strictly linked to the *páramos* from where EPMAPS extracts water for Quito. A consequence of this strict spatial focus has been the displacement of livelihood-related land degradation drivers to areas lying beyond EPMAPS' priority catchments. The conservation agreement that FONAG signed with the Oyacachi community focused on strictly conserving the *páramo* at 3,500 metres above sea level [FONAG3], with lower parts of the catchment designated for sustainable livelihood practices such as trout farming, dairy production, and tourism activities [FONAG2; Oyacachi6]. However, community members logged wood from a cloud forest located in the lower-lying part, not only to construct houses, obtain fuelwood, and make wooden handicrafts sold in a community-managed shop that FONAG helped establish [Oyacachi7], but probably also to sell wood to external markets, given the large quantities of trees being felled [FONAG1]. Around the same time that livestock pressure in the *páramo* was reduced to ensure higher water quality for EPMAPS, the considerably increased deforestation in the cloud forest took FONAG by surprise [FONAG1]. Although the fund saw a need to intervene, it was unable to address this displacement of degradation drivers, given that the forest lies beyond EPMAPS' water extraction area and was hence not included in the conservation agreement.

Being aware of the limitations and challenges that a strict spatial focus entails, as is the case in Oyacachi, FONAG has come up with other strategies to create better spatial fit between land degradation drivers and restoration efforts. First, FONAG has focused on diversifying its funding sources (SSG strategy 3.1). FONAG is practically limited to using constituents' permanent contributions to work in EPMAPS' priority catchments, but external funding enables restoration efforts to take place outside these catchments. The more external funding FONAG receives, the more flexible the fund is to recreate fit in situations where the spatial and the temporal reach of its restoration strategies form a mismatch with land degradation processes. In 2019,

external funding accounted for a quarter of FONAG's annual budget [FONAG1]. The Integrated Amazon Programme for Forest Conservation and Sustainable Production (PROAmazonía) initiative, which started in 2017 and aims to reduce emissions from deforestation, has made the highest contribution. Another way to increase external funding is the water fund's corporate water footprint initiative that enables companies to compensate their water use by financing projects that restore parts of the *páramo*. In 2019, FONAG signed the first agreement with General Motors. Second, FONAG highlighted that the fund plans to increase the number and types of constituents on its trust board (SSG strategy 3.2) to complement EPMAPS' focus on water quantity and quality objectives. New constituents could facilitate the broadening of the scope of FONAG's work and enable the fund to choose intervention areas where the ecological restoration needs are highest.

6.4.3 FORAGUA's strategies to stay on course to realise its restoration efforts

The tropical mountain forests of southern Ecuador have fulfilled important water regulation and habitat provisioning functions. However, a growing population, agricultural expansion, and road construction have fragmented mountain forests into ever-smaller and isolated forest remnants (Keese et al., 2007). In the region's dry forest ecosystem, 95% of the natural vegetation cover has been lost (NCI, 2021). Observing the effects of deforestation and unsustainable agricultural practices on water scarcity and quality, several development projects have worked with multiple municipalities on integrated watershed management planning and payment for ecosystem service projects (Kauffman, 2014). These earlier initiatives led in 2009 to the establishment of FORAGUA by five municipalities (Celica, Loja, Pindal, Puyango, Macará) and the civil society organisation Nature and Culture International (NCI) (FORAGUA, 2019; Goldman-Benner et al., 2012). The water fund's task is to secure, sustain, and upscale the generation of financial resources to conserve forest remnants and restore degraded forests in hydrologically important areas (FORAGUA, 2018; Raes et al., 2012). As a result of the earlier experiences with municipal watershed management projects, FORAGUA has a decentralised set-up in which municipalities play a pivotal role.

FORAGUA assists member municipalities to create municipal ordinances that enable the institution of an environmental tax on water use and to establish municipal reserves with the aim of protecting water sources and creating ecological connectivity. Within municipal reserves, private landowners are permitted to apply only sustainable land-management practices (Raes et al., 2012). Most restrictions are placed on areas surrounding water sources, where landowners tend to keep livestock for easy water access [FORAGUA3; Carmen2]. Member municipalities collect the environmental tax

on water use and transfer the revenue to FORAGUA (Raes et al., 2012). Of these revenues, 90% flow back to the municipalities and are used for two purposes. One is to create voluntary conservation agreements between FORAGUA, a member municipality, and rural landowners. These last for five years and financially compensate landowners who implement sustainable land-management practices on their property. The second purpose is land purchase, which FORAGUA and member municipalities see as the most effective restoration strategy in the long term, given that such land becomes part of a permanent restoration process. Landowners may voluntarily agree to sell their property or a municipality may declare their property a public utility and expropriate it. A landowner then has to sell it for a price established by cadastral appraisal, which tends to be lower than the market price. Subsequently, the property is placed into FORAGUA's trust fund for 80 years to prevent future politicians from selling the land or using it for unsustainable land-use practices. Municipalities remain responsible for managing the land in terms of fencing, signposting, and monitoring it and sanctioning those who encroach on it.

Following FORAGUA's establishment, various scale challenges have emerged to which the fund has reacted, or plans to react, with strategies to create cross-scale fit and cross-level alignment. We depict FORAGUA's emerging scale challenges and scale-sensitive governance strategies chronologically in *Figure 6.3* and then describe their connectedness.

Dealing with the blind spot that caused FORAGUA to give no recognition to livelihood dependence on land targeted for restoration (SC1)

An important blind spot for FORAGUA and member municipalities was landowners' dependence on properties that became part of municipal reserves and were restricted regarding land-management practices. The failure by the fund and its members to financially compensate for livelihood loss or to provide alternative livelihoods when landowners were restricted in their use of their hydrologically important land [Carmen1; Carmen2] caused landowners to actively break regulations and restrictions, for example by cutting fences around conserved land to let their livestock graze illegally again [Carmen2; Carmen6; MBS; NCI1; FORAGUA2]. In the El Carmen micro-catchment for example, frustration related to restrictions was high and the feeling of unfair treatment was common [Carmen1; Carmen2; Carmen4; Carmen7]. Between 2008 and 2014, landowners' livelihoods in El Carmen were affected because they were pushed to sell their land for a price well below the actual market value [Carmen4; Carmen7; Carmen8; MBS]. On several occasions, municipal civil servants signalled to landowners that their land would be expropriated without compensation if they did not accept the offered price [GAD-Loja1; Carmen3]. FORAGUA and member

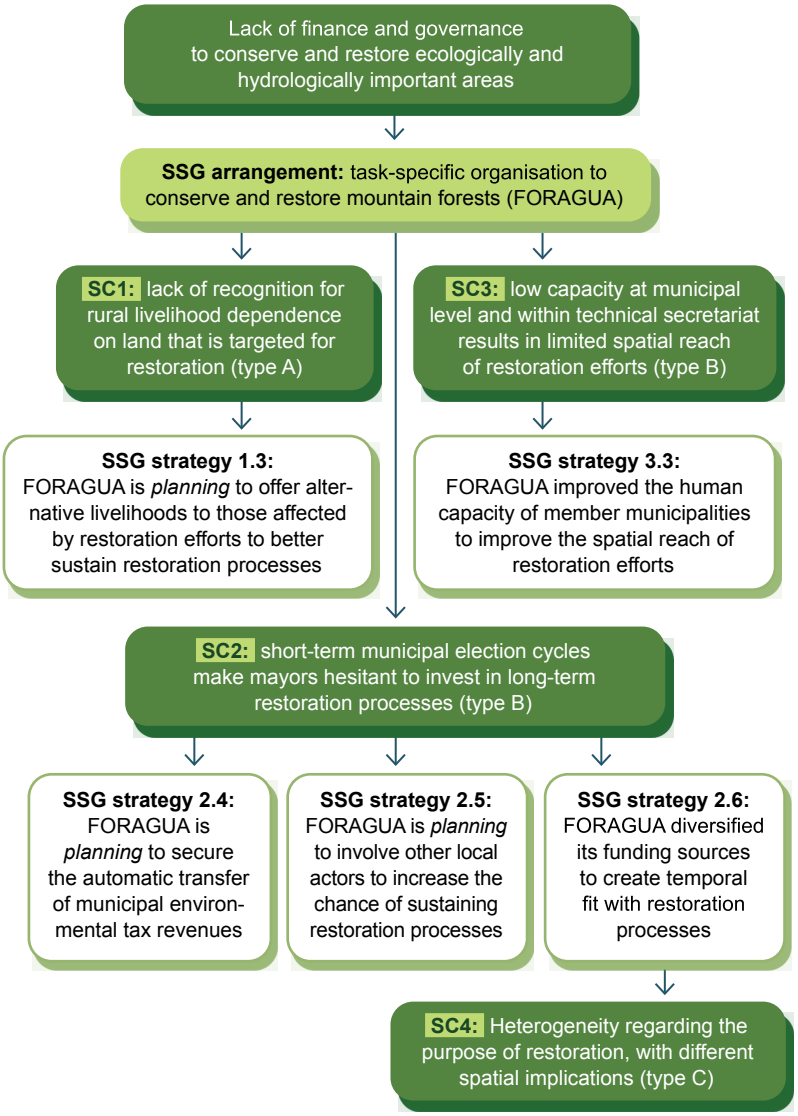


Figure 6.3 Scale challenges (SC) and scale-sensitive governance (SSG) strategies at FORAGUA

municipalities framed the majority of landowners with whom they worked as rich individuals with enough resources to buy another property and without need to be supported with alternative livelihoods [FORAGUA3; FORAGUA4; GAD-Celica]. However, no livelihood impact study was conducted to substantiate this frame

[FORAGUA2; FORAGUA3; NCI1]. This blind spot ultimately created a distance between FORAGUA and its members on the one hand, and landowners on the other [FFL].

In recent years, FORAGUA has become increasingly aware that its restoration efforts affect rural livelihoods and that this reflects negatively on the fund's reputation and effectiveness. Although FORAGUA has not yet formulated specific livelihood targets [FORAGUA3; NCI1], it is planning to offer alternative livelihoods to those affected by its restoration efforts (SSG strategy 1.3). For example, the fund launched a pilot in El Pangui municipality to compensate landowners for lost opportunity costs. FORAGUA did so by developing agroforestry activities in the lower parts of the watershed to hire landowners who sold their land or were restricted in their land-use practices within water sources in the upper watershed [FORAGUA1]. By providing employment, FORAGUA hopes to prevent livelihood loss and lower the risk of landowners engaging in illegal land-use practices on their former property [FORAGUA2; FORAGUA3]. The fund is also working more closely with municipalities on community engagement to prevent past mistakes from recurring and guarantee that landowners receive adequate livelihood alternatives.

Dealing with a spatial mismatch in which low capacity at the municipal level and within the technical secretariat resulted in the limited spatial reach of restoration efforts (SC3)

FORAGUA's objective to declare municipal reserves was severely hampered by the inability of member municipalities to put regulations into practice. Municipalities lacked the human and the financial capacity to regulate sustainable land-management practices in their reserves, maintain fences and signposts, and monitor restoration processes [NCI3]. On becoming members, several municipalities approached FORAGUA's technical secretariat for assistance in the management of water resources and municipal reserves. However, FORAGUA had to turn many requests down because of its limited capacity.

To address the observed capacity challenge, FORAGUA developed a training curriculum in 2016 to improve the capacity of technical staff in municipal environmental management departments to protect and restore water sources and establish ecological connectivity (SSG strategy 3.3). This Water School (*Escuela del Agua*) is implemented in collaboration with Senagua, NCI, the Water Fund for the Conservation of the Paute River Basin (FONAPA), and the Private Technical University of Loja (UTPL). Municipal staff have been taught to work on the required ordinances that establish municipal reserves and institute an environmental tax on water use in their municipality. In addition, they have gained basic skills to work with geographical

data related to water and forest cover, as well as a multi-criteria methodology to demarcate municipal conservation areas. From 2017 onward, technical specialists could be hired by NCI and FORAGUA with funding from PROAmazonía and the Green Climate Fund (GCF) to work closely with municipal staff and socialise and approve the municipal ordinances and reserves. About 180 civil servants graduated from the Water School in 2019 and FORAGUA's relation with both member and non-member municipalities in southern Ecuador improved significantly [FORAGUA4].

Despite FORAGUA's efforts to build local capacity, considerable challenges remain to manage declared reserves effectively. Although the spatial extent of municipal reserves in the water fund's member municipalities approached 400,000 hectares in 2021 [FORAGUA2], it is recognised that this effort is only on paper and that these declarations cannot guarantee the end of unsustainable land-use practices [GAD-Celica; GAD-Loja1; FORAGUA2; AN]. FORAGUA's focus is now mainly on preventing deforestation in declared reserves by monitoring satellite imagery with Global Forest Watch, and restoration is restricted to areas of hydrological importance.

Dealing with a temporal mismatch in which short-term election cycles make mayors hesitant to invest in long-term restoration processes (SC2)

One of the main threats to the continuity of FORAGUA's restoration efforts is the mismatch between short-term municipal election cycles and long-term restoration timelines. Mayors are often hesitant to invest in long-term restoration processes because they experience a lack of interest in, or resistance to, this among the electorate. Following municipal elections, new mayors will review all regulations instituted by their predecessor [GAD-Celica; GAD-Pindal; GAD-Zamora2]. It often happens that they put the adoption of municipal ordinances on hold, stop transferring environmental tax revenues to FORAGUA, and terminate restoration contracts with the water fund, notwithstanding recommendations made by their own technical staff who have attended the Water School [GAD-Celica; GAD-Zamora2]. Given that their temporal reach is limited to five years, restoration agreements are terminated and landowners no longer receive compensation for allowing natural regeneration to occur on their property when a new mayor does not renew them, causing restoration processes to be disrupted.

Mayors do not sufficiently assess the long-term benefits of restoration efforts [FORAGUA1; FORAGUA2; FEA]. Even though water source restoration greatly improves water quality and thereby lowers the costs of drinking water treatment in the medium term, in the short term this means that citizens need to pay an environmental tax, for which no broad support exists [GAD-Loja1; GAD-Zamora1;

NCI3]. Funds are rarely allocated to maintain purchased land or regulate municipal reserves, as such efforts are invisible to the electorate. Instead, mayors prefer to profile themselves with infrastructure investments that show short-term results, as a way to gain popular support [MBS; GAD-Celica; GAD-Zamora2]. In addition, some mayors, to avoid conflicts that could reduce their re-election chances, refrain from sanctioning landowners who apply unsustainable land-use practices within municipal reserves, such as the cutting of trees [GAD-Celica; FORAGUA2]. In 2019, FORAGUA had 11 member municipalities, of which, in five, the mayor was in conflict with the water fund [FORAGUA3].

The temporal mismatch between short-term municipal elections and long-term restoration processes has greatly reduced FORAGUA's ability to promote restoration efforts [FORAGUA1; FORAGUA2]. To become more resilient towards the uncertainties associated with municipal elections, FORAGUA has developed various strategies. First, the fund plans to secure the automatic transfer of municipal environmental tax revenues (SSG strategy 2.4). Mayors would have to sign a long-term agreement with the public agency (CFN) administering the financial resources in FORAGUA's trust fund. CFN could then automatically transfer the municipality's environmental tax revenues to the fund. This would remove the possibility of new mayors discontinuing their tax payments to the fund. The idea was approved by FORAGUA's board of trustees and negotiations have already started with the Ministry of Economics and Finance to set up the mechanism. When the mechanism is installed, FORAGUA can focus on sustaining existing, and starting new, restoration efforts, rather than on constantly convincing mayors to transfer their tax revenues [FORAGUA2; FORAGUA3]. Simultaneously, FORAGUA is engaged in conversations with municipalities to underline their legal obligation to transfer the environmental tax, stressing that all delayed payments are being registered as debt and that an audit by CFN could conclude misappropriation of funds. This strategy helped solve delayed transfers in one municipality.

Second, FORAGUA plans to involve other local actors to sustain restoration processes (SSG strategy 2.5), thereby making restoration efforts more resilient towards a possible lack of willingness by municipalities to collaborate [FORAGUA3]. The water fund has started working with parishes – the most decentralised government level – in two member municipalities: Valladolid parish in Palanda municipality and Vilcabamba in Loja municipality. In addition, the fund is planning to include community-based water boards (*juntas de agua*) in its strategy to implement, regulate, and monitor restoration efforts [FORAGUA2]. Apart from capacity-building activities, the boards are not yet included in restoration efforts. Working with parishes and water boards provides an alternative way in which to sustain restoration efforts

when FORAGUA's relationship with a municipality turns unproductive, although this does not need to be the case.

Third, FORAGUA has diversified its income sources (SSG strategy 2.6) in order to be less dependent on member municipalities and to increase its technical capacity to implement restoration efforts. Through active fundraising, FORAGUA has attracted external funding from civil society organisations and international development partners, such as TNC, PROAmazonía, the United States Agency for International Development, and GCF. To attract this funding, FORAGUA aligned its objectives with those of development and conservation organisations; this implied going beyond a narrow water focus towards a focus on ecological connectivity [FORAGUA4]. The fund also ventured into climate finance and, together with the National University of Loja, refined the methodology to study the carbon sequestered in municipal reserves and on purchased land, with the aim of being more visible at the national and global level and receiving financial support [FORAGUA2]. With external funding, the water fund was able to give technical assistance and complement member municipalities' environmental tax revenues [FORAGUA2]. Particularly smaller municipalities benefited from this, as they face difficulties in building capacity and generating enough resources to invest meaningfully in restoration efforts. External funding helped the technical secretariat convince other mayors to join the water fund [GAD-Pindal; GAD-Zamora2] and ensure that mayors transfer their tax revenues on time. FORAGUA's board adopted a resolution in 2017 stating that no investments were to be made in municipalities that did not transfer all revenues.

Scale challenge related to plurality, in which heterogeneity exists regarding the purpose of restoration, with different spatial implications (SC4)

Linked to FORAGUA's strategy to diversify funding sources, a new scale challenge has emerged. The reliance on external funding has given rise to heterogeneity in relation to how restoration is framed by different actors. FORAGUA's development partners are primarily concerned with tackling landscape degradation on large tracts of land and see restoration as a solution for global problems such as climate change and biodiversity deterioration [PROAmazonía]. Meanwhile, member municipalities are worried mostly about water-related challenges at the local level [NCI4] and see restoration as a solution to local problems of water scarcity and quality [GAD-Celica; MBS]. This has led to different understandings regarding the relevant spatial reach at which solutions need to be sought.

Whereas member municipalities focus primarily on conserving and restoring water sources at the micro-catchment level, development partners such as PROAmazonía

focus on declaring large municipal reserves to promote carbon sequestration and ecological connectivity [FORAGUA2; PROAmazonía]. As the declaration of these reserves is a condition for the disbursement of funds [AN; PROAmazonía], FORAGUA's technical secretariat has been dedicating its human and financial capacity mainly to reaching PROAmazonía's target of protecting 50,000 hectares in southern Ecuador by 2025 [FORAGUA2]. Thus, FORAGUA prioritises the solutions promoted by development partners, and on-the-ground restoration efforts to improve water supply and quality at the micro-catchment level are deprioritised [GAD-Celica; GAD-Loja1; GAD-Zamora1]. No conditions are set on the location of municipal reserves in relation to water resources, and water is perceived as a co-benefit for which no specific targets are set by the PROAmazonía initiative [MAE; PROAmazonía; FORAGUA2]. Success is measured by the number of hectares declared as a municipal reserve, with this number equated to a deforestation reduction [PROAmazonía]. However, if regulations are not enforced, actual conservation does not occur. Although all municipal reserves are supported by an environmental tax, the revenue is still too low to make a significant impact. FORAGUA has recently started planning to expand its agroforestry activities to generate revenue that can finance its restoration efforts, but the fund's dependence on development partners is still too great to overcome this challenge and give more attention to the conservation and restoration of water sources.

6.5 Discussion

6.5.1 Interaction between scale challenges and scale-sensitive governance strategies

Over the past two decades, water funds have gained traction as organisations specifically tasked (Marks and Hooghe, 2004) to conserve and restore watersheds. These funds can be understood as a type of scale-sensitive governance arrangement (Padt et al., 2014; Wiegant et al., 2022b). First, they have been established at a governance level that facilitates creating spatial fit with the relevant ecological processes that they seek to influence. Second, by adopting a long-term perspective, they are designed to create temporal fit with restoration timelines. In these ways, water funds create fit with FLR's large spatial reach and long-term character (Mansourian and Parrotta, 2019). However, despite water funds being designed to create temporal and spatial fit, our results show that water funds have to continuously adopt new strategies to deal with emerging scale challenges and stay on course to implement objectives.

We studied two water funds, FONAG and FORAGUA, which follow different institutional set-ups. Even so, our results show overlap in the kinds of scale challenges that emerge when the funds implement restoration efforts. First, rural livelihoods were a blind spot (type A) in both cases. Whereas FORAGUA did not acknowledge the impact of its restoration efforts on rural livelihoods, FONAG was initially unaware that vulnerable groups at the community level had difficulties adapting to the land-use and livelihood changes provoked by its conservation agreements. In both cases, the blind spot led to local discontent vis-à-vis restoration efforts. Second, both water funds experienced discontinuity of their restoration efforts following municipal election cycles (type B), as these caused instability in their relation with their members or constituents. Besides this temporal mismatch, a spatial mismatch became evident in both cases, in the sense that restoration efforts did not fit with the extent of landscape degradation processes (type B). In the FONAG case, the limited spatial reach of their conservation agreement resulted from the fund's inability to work outside EPMAPS' priority catchments. In the FORAGUA case, the limited spatial extent of restoration efforts resulted from a lack of capacity within the technical secretariat and member municipalities to regulate and monitor restoration efforts in municipal reserves. Third, a plurality challenge was observed in the FORAGUA case (type C), with development partners seeing landscape restoration as a way to address climate change and biodiversity loss, whereas its members saw it as a solution to reduce local water scarcity and quality problems. This led to different interpretations of the preferred spatial extent of restoration efforts.

Previous restoration governance research has shown that scale challenges emerge during the implementation of restoration efforts (Wiegant et al., 2020). However, limited research has been undertaken regarding how actors deal with these challenges. We identified various strategies that water funds deployed or were planning to deploy to overcome emerging scale challenges. These strategies fall into two broad categories. The first category aims to change the water funds' relation with actors with whom they already work. This can be seen when FONAG strengthened its relationship with EPMAPS to build a broader support base, when FORAGUA aimed to change its relationship with member municipalities, or when the water funds gave or planned to give more attention to alternative livelihoods to assist those affected by restoration efforts. The second category aims to build relations with new actors, either because the relation with existing actors has become unproductive, or because new actors can fulfil a function that can improve the sustainability of restoration efforts. To reduce the risk of a temporal or a spatial mismatch, FONAG and FORAGUA started engaging with international development partners and conservation organisations to attract finance, which they can apply more flexibly than the funds they receive from their constituents or members. In addition, FORAGUA sought to

establish new relationships with community-based water boards to have alternative implementing partners when mayors lacked willingness to collaborate. Lastly, FONAG built a relationship with Senagua to lobby for a policy change that can increase the sustainability of its conservation areas.

The FONAG and FORAGUA cases show that FLR governance is an iterative process in which new scale challenges emerge during the implementation process and which need to be tackled to stay on course to meet restoration objectives. To address these scale challenges, actors need to deploy scale-sensitive governance strategies. By tracing the process of scale challenges and scale-sensitive governance strategies, we show that FLR governance is not static but needs a continuous process of recreating fit and alignment. This is in line with the wicked problem literature that describes challenges that have no definitive solution (Head and Alford, 2015; Rittel and Webber, 1973). Seeing scale-sensitive governance as a process has implications for the ways in which restoration efforts are designed and for their temporal reach.

6.5.2 Implications and limitations

Despite their different institutional set-ups, we found similarities in the scale challenges with which FONAG and FORAGUA are confronted. Being able to observe and act on such challenges when they emerge can greatly improve the success of restoration efforts. FONAG's agency model has allowed it to implement local restoration efforts by itself, learn through trial and error, and develop strong technical capacity. By actively listening to and observing the needs and priorities of rural communities as part of its hydro-social diagnostics, FONAG seems in a good position to adapt its strategies and find fitting solutions to emerging scale challenges. Learning from experience is what shaped FONAG's restoration strategies over time, and the fund is recognised for this at the national level. Meanwhile, FORAGUA's grant model has caused scale-sensitive strategies to take longer to formulate, and several are only in the planning stage. The limited ability of FORAGUA and its member municipalities to observe cross-scale and cross-level challenges emerging as part of the implementation process has reduced the water fund's effectiveness in addressing landscape degradation.

Studying the differing agency and grant models followed by FONAG and FORAGUA increases the transferability of our results to other water funds. However, additional research is needed given the limited geographical reach of this study, in which only two cases were analysed in the same country. As regards water funds as task-specific organisations, other water funds exist within Ecuador, in other Latin American countries, and in Africa, and analysing the similarities and differences in how other funds address emerging scale challenges would facilitate the categorisation of

scale-sensitive governance strategies in more detail. Describing the interaction between scale challenges (Cash et al., 2006) and scale-sensitive governance strategies (Termeer and Dewulf, 2014) is, to the best of our knowledge, novel, and more empirical research will create a more robust understanding of the governance strategies that work well to create cross-scale fit and cross-level alignment. Research efforts should not just focus on task-specific organisations, but also venture into the strategies of other scale-sensitive governance arrangements (Wiegant et al., 2022b).

A limitation relating to describing the interaction between scale challenges and scale-sensitive governance strategies at FONAG and FORAGUA is that results are time sensitive. Kauffman (2014), for example, initially assumed that the contractual agreements that water funds set with their constituents or members, and which were innovative at the time, would be able to provide protection against political instability. Our results indicate, however, that fund constituents and members can alter or discontinue their relation with a water fund, despite these agreements. This requires water funds to constantly deploy new strategies to stay on course when implementing their restoration objectives. Regarding our results, particularly the FORAGUA case is time sensitive, given that a number of scale-sensitive governance strategies are only in the planning stage. It is hence not known whether and how these strategies will actually be implemented and what their effect will be on creating cross-scale fit and cross-level alignment.

6.6 Conclusion

We studied the scale challenges encountered by two Ecuadorian water funds in the process of implementing their FLR efforts at the local level and the scale-sensitive governance strategies that the funds and their implementing partners deployed to stay on course and realise their restoration objectives. Building on a document review, 48 semi-structured interviews, and participatory observation, and following the scale challenge types proposed by Cash et al. (2006), we identified four scale challenges in the cases of FONAG and FORAGUA: 1) a blind spot towards rural livelihood realities (type A), 2) a temporal mismatch between short-term election cycles and long-term restoration timelines (type B), 3) a spatial mismatch between the reach of restoration efforts and land degradation processes (type B), and 4) heterogeneity across levels regarding the purpose of restoration with different spatial implications (type C).

With attention on, and investments in, FLR rising during the United Nations Decade on Ecosystem Restoration 2021–2030, it is important to understand the governance

strategies deployed to overcome scale challenges in the process of implementing restoration efforts. We identified a total of 12 scale-sensitive strategies that the two water funds deployed or aim to deploy in reaction to identified scale challenges in an attempt to re-create cross-scale fit and cross-level alignment. Whereas one set of strategies aims to change the water funds' relationship with actors with whom they already work, a second set aims to build relations with new actors, either because the relationship with existing actors is becoming unproductive or because new actors' actions can improve the sustainability of restoration efforts.

We found similarities in the type of scale challenges confronting both FONAG and FORAGUA, but also observed varying degrees of success between the two water funds in terms of formulating and deploying scale-sensitive governance strategies. The results seem to suggest that FONAG, which follows the agency model, is better equipped to engage in an iterative process of re-creating cross-scale fit and cross-level alignment. FORAGUA, which follows the grant model, appears to have more difficulties observing and addressing cross-scale and cross-level challenges. However, the results are time sensitive, and multiple strategies were still in the planning stage at the time of the research. Given our novel approach, more empirical research will be needed – covering longer timelines, more water funds, and ideally other countries – to obtain a robust understanding of the governance strategies that effectively create cross-scale fit and cross-level alignment. Given that scale challenges and scale-sensitive governance strategies have alternated since the water funds were established, it seems that no lasting solution for fit and alignment can be obtained. To stay on course in FLR governance, a long-term, iterative process is required through which cross-scale fit and cross-level alignment are continuously sought.

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7

Discussion and conclusions

In this chapter, I respond to the general research question and the specific research questions, and explain my contribution to different branches of the scientific literature. Subsequently, I discuss the limitations of my research and point towards directions for future research. After, I give recommendations for practice, and close with some concluding remarks.

7.1 Response to the general research question

In this dissertation, I try to contribute to the currently limited understanding of the cross-scale and cross-level challenges that arise when translating national restoration targets into local action, and to clarify the ways in which actors have addressed these challenges. The general research question is:

What scale challenges emerge when implementing policies to meet national restoration targets, and what scale-sensitive governance arrangements and strategies do actors use in dealing with such challenges?

In recent decades, governments have come under increasing pressure to take concrete steps to restore large areas of their national territory to address land degradation processes that often aggravate biodiversity loss, climate change, and water and food security crises. In some cases, the degree of complexity associated with these issues can be perceived as so overwhelming that public actors feel paralysed and discouraged to address them. In other instances, actors may overestimate their ability to solve land degradation by implementing simple solutions that only focus on one single perspective or aspect of the problem, while at the same time overlooking system complexity and critical human-environment interactions (Termeer et al., 2019). By unravelling the different scale challenges that are linked to FLR governance, I tried to give due consideration to the complexities of reversing land degradation, while also giving insights into how these have been addressed in FLR governance.

To capture the **cross-level and cross-scale challenges** that emerge in FLR governance I studied the implementation of restoration-oriented policies in four case-study landscapes in Ecuador and Ethiopia (Chapters 2 and 3), as well as the implementation of the restoration efforts of two Ecuadorian water funds (Chapter 6). These analyses made clear that a multitude of scale challenges emerge in FLR governance contexts, and that some challenges show similarities. When it comes to cross-scale interactions, notable challenges relate to the temporal and spatial reach of restoration governance efforts that mismatch with ecological timelines and with the reach of land degradation processes. In terms of cross-level interactions, multiple challenges are the result of a

failure to recognise crucial interactions between different governance levels, misaligned governance processes at different levels and heterogeneity in how actors at different governance levels perceive land degradation problems and their solutions. We observed eight unique scale challenges that hampered the effectiveness of national restoration policy implementation in Ecuador and Ethiopia (*Table 7.1*), as well as four unique scale challenges that curtail the effectiveness of restoration efforts of individual restoration actors (*Table 7.2*). In addition, my study of the national FLR context in Ethiopia indicated that the implementation of national restoration targets is further complicated by cross-sector challenges between the agricultural and environment agencies (Chapter 4).

To overcome cross-scale and cross-level challenges, I studied how governance arrangements create cross-scale fit and cross-level alignment, and how scale-sensitive governance strategies assist actors to address new scale challenges and stay on course in the implementation of their restoration efforts. In the 84 cases that are part of the systematic literature review, I identified eight **scale-sensitive governance arrangements** that play a role in FLR governance (Chapter 5). While two are explicitly focused on creating cross-scale fit (moving tasks to other levels; task-specific organisations), one creates cross-scale fit and cross-level alignment (polycentric governance), and five explicitly aim to create cross-level alignment (multi-level coordination; multi-level collaboration; multi-level learning; bridging organisations; multi-level networks) (*Figure 7.1*). The eight governance arrangements were found in a wide variety of geographical contexts and across different natural resource bases. I observed that cross-scale fit was created by arrangements that are located at different governance levels, and that significant variation exists when it comes to the governance levels between which cross-level alignment is created.

The cases that were analysed as part of the systematic literature review also indicated that scale-sensitive governance arrangements give rise to new scale challenges. This seems to indicate that such challenges are an inherent part of FLR governance. Hence, as new scale challenges may emerge over time, ways to continuously observe and address them need to be sought to improve FLR governance. This requires **scale-sensitive governance strategies** that help actors to stay on course in translating restoration targets into local action. By studying two task-specific organisations in Ecuador, I traced the process of emerging scale challenges and scale-sensitive governance strategies deployed or in the planning to be deployed to address them (Chapter 6). A total of 12 scale-sensitive strategies have been found in response to identified scale challenges, aiming to re-create cross-scale fit or cross-level alignment (*Figure 7.2*). Strategies either aimed to alter the organisations' relationship with actors at higher and lower governance levels with whom they already work, or build

relations with new actors at higher and lower levels. The latter occurred either because their relationship with existing actors had become unproductive or because new actors could improve the sustainability of their restoration efforts.

No matter how hard actors try and no matter how fruitful restoration efforts become, any response to the wicked problem of land degradation is likely to be provisional and incomplete to varying degrees (Head and Alford, 2015). Today's solution, i.e. a restoration policy to tackle land degradation, will lead to tomorrow's problem, i.e. scale challenges that emerge when the policy is implemented. Given that scale challenges adversely affect the implementation of restoration targets, continuous efforts are required to address them. I showed that there are a large number of governance arrangements and governance strategies that can be instrumental to create and re-create cross-scale fit and cross-level alignment. There is no need for actors to become paralysed or discouraged when faced with scale challenges. At the same time, the scale challenges illustrate the complexity of FLR governance and should serve as a warning to actors with simple one-off solutions not to overestimate their ability to reverse land degradation in the long-term.

7.2 Response to the specific research questions and contributions

In this section, I provide a detailed response to the four specific research questions and explain my contribution to the scientific literature for each of the questions.

RQ1: What cross-level misalignment and cross-scale mismatch emerge in the process of implementing policies to meet national restoration targets?

To understand the scale challenges that arise in the restoration policy implementation process, interviews with both public and non-state actors were conducted at all restoration-relevant governance levels within a country. In Ethiopia, these include the federal, regional state, zone, district and ward levels, and in Ecuador these are the national, provincial, municipal and parish levels. To obtain a thick description of how national restoration targets are translated into local action, two case study landscapes were identified for both Ecuador and Ethiopia. Building on the experiences and perspectives of the FLR community of practice and using the scale challenge typology of Cash et al. (2006), I identified eight unique scale challenges in Ecuador (*Chapter 2*) and Ethiopia (*Chapter 3*) of which two occurred in both countries (*Table 7.1*). Cross-scale challenges arose because the temporal or spatial reach of governance processes was a mismatch with the temporal or spatial reach of ecological processes (2 x type B).

Table 7.1 Cross-scale mismatch and cross-level misalignment identified in the Ecuadorian and Ethiopian FLR governance contexts, by following the scale challenge typologies of Cash et al. (2006): the failure to recognise important scale and level interactions (type A), the persistence of cross-scale mismatch and cross-level misalignment (type B), and the failure to recognise heterogeneity in the way scales are perceived and valued by different actors (type C).

Scale challenge	Ecuador	Ethiopia
Cross-scale mismatch		
Temporal mismatch between short-term political cycles and long-term restoration timelines (type B)	✓	✓
Temporal mismatch between short-term planning horizons and long-term restoration timelines (type B)	✓	✓
Cross-level misalignment		
National restoration objectives misalign with decentralised land use planning realities (type A)	✓	
Federal forest and land policies have not created secure land tenure conditions to sustain local restoration efforts (type A)		✓
The governance level of existing restoration efforts misaligns with the level predominately receiving restoration funds (type B)	✓	
Misalignment of the forest and landscape restoration portfolio in the cascading government structure (type B)		✓
High-level budget allocation for alternative local livelihoods misaligns with sustained local restoration processes (type B)		✓
Heterogeneity between governance levels regarding the spatial reach of biodiversity and water-related restoration efforts (type C)	✓	

Cross-level challenges emerged when actors at one governance level did not give due attention to important interactions at other levels (2 x type A), when governance processes at different levels were misaligned (3 x type B), or when heterogeneity existed between levels regarding the most important scale levels to implement restoration efforts (1 x type C). The scale challenges caused the effectiveness or sustainability of restoration efforts to be reduced and the full potential of restoration efforts not to be met.

The results show that restoration efforts run the risk of primarily serving short-term political interests, failing to look beyond their planning horizons, failing to show flexibility to build on existing landscape restoration efforts, and failing to sufficiently consider livelihood realities and interests of communities and low implementation capacity at local level. Too much focus on the rapid fulfilment of national restoration targets leaves little room for negotiating visions that align with local needs, interests and priorities, and assess and adjust the temporal and spatial reach of governance processes to ensure the restoration and sustenance of relevant ecological processes.

In addition to the two national FLR governance contexts, the scale challenges encountered by two Ecuadorian water funds were also studied (*Chapter 6*). Four different scale challenges were found that are linked to the restoration efforts of the Water Protection Fund (FONAG) and the Regional Water Fund (FORAGUA) (*Table 7.2*). Three of these challenges were found in both water fund case studies, although they manifested themselves in different ways. One challenge was only observed in the case of FORAGUA. The results indicate that scale challenges can be observed from different angles, both when studying an entire national FLR governance context as well as when studying the restoration efforts of individual actors. This makes the scale challenges approach a widely applicable instrument to understand the cross-scale and cross-level interactions that influences the effectiveness and sustainability of restoration efforts.

Contribution to scaling and governance literature

The *scale* and *level* concepts (Gibson et al., 2000; Padt and Arts, 2014) and the scale challenge typology of Cash et al. (2006) help to understand the challenges that emerge when governance actors at multiple levels aim to influence relevant ecological processes. I contribute a high level of detail on how cross-scale and cross-level challenges play out in two national FLR governance contexts, and as part of the restoration efforts of two restoration-oriented actors. I add further distinction to the *scale challenge* concept by making a subdivision between cross-scale mismatch and cross-level misalignment. **Cross-scale mismatch** occurs when the spatial and temporal reach of governance processes do not correspond with the spatial and temporal reach of the ecological processes they aim to influence. Mismatch can be addressed by efforts that aim to create spatial or temporal fit across scales. **Cross-level misalignment** occurs as the result of a failure to recognise important scale and level interactions, when governance processes at different levels are not aligned, or due to a failure to recognise heterogeneity in the way scales are perceived and valued by different actors. Misalignment can be addressed by efforts that aim to create alignment between actors across levels. By unravelling the multiple cross-scale

Table 7.2 Cross-scale mismatch and cross-level misalignment identified as part of the restoration efforts of two Ecuadorian water funds, by following the scale challenge typologies of Cash et al. (2006): the failure to recognise important scale and level interactions (type A), the persistence of cross-scale mismatch and cross-level misalignment (type B), and the failure to recognise heterogeneity in the way scales are perceived and valued by different actors (type C).

Scale challenge	FONAG	FORAGUA
Cross-scale mismatch		
Short-term municipal election cycles created instability in the funds' relation with constituents or members and impeded long-term restoration processes (type B)	✓	✓
The limited spatial reach of restoration efforts mismatches with the extent of landscape degradation processes (type B)	✓	✓
Cross-level misalignment		
A blind spot related to alternative livelihoods has led to local discontent with restoration efforts and made it harder to sustain restoration processes (type A)	✓	✓
Heterogeneity regarding the purpose of restoration, with different spatial implications (type C)		✓

mismatch and cross-level misalignment challenges that coexist in the same governance context, I show the degree of complexity associated with improving FLR governance.

In all case study contexts where scale challenges were studied efforts had already been made to create cross-scale fit between governance and ecological processes. In other words, scale challenges can be found in contexts where environmental governance efforts have occurred for multiple years and where one could expect governance capacity to restore and sustain ecosystem functions to exist. Cross-scale mismatch was an explicit reason to establish the two Ecuadorian water funds (*Chapter 6*), while also in all four case study landscapes in Ecuador and Ethiopia (*Chapters 2* and *3*) restoration-oriented actors were identified that aim to create fit with ecological processes. These include the local government associations of the Chocó Andino and Bosque Seco in Ecuador and the Mount Guna Community Conservation Area office and the Kafa Biosphere Reserve project office in the Ethiopian landscapes. The reasons for creating these associations and offices were not explicitly studied. However, this likely followed processes of land degradation and deforestation that reduced the resilience of the local social-ecological system. The scale challenges identified in Chapters 2, 3 and 6 indicate that neither the existence of restoration-

oriented actors in the studied landscapes, nor the establishment of the two water funds created lasting cross-scale fit with ecological processes, but rather led to new challenges. This is in line with Head and Alford (2015) who emphasised that attempts to tackle a wicked problem often lead to poor results or unforeseen outcomes.

Contribution to forest and landscape restoration literature

Research about the specific interactions between FLR and governance and the challenges arising from these interactions has begun relatively recently (Mansourian, 2017b). Detailed analysis of scale challenges that emerge in FLR governance offers insights into the factors that hamper restoration success and a basis from where to incrementally improve FLR governance. The scale challenges I identified in Ecuador and Ethiopia show that efforts to improve the implementation of national restoration targets at local level need to be multifaceted. Aiming to solve only one scale challenge, such as short-term planning horizons, while not addressing other challenges, is unlikely to lead to major improvements in effectively achieving restoration targets.

That scale challenges are pervasive, as Cash et al. (2006) highlighted, is supported by the challenges that other authors have recently found in FLR governance. In a special issue related to governing FLR, Chazdon et al. (2020) observed widespread policy misalignment within and across different government levels and agencies, and a lack of supportive legal instruments and policies to strengthen FLR-related local decision-making. In terms of temporal mismatch, it has been highlighted that many benefits from restoration may require decades to be attained while restoration efforts are often not sustained beyond election cycles or the short-term planning horizons of donors (IPBES, 2018; Mansourian and Sgard, 2019). The limited project periods to achieve reportable restoration outcomes result in mere short-term support and capacity building efforts (Ota et al., 2020; Wilson and Cagalanan, 2016) while governance processes that can effectively sustain restoration processes require considerable time to develop (Stanturf et al., 2019). Short-term interventions that are not followed by long-term maintenance efforts have caused many restoration efforts to fail and financial resources to be wasted without generating desired ecological and livelihood improvements (Holl and Brancalion, 2020).

With my results I show that scale challenges need to be high on the agenda as the UN Decade on Ecosystem Restoration unfolds. Cumming et al. (2006) warned that scale challenges can easily be blamed on other, apparently more obvious factors and that recognising the underlying scale aspects of a challenge may require significant learning. The intertwinement of scale challenges with other types of governance challenges makes it difficult to observe them. Other challenges include overall

Table 7.3 Cross-sector challenges in Ethiopian FLR governance

Cross-sector challenge	Ethiopia
Food security dominates the restoration policy frame and budgetary allocation at the expense of forestry livelihoods and biodiversity benefits	Misaligned policy frames
Agricultural and environmental policy objectives and targets, and restoration mandates at the sub-national level are incoherent	Misaligned policy objectives
A siloed land use planning instrument makes it difficult to negotiate trade-offs and find synergies between sectoral policy objectives	Misaligned policy instruments

fragility of public agencies due to weak technical skills, experience and finance; weak institutional memory due to high staff turnover; non-existence, insignificance or instability of public policies, or non-compliance with them (Aguiar et al., 2021; Chazdon et al., 2020), or 4); and a lack of political will to change long-entrenched practices such as corruption. More specifically related to FLR is the lack of viable value chains for seed supply to meet restoration targets and needs, and lacking knowledge related to the propagation of native tree species to go beyond the growth of easy-to-manage exotic species like pines and acacias (Mansourian et al., 2021) that cause a homogenisation of the ecosystem. All challenges together add up to the complexity of reversing land degradation processes. Awareness about cross-scale mismatch and cross-level misalignment helps to explain why restoration efforts do not result in the expected outcomes nor sustain restoration achievements at the local level, and offers practitioners opportunities to improve the scale-sensitivity of existing and future efforts that aim to promote and sustain FLR.

RQ2: How do cross-sector challenges influence the implementation of policies to meet national restoration targets?

To understand how vertical interaction occurs across governance levels to translate national restoration targets into local action, it is important to observe how horizontal interaction occurs between actors that operate at the same governance level. In line with what has yet been concluded in the landscape governance literature (Arts et al., 2017; Reed et al., 2017, 2014; Sayer et al., 2013), my research shows that it turns out to be difficult to align sectoral policy objectives in a way that balances various land uses and enables restoration. I found three cross-sector challenges in Ethiopia's FLR governance context that influence the ways in which the country's federal government meets its national restoration target of 15 Mha (*Table 7.3*). The challenges are a result of cross-sector misalignment between the agricultural and environmental agencies.

Contribution to scaling and governance literature

While I place most attention on understanding cross-scale and cross-level challenges in FLR governance, this does not mean that cross-sector challenges between restoration-relevant agencies are unimportant. In this dissertation, I show how cross-sector challenges influence the ways in which public actors in Ethiopia translate national restoration targets into local action. I contribute to understanding how cross-level (vertical) and cross-scale challenges (Chapter 3), and cross-sector (horizontal) challenges (Chapter 4) coexist and widen the complexity of addressing land degradation. The restoration-related, cross-sector challenges exist due to the absence of an authority at the centre of government that can create a level playing field between sectoral agencies to realise a balanced approach to land use governance.

Traditional hierarchical forms of public administration that foster specialised agencies have not been able to readily address wicked problems (Peters, 2018). The demarcated sectoral domains of these agencies significantly limit the scope for thinking expansively about policy issues that do not neatly fall within the domain of a single agency (Head and Alford, 2015). If specialised agencies are evaluated on whether they meet their own sectoral interests, there is little incentive to invest resources in issues outside their sectoral domain (Peters, 2018). However, expansive thinking by involving multiple agencies is essential to create synergies and negotiate trade-offs between land use-related interests. The three identified cross-sector challenges support Parrotta and Mansourian's (2018) argument that most restoration efforts continue to be characterised by narrow silo-based approaches that focus on only a limited set of restoration benefits, while ignoring others.

RQ3: What scale-sensitive governance arrangements enable restoration actors to create cross-scale fit and cross-level alignment in order to achieve FLR objectives?

As part of a systematic literature review, I built on the collaborative, adaptive, multi-level and polycentric governance literature and identified nine different governance arrangements that support actors in creating cross-scale fit and/or cross-level alignment to improve environmental governance. By assessing the use of these arrangements in 84 cases studies that focus on FLR governance I sought to understand their characteristics and how they played out in practice. Examples of eight arrangements have been found: B, C, D, E, F, G, H and I (*Figure 7.1*), in cases targeting different types of natural resources and on six different continents. The governance arrangements were found at different governance levels or spanning different governance levels. This underlines their prevalence in a wide range of restoration contexts and their relevance from the international to the local level.

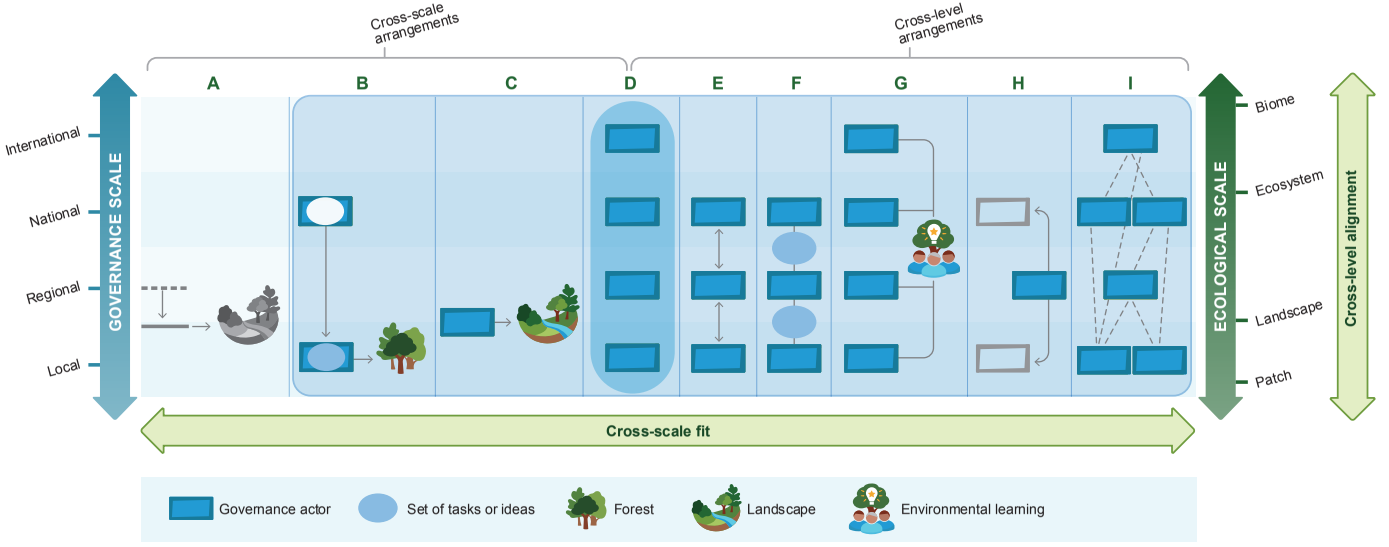

Figure 7.1 Nine scale-sensitive governance arrangements are visualised in relation to the governance and ecological scales, of which eight (B-I) were found in FLR governance. Specific arrangements aim to create fit between the governance scale (left) and ecological scale (right), and/or alignment between different governance levels (e.g. international, national, regional and local levels). While arrangements **A**, **B**, and **C** aim to create cross-scale fit, **D** aims to create both cross-scale fit and cross-level alignment, and **E**, **F**, **G**, **H** and **I** aim to create cross-level alignment. An example is visualised for each arrangement: **A.** Adding, removing and moving a general-purpose jurisdiction; **B.** Moving tasks to higher or lower governance levels; **C.** Task-specific organisations; **D.** Polycentric governance; **E.** Multi-level coordination; **F.** Multi-level collaboration; **G.** Multi-level learning; **H.** Bridging organisations; and **I.** Multi-level networks.

I found two out of three arrangements that aim to create cross-scale fit by seeking to govern ecological processes at the appropriate governance level: moving tasks to other levels (B) and task-specific organisations (C). With regard to moving tasks to other levels, decentralisation has been instrumental in increasing local ownership, improving response to local preferences and needs, and increasing the local benefits of restoration. On the other hand, centralisation increased consistency and control to address natural resource management challenges. However, after moving tasks to other levels, it has proved difficult for national governments to anticipate and avoid new challenges from arising. I found that task-specific organisations add value by facilitating transboundary restoration efforts, increasing public attention for restoration and creating financial and institutional stability to plan and implement restoration efforts. At the same time, I found that task-specific organisations are less effective when they lack transparency and accountability to local actors or when they are not sensitive to local needs, and they lack impact when they have a convening instead of an executing role. This suggests that their existence alone does not guarantee a smooth restoration process.

Due to its comprehensive nature, polycentric governance (D) has both cross-scale and cross-level characteristics. In cases displaying characteristics of polycentric governance, government actors at different levels have been active in orchestrating restoration processes by setting targets, raising awareness and creating enabling policy frameworks. Through their actions they stimulated other public and non-state actors at lower or similar governance levels to play a role in restoration, even though the other actors are formally independent from the orchestrating actors. In this way, the implementation of locally appropriate measures, new policy instruments and cross-level synergy was encouraged. I did not find challenges in the polycentric governance cases.

Five governance arrangements aim to create cross-level alignment, by strengthening human and financial capacities at other governance levels, by sharing restoration responsibilities, and by connecting actors at different levels to facilitate learning and sharing ideas and experiences. Multi-level coordination (E) has facilitated the implementation of policy frameworks and international development projects across levels, and created synergy between public and non-state efforts at different levels. However, in addition to positive interplay, I also found negative interplay between actors at different governance levels, for example because actors were not aware about the dynamics, interests or lack of capacity that existed at other governance levels. Multi-level coordination was also a challenge when trade-offs had to be found between economic and ecological uses of a natural resource, or when coordination was short-lived, which did not result in stronger local implementation capacity.

Multi-level collaboration (F) has enabled governments and rural communities to share responsibilities for the sustainable management and restoration of natural resources, and facilitated the building of capacities at different governance levels to promote environmental governance and strengthen livelihoods. In several cases, multi-level collaboration enabled creating coherent restoration projects that comprise both publicly and privately-owned lands. However, it turned out to be challenging when the efforts of one actor fell short of another actor's expectations. Multi-level learning (G) encompassed joint knowledge acquisition that built trust, positive relationships and common understanding between actors at different levels, experimentation that created experience and skills and reduced uncertainty associated with new restoration practices, and the tapping into knowledge at other levels through exchange. However, multi-level learning failed to overcome power imbalances between actors when it was used to find ways to reconcile the economic and ecological uses of a natural resource. Bridging organisations (H) were instrumental in connecting international ideas with local conditions, and higher-level policy frameworks and actors with rural communities and landowners. Lastly, multi-level networks (I) facilitated the building of restoration-related skills, the exchange of knowledge and experiences, and the creation of a professional identity by bringing restoration actors together. They also facilitated a shared understanding of challenges and pursuit of common goals between actors at different levels. I did not identify any challenges as part of bridging organisations or multi-level networks.

Contribution to scaling and governance literature

According to Head and Alford (2015), the most characteristic response to wicked problems is to engage in a collaborative process. However, as there is no single best governance approach to addressing wicked problems, collaboration is not always the most adequate option among all possible responses and it does not necessarily address all facets of the wicked problem (Head and Alford, 2015; Termeer et al., 2010). While multiple governance arrangements have been proposed to address cross-scale and cross-level challenges, they have been fragmented across different branches of the governance literature. My systematic literature review has brought coherence to the scale-sensitive governance literature by bringing together different governance arrangements that foster cross-scale fit and/or cross-level alignment in a comprehensive conceptual framework.

The conceptual framework facilitates actors to adopt a nuanced scale-sensitive governance approach and deploy specific arrangements in line with what a local context requires at certain stages of the restoration process. Particular types of scale challenges that arise in a given context can be taken as a starting point for setting up

specific governance arrangements to achieve effective FLR governance. While in some cases it can make sense to govern an entire ecological or landscape unit by making the boundaries of an arrangement coincide with the boundaries of a specific ecological process (Cohen and McCarthy, 2015), in other cases the environmental governance context may require building stronger links between governance levels. Cross-level governance arrangements make it easier to tap into unique knowledge and capacities present at each level (Cash and Moser, 2000) and exchange insights among actors at different levels, which increases the likelihood that ways are found to address scale challenges (Head and Alford, 2015).

Contribution to forest and landscape restoration literature

The conceptual framework that I developed from the original *scale-sensitive governance* concept (Padt et al., 2014) is well applicable to the FLR governance literature. By showing how eight scale-sensitive governance arrangements played out in practice in 84 case study contexts, I give grounded insights into how FLR has been facilitated by different scale-sensitive governance arrangements. The governance arrangements that were found in FLR contexts offer practical ideas to improve current and future restoration efforts, while also informing practitioners about the challenges associated with specific arrangements.

In the systematic review, I found that the presence of scale-sensitive arrangements is often not enough to ensure a smooth restoration process. Governance arrangements that aim to create cross-scale fit were followed by cross-level misalignment. This indicates that additional cross-level arrangements are needed to allow actors at different levels to provide each other with feedback on any challenges that arise after cross-scale arrangements are established. In several other cases, cross-level misalignment was observed even when governance arrangements that aim to create cross-level alignment were found. This highlights the need for continuous efforts to address new scale challenges, in order to sustain restoration processes in the long-term.

RQ4: What scale-sensitive governance strategies enable restoration actors to stay on course towards achieving forest and landscape restoration objectives in a context where new scale challenges emerge?

After concluding from the systematic literature review that scale challenges are an inherent part of FLR governance, the scale-sensitive governance strategies of two Ecuadorian water funds, FONAG and FORAGUA, were studied to address the scale challenges that emerge as part of their restoration efforts. The water funds are

task-specific organisations that were designed to create spatial and temporal fit with the relevant ecological processes they seek to conserve and restore. The results show that the funds have to continuously deploy scale-sensitive governance strategies to address new scale challenges and stay on course in realising their restoration objectives (*Figures 7.2*).

The total of 12 scale-sensitive strategies the water funds deployed or were planning to deploy focus both on creating cross-scale fit and cross-level alignment. The strategies fall into two broad categories. The first category of strategies aims to alter the water funds' relationship with actors at higher and lower governance levels with whom they already work to improve the ecological and social outcomes of their restoration efforts. For example, FONAG and FORAGUA gave or planned to give more attention to alternative livelihoods to assist community members who were affected by restoration efforts, thereby improving the sustainability of the funds' restoration efforts. The second category of strategies aims to build relations with new actors at higher and lower governance levels, either because the relationship with existing actors had become unproductive or because new actors offer new options to improve the sustainability of restoration efforts. For example, both water funds engaged with international development partners and conservation organisations to attract funding that they could apply with greater flexibly compared to the funds they receive from their own constituents or members, to enable them to create better spatial or temporal fit with ecological processes.

Mixed success was observed between the two water funds in formulating and deploying scale-sensitive governance strategies. This may be related to the different organisational models the water funds follow (Bremer et al., 2016), which affect their ability to observe scale challenges and deploy strategies to address these. FONAG follows the agency model, meaning it carries out restoration efforts itself. Meanwhile, FORAGUA follows the grant model, which means that it reviews and finances proposals that are designed and submitted by its member municipalities. FONAG's agency model allowed it to learn by trial and error and develop a strong technical capacity. By actively listening to rural communities, observing their needs and priorities and learning from experience, FONAG has become well placed to adapt its strategies and find appropriate solutions to emerging scale challenges. FORAGUA's grant model has meant that scale-sensitive strategies take longer to formulate, with several being only in the planning phase. The limited ability of FORAGUA and its member municipalities to observe cross-scale and cross-level challenges in a timely manner has reduced the effectiveness of the water fund in addressing landscape degradation. The results seem to suggest that the internal capacity that FONAG was able to develop made it better equipped to engage in an iterative process of 're-creating' cross-scale fit and cross-level alignment than FORAGUA.

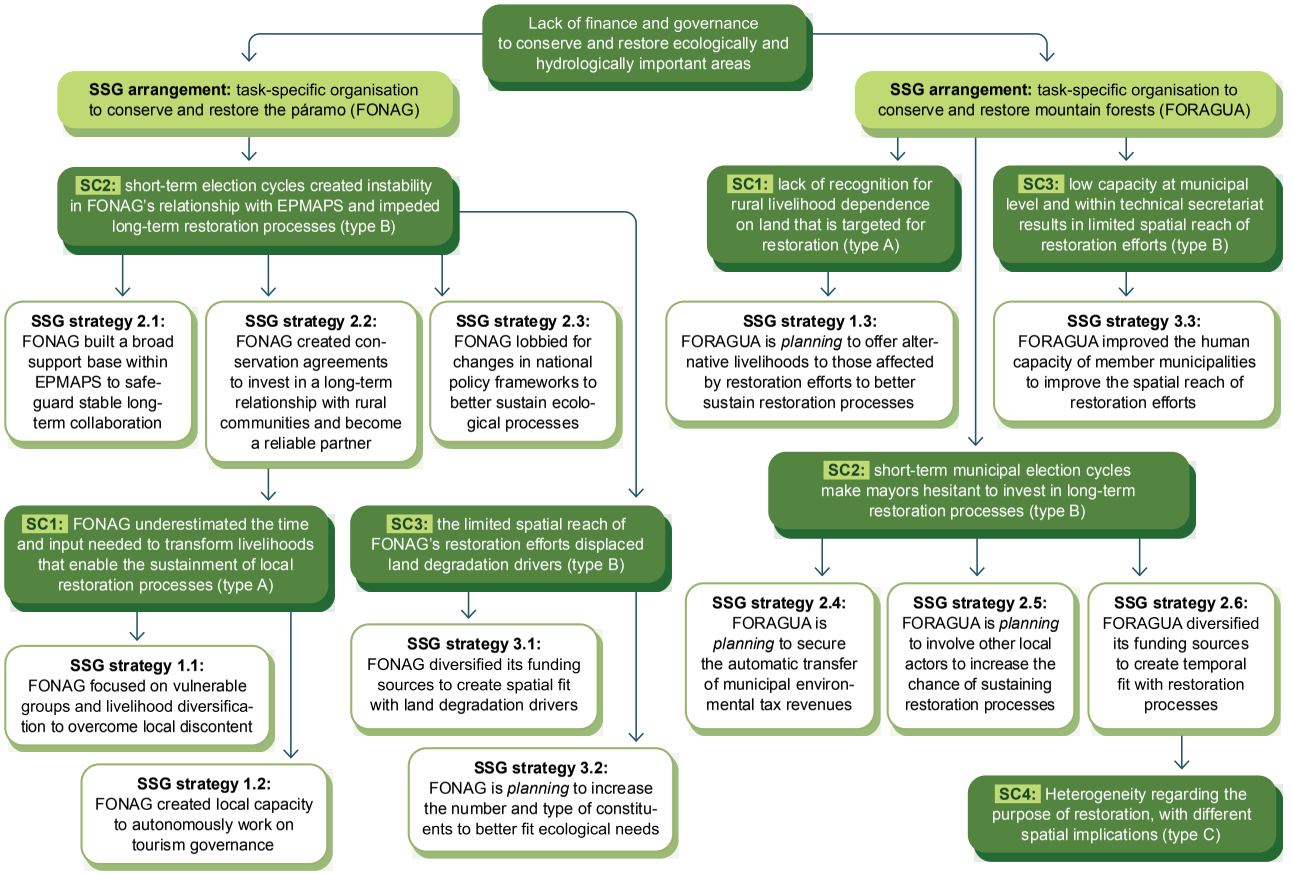

Figure 7.2 Scale challenges (SC) and scale-sensitive governance (SSG) strategies at FONAG and FORAGUA

Contribution to scaling and governance literature

The case studies of the water funds contribute to the limited empirical research that explicitly focuses on how actors deal with scale challenges. The two cases demonstrate that FLR governance is a continuous and iterative process in which scale challenges that arise during the implementation of restoration efforts need to be addressed, in order to stay on course to achieve restoration targets. This is in line with the wicked problem literature that describes challenges that have no definitive solution and must be continuously 're-solved' (Head and Alford, 2015; Rittel and Webber, 1973).

Lindblom (1959) highlighted the notion that programme managers and policy-makers who are responsible to deal with an issue have only limited time and resources available, while the list of challenges influencing the issue is fast. With multiple scale challenges taking place simultaneously in FLR, it is therefore necessary to prioritise and focus on the scale challenges that seem most urgent at any given time. As the research shows, strategies will only achieve part of what is hoped for and may lead to new challenges. No one can know enough about a given context to avoid errors in predicting the consequences of policies or strategies (Lindblom, 1959). So the objective is not so much to formulate a definitive solution as to formulate new strategies of dealing with challenges that can generate actions that make sense, even if they do not solve them in the end. This requires actors to be flexible and adaptive (Mansourian and Sgard, 2019) and calls for broad governance capabilities, which take time, effort and resources to develop (Head and Alford, 2015; van Oosten, 2021).

Contribution to forest and landscape restoration literature

FLR takes place over a period of decades during which ecological, social and political changes can lead to unforeseen cross-level and cross-scale challenges. This makes FLR to be surrounded by uncertainty. Given that the process of creating and re-creating fit with ecological processes is iterative, it is critical for restoration governance to take a long-term perspective, so that scale-sensitive governance strategies can be deployed when new scale challenges emerge. The results of the water funds show that task-specific organisations that focus on the long-term governance of a specific ecological or landscape unit are a useful addition to the FLR governance landscape, as they bring in capacity for iterative governance. Nevertheless, creating new organisations is relatively costly and mostly done to manage complex situations that need long-term interaction among many actors (Gray and Purdy, 2018). To support their creation, it is hence important to map the social and ecological benefits that new task-specific organisations are likely to generate.

7.3 Limitations and directions for future research

In this section, I list the various limitations and possible biases that are part of my research approach, research design and methods for collecting and analysing data. Subsequently, I point out promising directions for future research.

7.3.1 Limitations regarding the research approach and design

In terms of the research approach, it strongly depends on the researcher's choice of particular scales and levels and the detail with which phenomena are studied, what kinds of cross-scale and cross-level challenges are detected in the data (Gibson et al., 2000). Multiple scales (e.g. Cash et al., 2006) and epistemological views coexist in the scale-related scientific literature, each with their own advantages and shortcomings, and hence there is no point to a priori favour one scale over another (Padt and Arts, 2014). It is rather important to substantiate which ones were used and why. Following the recommendations of Buizer et al. (2011) I have tried to be clear and transparent about my *scale* and *level* choices, observation techniques, and epistemological choices regarding how I use the *scale*, *level* and *dimension* concepts in my research. I have also been transparent about the organisations that were interviewed and at which governance level they are positioned. With regard to the research design, I have used multiple case studies to generate a thick description of FLR governance processes in Ecuador and Ethiopia, and to study how different governance arrangements and governance strategies aimed at creating cross-scale fit and cross-level alignment have played out in different FLR governance contexts. This research design gave room to bring in FLR governance-related context and nuance to analyse scale challenges.

There has been widespread concern about the lack of rigour associated with case study research (Yin, 2003). The risk exists that case study researchers are 'sloppy', do not follow systematic procedures, and allow biased views and ambiguous evidence to influence the results and conclusion. I addressed this concern by basing the results and conclusion of each chapter on a large number of interviews and conducting my analysis on the transcripts of all interviews. In addition, I collected data from various sources (Yin, 2003), including policy and project documents, interviews, focus group discussions, participatory observation and systematic literature review. For Chapters 2, 3 and 4, I collaborated with local researchers in the two case study countries, while I organised two validation workshops with staff from the two water funds studied for Chapter 6 to discuss the results. A possible bias that remains when analysing scale-sensitive governance strategies relates to their time-sensitivity. It will take time before it is clear whether planned scale-sensitive governance strategies are actually deployed and what their effects are on creating cross-scale fit and cross-level alignment. To address this bias, a clear subdivision was made between strategies that are deployed and strategies that are *planned* to be deployed.

A second common concern with case study design is that it provides little basis for scientific generalisation. In this regard it needs to be pointed out that the goal of exploratory case study design is not to draw conclusions for a larger population but to build and expand theory about a context that lacks detailed preliminary research and to define specific questions for follow-up research (Mills et al., 2012; Yin, 2003). Therefore, the case study results cannot be generalised outside their immediate contexts in the way that a representative sample of a survey can be statistically generalised to a larger population (Yin, 2003). Rather, the case studies facilitate analytical generalisation. In the case of this dissertation, this involved a theoretical analysis of the cross-scale and cross-level factors that influence the translation of national restoration targets into local action, based on thick descriptions of FLR governance in Ecuador, Ethiopia and beyond.

A third concern is that case studies take too long and result in massive, unreadable documents (Yin, 2003). I dealt with this concern by writing each Chapter in the form of an individually readable journal article, thereby imposing a strict word limit to reporting case-study findings. I acknowledge that the multiple case study is not the only research design through which to study FLR governance and that it does not explicitly focus on some important issues such as the political dimension of FLR and the asymmetric power relations that influence how restoration targets are being implemented.

7.3.2 Limitations regarding the data collection and analysis methods

When it comes to the methods of data collection and analysis, it is important to emphasise that the choice to focus on the multi-level nature of FLR governance processes comes with practical time limitations regarding the depth at which each governance level can be studied. This is relevant for Chapters 2, 3, 4 and 6. The limited time available for fieldwork made it difficult to fully understand all the dynamics that are inherent to each governance level, such as the political dynamics that unfold at municipal level or the social dynamics that occur between sub-groups at the community level. Although studying the multi-level character of FLR governance influenced the depth that could be obtained at each level, it was considered the best way to study the influence of different governance levels on the translation of national restoration targets into local action. A more ambitious research set-up with more financial and human resources to study each governance level more in-depth would likely detect additional scale challenges. Hence, I highlight that my analysis is not an exhaustive list of the scale challenges, cross-sector challenges and scale-sensitive governance strategies that exist in Ecuadorian and Ethiopian FLR governance. They are a first thorough exploration of cross-scale and cross-level challenges, and responses to these, that can be further refined and expanded by other researchers.

In addition, data collection greatly depended on the willingness of actors at different levels to be interviewed and share their experience and perspective regarding FLR governance. Not all actors central to the implementation of FLR were able or willing to share their insights in an interview. In some instances, it was difficult to get an interview with the most relevant person within an organisation and several interviews were therefore conducted with the 'second-best' person. In other instances it was difficult to arrange an interview with an organisation altogether. Besides some persons simply not having time, another reason could be that sharing perspectives on governance challenges can be experienced as potentially harmful. Particularly in countries governed by authoritarian regimes such as Ethiopia (The Economist Intelligence Unit, 2021) it is difficult to openly discuss governance challenges.

The quality of the fieldwork has also been affected by the volatile security situation in several research contexts. The research in Ethiopia was conducted during a time in which the national security situation was extremely uncertain. This limited the time during which the team could do fieldwork for Chapters 3 and 4 to about 10 days in each landscape, as it was not possible to rely on public transportation and a private car had to be available at all times in the event of a sudden emergency. Also, the research team in Ecuador was faced with national strikes in October 2019 at the time of fieldwork for Chapter 6, resulting in reduced flexibility to plan rural community visits. Lastly, the COVID-19 pandemic prevented field visits to Ecuador and Ethiopia in the period March 2020 until September 2021 altogether.

In terms of the systematic literature review, reliance on peer-reviewed journal articles creates a possible bias regarding the information that primary authors choose to document and share about a particular case study, including important factors related to the success or failure of a specific governance arrangement. Another bias relates to the possible emphasis placed by some authors on the achievements, positive impact or future potential of governance arrangements, while paying less attention to the challenges associated with them. As for categorising the scale-sensitive governance arrangements, some could be easily recognised in the FLR governance cases, such as task-specific organisations and multi-level networks. Other arrangements required a relatively thick description of the governance context to distinguish, as the way they play out in practice is relatively similar.

Although the 84 case studies offer a broad overview of the characteristics of scale-sensitive FLR governance, the systematic literature review does not provide an exhaustive overview. It is likely that several interesting cases in the scientific literature fell outside the scope of the search terms. In the cases selected for the literature review, I observed a bias towards countries in the global North where

strong restoration-related policies exist, as well as relatively safe countries in Latin America, Sub-Saharan Africa and Southeast Asia where international development partners implement FLR efforts. Few cases were reported from the former Soviet Union, the Middle East and Northern Africa or from (other) conflict regions, while there is a need to learn lessons from these regions regarding FLR governance.

Another possible bias is that the research for this dissertation was conducted by researchers who are primarily grounded in the governance literature, and that no researchers with a strong ecological background participated. Researchers from different academic backgrounds, for example the life sciences, might have found different cross-scale challenges and observed other cross-level governance interactions that have adverse effects on ecological processes. With more knowledge of ecological processes it could be easier to identify cross-scale mismatch. For example, a mismatch could arise if restoration efforts that aim to reverse biodiversity loss would fail to consider the migration routes of endangered species, and thus not restore the appropriate areas to safeguard this migration, which could lead to the species' further decline despite restoration taking place. More ecological knowledge would also make it easier to understand cross-scale mismatch between the tree species found in the natural ecosystem and the species used during tree planting efforts.

7.3.3 Future research

Based on my research of cross-scale, cross-level and cross-sector challenges and scale-sensitive governance arrangements and strategies, and considering the limitations of my research, I make recommendations for future research. Firstly, I emphasise the need for research on scale challenges in other national contexts, to strengthen our understanding and theory of the scale challenges that arise when translating restoration targets into local action. As national and sub-national governments increasingly have to play their part in fulfilling national restoration targets, there is a growing need to study the multi-scale and particularly multi-level nature of FLR governance. This will help to inform the governments that are studied, as well as other actors, about the scale challenges that arise in their national context.

In the further study of FLR-related scale challenges, I recommend a more thorough analysis of the dynamics occurring at each governance level that could influence restoration outcomes. One example is to focus on the perception of different community-level subgroups regarding their interaction with higher-level public actors. To better expose inequalities at the community level, research should go beyond merely targeting members of natural resource user groups who are directly involved in local restoration efforts, as has been done in this dissertation. In the study of scale

challenges, I also advise to set up interdisciplinary research teams consisting of landscape ecologists, besides governance researchers, to better identify cross-scale mismatch between governance and restoration-relevant ecological processes.

In terms of scale-sensitive governance arrangements, my systematic literature review was aimed at identifying one dominant scale-sensitive governance arrangement in each case. However, the arrangements are not mutually exclusive, but overlap in several cases. To pay more attention to this overlap, I recommend studying different governance arrangements within the same landscape context, how they interact and which combinations of arrangements are particularly fruitful to govern ecological processes, because they are mutually reinforcing. It is relevant to explore which governance arrangements are most useful for dealing with specific types of scale challenges, and what roles, responsibilities and capabilities governance actors require to shift governance arrangements to the appropriate ecological scale level or strengthen interaction between two or more relevant governance scale levels.

Since studying the interaction between scale challenges and scale-sensitive strategies in FLR is new, it would be relevant to expand the study of scale-sensitive strategies beyond task-specific organisations. Studying the strategies that are deployed by actors who are involved in other governance arrangements would bring the categorisation of strategies that create cross-scale fit and cross-level alignment further and provide a robust understanding of which strategies work well when new scale challenges arise. In this regard, a distinction can be made between the strategies that are used by actors at different levels, including multilateral and bilateral development partners, national and sub-national governments, non-state actors, and rural communities. Since the interaction between scale challenges and scale-sensitive governance strategies is time-sensitive and multiple strategies were still in the planning phase at the time of research, there is also a need for case studies that cover longer timelines.

7.4 Recommendations for FLR governance in practice

In this section, I make three recommendations for improving FLR governance in Ecuador, Ethiopia and beyond.

7.4.1 Focus on cross-sector challenges to improve the local implementation of FLR targets

Efforts to improve cross-scale and cross-level interaction cannot be separated from the need to improve cross-sector interaction, since cross-sector challenges influence how restoration targets are translated into local action. Now that the role of natural ecosystems in solving problems such as climate change, biodiversity loss and land degradation is gaining prominence, it is important to promote policy processes that create synergies and negotiate trade-offs between land uses that meet immediate human needs and those that safeguard the long-term ecological processes that generate ecosystem functions (Foley et al., 2005; Sayer et al., 2013). As part of such policy processes, I recommend strengthening integrated land use planning as a policy instrument to achieve a wider range of ecosystem functions at the local level. To stimulate actors from different sectors, such as agriculture, forestry, water and environment, to interact as part of such an instrument they should ideally have no alternative venues to fulfil their land use needs or regard any alternatives as less unattractive (Ansell and Gash, 2007).

One way to achieve cross-sector alignment is to establish a dedicated authority or cabinet committee that can regulate different sector interests. Such an authority should create a level playing field for all land use-related sectors in order to balance competing land use claims (Peters, 2018; Scharpf, 1978). For this to succeed, it is critical that public actors at the centre of government recognise that land use planning processes benefit from building on a diversity of sectoral perspectives, as compared to letting land use planning be dominated by one sector alone. When more sectors directly participate in land use planning, there will be actors at the table who represent different restoration benefits, including increased food and water security, forestry livelihoods and biodiversity conservation. However, when changing land use planning rules to better balance various land uses, it will be needed to overcome resistance from agencies that see their vested interests affected (Klijn and Koppenjan, 2006). A way for development partners to achieve cross-sector alignment at the national level is to design multilateral initiatives that stimulate interaction between land-related agencies like the Ministry of Agriculture and Ministry of Environment. In Ecuador, the Integrated Programme for Forest Conservation and Sustainable

Production in the Amazon (PROAmazonía)[12] is an example of an initiative where two agencies, the Ministries of Agriculture and Environment, which previously had only a limited working relationship, had to collaborate to be able to access sizeable development funds focused on sustainable land management, value chain development and restoration.

7.4.2 Develop scale-sensitive observing and acting capacity at multiple governance levels

It is necessary to develop human capacities at multiple levels to improve the ability of actors to observe the cross-scale and cross-level dependencies and interactions that hamper restoration efforts, and act on these by deploying strategies that cut across scales and levels. To facilitate FLR implementation at the local level, Stanturf et al. (2019) stressed the need to train landscape generalists who can bring technical knowledge, sensitivity to local conditions, and diverse actor objectives together. Such generalists could be in the lead to help identify existing or new scale-sensitive governance arrangements that work best in specific landscape contexts and at different phases of the restoration process. When actors are able to establish new governance arrangements, such as multi-level collaboration or a task-specific organisation, they create the enabling structures for scale-sensitive observing and acting. The FONAG and FORAGUA case studies show that task-specific organisations are particularly useful to create temporal fit with restoration timelines and spatial fit with relevant ecological processes when they engage in a continuous and iterative governance process. Despite their potential, existing FLR-oriented task-specific organisations at the landscape level have not always received adequate attention from higher-level actors.

Different task-specific organisations have been found in the four landscapes that were studied as part of this dissertation, including the local government associations of the Chocó Andino and Bosque Seco in Ecuador, and the Mount Guna Community Conservation Area and Kafa Biosphere Reserve offices in Ethiopia. While they all developed FLR-oriented visions for their respective landscapes, the financial support for their offices has remained largely limited. This has made it difficult for most organisations to sustain and expand their long-term restoration efforts. In this regard it is crucial to increase the scale-sensitivity of actors at the international and national levels so that FLR-oriented policies and programmes are aligned, where possible, to existing restoration-oriented arrangements at the landscape level and longer-term funding mechanisms are in place to assist local actors in realising their FLR visions (Di Sacco et al., 2021; Mansourian and Sgard, 2019).

12 https://www.proamazonia.org

Scale-sensitive observing and acting capacities must be developed at all governance levels. When such capacities are only developed at one governance level, there is a risk that these will be ignored by actors at another level. For example, in the wake of Ecuador's 2014-2017 National Forest Restoration Plan, which has been characterised by multiple scale challenges (Chapter 2), the national government came up with the idea of creating territorial roundtables as part of its new 2019-2030 National Forest Restoration Plan. These roundtables would engage relevant restoration-oriented actors within each province and create a space for dialogue to jointly design context-sensitive restoration efforts. However, to implement the plan the government had to attract funding from international development partners, who have not been sensitive to the learning process of the national government. In recent years, development partners have rather followed their own short-term project logics and specific interests, such as carbon sequestration to mitigate climate change, making it difficult to align with local needs and priorities. Neither the territorial roundtables nor other spaces for dialogue at the sub-national level materialised to strengthen existing restoration processes and actors at the landscape level. International development partners are therefore recommended to invest in their scale-sensitive observing capacity by supporting multi-level learning and collaboration processes aimed at improving the local implementation of national restoration targets.

7.4.3 Keep paralysis and overestimation at bay when translating restoration targets into local action

Initiatives such as the Bonn Challenge and UN Decade on Ecosystem Restoration have generated unparalleled political commitment and optimism to restore hundreds of millions of hectares of the world's degraded and deforested lands (Di Sacco et al., 2021). However, the translation of national restoration targets into local action has been challenging as a result of the complexity of reversing land degradation, which can cause actors to become paralysed and discouraged to formulate a response. Restoration practitioners who are engaged in large-scale restoration often do not know where to start, due to the interdisciplinary nature of FLR governance challenges and the large spatial reach of FLR, implying the involvement of many actors with varying interests (Mansourian et al., 2019). The complexity of reversing land degradation may then cause actors to deploy 'simple' solutions that only focus on a single aspect or take one particular perspective and therefore overestimate their ability to solve the problem (Ostrom, 2009; Termeer et al., 2019). An example are the short-term tree planting campaigns that focus on the number of trees planted without considering the long-term governance arrangements needed to make the tree seedlings grow into forests. This has serious repercussions for the sustainability of these restoration efforts. Both paralysis and overestimation are problematic because any unmet expectations from FLR may result in waning enthusiasm for the Bonn Challenge and the UN Decade on Ecosystem Restoration (Stanturf et al., 2019).

To stay on course in FLR, it is necessary to have a governance process that keeps paralysis and overestimation at bay by focusing on feasible, partial solutions that take into account the complexity of the problems associated with reversing land degradation (Termeer et al., 2019). Such a process recognises that any effort to promote FLR is not final, but requires ongoing policy action to improve the local implementation of FLR incrementally. An important starting point for public actors is to obtain a clear understanding of the national FLR governance context, and unravel the different cross-scale, cross-level and cross-sector challenges that hamper the local implementation of FLR. Attempts to unravel these challenges provide clarity about what needs to be improved and give direction to efforts to strengthen FLR governance, either by supporting existing scale-sensitive governance arrangements or by creating new ones, and by deploying appropriate scale-sensitive governance strategies. Some actors will be better placed than others to deal with specific scale challenges. The national government might be best placed to strengthen the land use planning capacity of local governments, while international development partners play an important role in expanding the planning horizons of multilateral and bilateral FLR-oriented initiatives.

When scale challenges seem overwhelming, for example because they are too political and all-encompassing to be addressed by FLR efforts, alternatives must be found that provide partial solutions. An example is the challenge that federal forest and land policies in Ethiopia have not created secure land tenure conditions to sustain local restoration efforts. While it might be hard to change the policies that dictate that all land is state-owned, restoration practitioners have found a partial solution with the establishment of Participatory Forest Management groups. The groups, which are a multi-level collaboration between local governments and rural communities, have given community members a sense of forest ownership and confidence that they can reap the benefits of their improved forest management efforts. This has facilitated the regeneration of degraded forests.

7.5 Concluding remarks

Unravelling the cross-scale, cross-level and cross-sector challenges that arise in FLR governance facilitates a better understanding of the complexity associated with efforts that aim to reverse land degradation. The *scale* and *level* concepts, and the spatial and temporal dimensions of governance and ecological processes, have proved very helpful to analyse messy FLR governance contexts. The multiple case study analyses in Ecuador and Ethiopia included in this dissertation add specificity to the FLR governance literature. In two national contexts, eight unique scale challenges

were found that reduce the effectiveness of restoration efforts, either because important cross-scale and cross-level interactions are not recognised, because of persistent mismatch between the governance and ecological scales and misalignment between governance levels, or because of heterogeneity in the way problems and solutions are perceived across governance levels. In addition to cross-scale and cross-level challenges, cross-sector challenges that exist between public agencies have shown to further complicate the way in which national restoration targets are translated into local action. More clarity about the cross-sector, cross-scale and cross-level challenges in the process of implementing national restoration targets gives relevant actors the opportunity to improve restoration efforts incrementally.

To better understand the ways in which cross-scale and cross-level challenges can be addressed, I conceptualised nine different scale-sensitive governance arrangements that aim to create cross-scale fit and/or cross-level alignment. Through a systematic literature review I analysed how these arrangements played out in practice in 84 case studies that describe FLR governance processes. In addition to gaining an understanding of the characteristics of these arrangements in FLR governance, multiple scale challenges were identified that emerged after scale-sensitive governance arrangements were established. This suggests that scale challenges are an inherent part of FLR governance, which has implications for how actors should approach FLR processes. I studied how two Ecuadorian water funds, which are task-specific organisations that aim to create temporal and spatial fit with relevant ecological processes, deployed or planned to deploy strategies to overcome the scale challenges they are confronted with as part of their restoration efforts. It was found that FONAG is better equipped to stay on course in implementing its restoration efforts than FORAGUA, which was attributed to FONAG's capacity to observe cross-scale and cross-level challenges and act upon them.

To improve FLR, I recommend a governance process that focuses on feasible, partial solutions that take into account the complexity of challenges associated with reversing land degradation. To this end, I recommend studying the scale challenges that exist in particular FLR governance contexts and identifying the governance arrangements and strategies that can address these. The provided overview of scale-sensitive governance arrangements and strategies is helpful to improve FLR implementation during the UN Decade on Ecosystem Restoration 2021–2030, which is expected to increase global attention for, and investments in, FLR. Yet, the conditions for improving FLR policies will probably never be perfect, making it imperative to just start and 'trust the process' (Roberts, 2000), monitoring and making corrections along the way.

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Summary
Resumen

Summary

Introduction and research questions

Land degradation has become a pervasive, systemic phenomenon that has reached critical levels in many parts of the world. Its adverse effects at global level sparked the creation of a number of high-level initiatives, such as the Bonn Challenge, which have generated unprecedented political will among an increasing number of countries to design policies and set targets to restore degraded and deforested land on their national territory. The initiatives have drawn attention to forest and landscape restoration (FLR) as an approach to address biodiversity loss, climate change, water and food insecurity, and poverty. The intertwinement with other major crises such as biodiversity loss and climate change makes land degradation a *wicked problem*. An important characteristic of such a problem is that it resists attempts to be solved. Today's challenges are a result of the solutions to yesterday's challenges, and today's solutions are likely to lead to new challenges tomorrow.

With political will to restore hundreds of millions of hectares of degraded and deforested land now being generated worldwide, a next challenge is implementing national restoration targets at the local level. Countries still show limited progress in translating their targets into local action and most of them lack a detailed and viable plan that explains how restoration processes are fostered and sustained on the longer-term. This draws particular attention to the various governance arrangements that are used at the national and subnational level to promote restoration. This dissertation focuses on understanding the cross-scale, cross-level and cross-sector characteristics of FLR governance, the challenges that emerge when national restoration targets are implemented, and the governance arrangements and strategies that have supported actors to overcome these challenges. The following general research question has guided the research:

What scale challenges emerge when implementing policies to meet national restoration targets, and what scale-sensitive governance arrangements and strategies do actors use in dealing with these challenges?

The general research question has been subdivided into four specific research questions:

RQ1 What cross-level misalignment and cross-scale mismatch emerge in the process of implementing policies to meet national restoration targets?

RQ2 How do cross-sector challenges influence the implementation of policies to meet national restoration targets?

RQ3 What scale-sensitive governance arrangements enable restoration actors to create cross-scale fit and cross-level alignment in order to achieve forest and landscape restoration objectives?

RQ4 What scale-sensitive governance strategies enable restoration actors to stay on course towards achieving forest and landscape restoration objectives in a context where new scale challenges emerge?

Theoretical framework and research design

This dissertation builds on the multi-level governance literature and explores decision-making processes that occur across (cross-level) and within (cross-sector) politico-administrative levels, from the national down to regional and local levels. This research goes beyond these two perspectives by also explicitly studying the cross-scale interactions between governance processes and the ecological processes they seek to influence. The cross-level and cross-sector policy processes that are studied as part of multi-level governance fall within the governance scale, while the relevant ecosystem processes these policies seek to influence fall within the ecological scale. To study the challenges that emerge in FLR governance, three scale challenge types are employed: (a) the failure to recognise important scale and level interactions, (b) the persistence of cross-scale mismatch and cross-level misalignment, and (c) the failure to recognise heterogeneity in the way scales are perceived and valued by different actors. To study scale-sensitive governance of the environment, a distinction is made between governance arrangements and governance strategies.

This dissertation consists of four empirical chapters and one systematic literature review. The national FLR governance contexts of Ecuador and Ethiopia were studied to understand the cross-scale and cross-level challenges (RQ1) and cross-sector challenges (RQ2) that emerge when national restoration targets are translated into local action. In each country, two mountainous landscapes were identified where restoration efforts have been implemented. The results about cross-scale, cross-level and cross-sector challenges are based on a policy and project document review, 54 interviews in Ecuador, 56 interviews and 14 focus group discussions in Ethiopia, and participatory observation. To understand how restoration-related actors have overcome cross-scale and cross-level challenges focus was placed on scale-sensitive governance arrangements (RQ3) and strategies (RQ4). The results related to scale-sensitive arrangements are based on a review of 84 peer-reviewed FLR governance case studies, while the results related to scale-sensitive strategies build on a project document review, 48 interviews in Ecuador, and participatory observation.

Results

In *Chapters 2* and *3* (RQ1), the cross-scale and cross-level challenges that emerge in FLR governance were studied. In Ecuador, two temporal mismatches emerged between governance processes and ecological processes because neither (i) political cycles nor (ii) short-term planning horizons were aligned with long-term restoration timelines. In addition, cross-level challenges arose from the fact that (iii) national restoration objectives misaligned with decentralised land use planning realities, (iv) the governance level of existing restoration efforts misaligned with the level predominantly receiving restoration funds from the national level, and (v) heterogeneity existed between governance levels regarding the preferred spatial reach of restoration efforts. In Ethiopia, two temporal mismatches between governance processes and ecological processes were observed as well. Both (i) the short-term tree planting campaigns and quota of the government and (ii) the planning horizons of restoration-related international development projects were found to mismatch with long-term restoration timelines. In terms of cross-level misalignment (iii) the extent of federal and donor budget allocation for alternative livelihoods misaligned with sustained local restoration processes; (iv) federal forest and land policies did not create secure land tenure conditions to sustain local restoration efforts; and (v) misalignment of the FLR portfolio existed in the cascading government structure.

In *Chapter 4* (RQ2), three cross-sector challenges are presented that influence the way in which Ethiopia's federal government meets its national target of restoring 15 million hectares of degraded and deforested land by 2030. It was found that (i) food security dominates the restoration policy frame and budgetary allocation at the expense of forestry livelihoods and biodiversity benefits, (ii) agricultural and environmental policy objectives and targets, and restoration mandates at sub-national level are incoherent, and (iii) a siloed land use planning instrument makes it difficult to find synergies and negotiate trade-offs between sectoral policy objectives. The results show that cross-sector challenges further complicate the endeavour of implementing national restoration targets at the local level.

In *Chapter 5* (RQ3), a conceptual framework of nine scale-sensitive governance arrangements is proposed. These include (a) adding, removing and moving a general-purpose jurisdiction, (b) moving tasks to higher or lower governance levels, (c) task-specific organisations, (d) polycentric governance, (e) multi-level coordination, (f) multi-level collaboration, (g) multi-level learning, (h) bridging organisations, and (i) multi-level networks. As part of a systematic literature review, the scale-sensitive governance framework was applied to the FLR literature and evidence was obtained for how eight of these governance arrangements played out in practice. The restoration

governance-related case studies on which the review builds give a grounded understanding of how cross-scale fit between governance and ecological processes and cross-level alignment between governance levels can be created in FLR. However, for several arrangements various related challenges were identified, which indicate that the presence of scale-sensitive arrangements is not enough to guarantee a smooth restoration process. Rather, continuous efforts are needed to address new challenges that emerge when governance arrangements are altered.

In *Chapter 6* (RQ1 and RQ4), the scale-sensitive governance strategies are studied that two Ecuadorian water funds and their implementing partners deployed in reaction to new scale challenges. Four scale challenges were identified, being (i) a blind spot towards rural livelihood realities, (ii) a temporal mismatch between short-term election cycles and long-term restoration timelines, (iii) a spatial mismatch between the reach of restoration efforts and land degradation processes, and (iv) heterogeneity across levels regarding the purpose of restoration, with different spatial implications. In response, a total of 12 scale-sensitive strategies were identified that the two water funds deployed or aim to deploy in reaction to the identified scale challenges, in an attempt to re-create cross-scale fit and cross-level alignment. Whereas one set of strategies aims to change the water funds' relationship with actors with whom they already work, a second set aims to build relations with new actors, either because the relationship with existing actors became unproductive or because the involvement of new actors could improve the sustainability of restoration efforts. Similarities in the type of scale challenges with which the water funds are confronted were found. However, varying degrees of success were observed between the funds in terms of formulating and deploying scale-sensitive strategies.

Conclusions

Attention for, and investments in, FLR are expected to rise during the UN Decade on Ecosystem Restoration 2021–2030. It is therefore important to understand the cross-scale, cross-level and cross-sector challenges that have emerged in FLR governance, the scale-sensitive arrangements that are used, and the scale-sensitive strategies that are deployed to overcome cross-scale and cross-level challenges in the process of implementing restoration efforts.

With regard to cross-scale and cross-level challenges, the results show that restoration efforts run the risk of primarily serving short-term political interests, failing to look beyond their planning horizons, failing to show flexibility to build on existing landscape restoration efforts, and failing to sufficiently consider livelihood realities and interests of communities, as well as low local implementation capacity. Too much

focus on rapid fulfilment of national restoration targets leaves little room for negotiating visions that align with local needs, interests and priorities, and for assessing and adjusting the temporal and spatial reach of governance processes to ensure the long-term restoration of relevant ecological processes. In terms of cross-sector challenges, aligning sectoral policy objectives turns out to be difficult in practice, while FLR is intended to be a multi-actor process through which various land uses are coordinated.

Identification of cross-scale, cross-level and cross-sector challenges opens up possibilities for policy-makers to improve existing and future governance arrangements that are designed to sustain local restoration efforts. Particular scale challenges that arise in a given context can be taken as a starting point for setting up specific governance arrangements to achieve effective FLR governance. However, any response to the wicked problem of land degradation is likely to be provisional and incomplete. This is supported by the finding that the presence of scale-sensitive arrangements is not a guarantee for a smooth restoration process, indicating that no lasting fit and alignment can be obtained. To stay on course in FLR governance, a long-term, iterative process is hence required through which scale-sensitive governance strategies are deployed that continuously seek to re-create cross-scale fit and cross-level alignment.

Scientific contributions

This dissertation contributes a high level of detail on how cross-scale and cross-level challenges play out in two national FLR governance contexts, and as part of the efforts of two restoration-oriented actors. The various case studies facilitate understanding how cross-scale, cross-level and cross-sector challenges coexist in the same context and shape the complexity of addressing land degradation. This shows why efforts to improve the implementation of national restoration targets at the local level need to be multifaceted. The detailed analysis of scale challenges that emerge in FLR governance offers insights into the factors that hamper restoration success as well as a basis from where to incrementally improve existing and future FLR governance efforts.

Based on a grounded understanding of how scale challenges emerge in FLR governance, the *scale challenge* concept is subdivided into cross-scale mismatch and cross-level misalignment. Cross-scale mismatch occurs when the spatial and temporal reach of governance processes do not correspond with the spatial and temporal reach of the ecological processes they aim to influence. A mismatch can be addressed by efforts that aim to create cross-scale fit. Meanwhile, cross-level misalignment occurs as the result of a failure to recognise important scale and level interactions, when

governance processes at different levels are not aligned, or due to a failure to recognise heterogeneity in the way scales are perceived and valued by different actors. Such misalignment can be addressed by efforts that aim to create cross-level alignment.

The systematic literature review brings coherence to the scale-sensitive governance literature by bringing together the different governance arrangements that foster cross-scale fit and cross-level alignment in a comprehensive conceptual framework, which has relevance for the wider natural resource management literature. The framework facilitates actors to adopt a nuanced scale-sensitive governance approach in which specific arrangements are strengthened or created in line with what a specific context or stage of the restoration process requires. The case studies of the water funds contribute to the limited empirical research that explicitly focuses on how actors deal with scale challenges. The two cases demonstrate that FLR governance is a continuous and iterative process in which scale challenges that arise during the implementation of restoration efforts must be addressed in order to stay on course to achieve restoration targets. This is in line with the wicked problem literature that describes challenges that have no definitive solution and must be continuously 're-solved'.

Recommendations

To improve the local implementation of FLR targets, a first recommendation is to focus on addressing cross-sector challenges, and to particularly promote integrated land use planning as an instrument to achieve a wider range of ecosystem functions at local level. To stimulate actors from different sectors to interact as part of such an instrument they should have no alternative venues to realise their land use-related objectives or regard any alternatives as less attractive. A dedicated agency could be established to create a level playing field for all land use-related sectors and balance competing land use claims by drawing on hierarchical authority. When this is not feasible multilateral and bilateral development partners may foster cross-sector alignment by designing initiatives that stimulate interaction between land-related agencies.

A second recommendation is to develop human capacity at multiple governance levels to improve the ability of actors to observe cross-scale and cross-level dependencies and interactions that hamper restoration efforts. This should include developing human capacity to strengthen existing or create new scale-sensitive arrangements that are most suitable in specific contexts, and to deploy strategies that transcend scales and/or levels.

A third recommendation is for actors not to become paralysed or discouraged to implement restoration efforts when they are faced with the complexity of sustainably reversing land degradation processes. Restoration practitioners engaged in large-scale restoration often do not know where to start, due to the interdisciplinary nature of FLR governance challenges and the large spatial reach of FLR, implying the involvement of many actors with varying interests. The complexity of reversing land degradation may also cause actors to deploy 'simple' solutions that only focus on a single aspect or take one particular perspective and therefore underestimate the problem. To stay on course in FLR, it is necessary to have a governance process that keeps paralysis and overestimation at bay by focusing on feasible, partial solutions that take into account the complexity of the problems associated with reversing land degradation. Such a process recognises that any effort to promote FLR is not final, but requires ongoing policy action to incrementally improve the local implementation of FLR.

Resumen

Introducción y preguntas de investigación

La degradación de la tierra se ha convertido en un fenómeno generalizado y sistémico que ha alcanzado niveles críticos en muchas partes del mundo. Sus efectos adversos a nivel mundial provocaron la creación de una serie de iniciativas de alto nivel, como el Desafío de Bonn, que generaron una voluntad política sin precedentes entre un número cada vez mayor de países para diseñar políticas y establecer objetivos para restaurar tierras degradadas y deforestadas en su territorio nacional. Las iniciativas han atraído la atención hacia la restauración de bosques y paisajes como un enfoque para abordar la pérdida de biodiversidad, el cambio climático, la inseguridad hídrica y alimentaria, y la pobreza. La interrelación con otras crisis importantes, como la pérdida de biodiversidad y el cambio climático, hace que la degradación de la tierra sea un *problema perverso*. Una característica importante de tal problema es que resiste los intentos de solución. Los desafíos de hoy son el resultado de soluciones a los desafíos de ayer, y es probable que las soluciones de hoy conduzcan a nuevos desafíos mañana.

Con la voluntad política de restaurar cientos de millones de hectáreas de tierras degradadas y deforestadas que ahora se generan en todo el mundo, el próximo desafío es implementar los objetivos nacionales de restauración a nivel local. Los países aún muestran un progreso limitado en la traducción de sus objetivos de restauración en acciones locales y la mayoría de ellos carecen de un plan detallado y viable que explique cómo se fomentan y sostienen los procesos de restauración a largo plazo. Esto llama la atención en particular sobre los diversos arreglos de gobernanza que se utilizan a nivel nacional y subnacional para promover la restauración. Esta disertación se enfoca en comprender las características de la gobernanza de la restauración de bosques y paisajes, los desafíos que surgen entre escalas, sus niveles y los sectores cuando se implementan los objetivos nacionales de restauración, y los arreglos y las estrategias de gobernanza que han ayudado a los actores a superar estos desafíos. La siguiente pregunta general ha guiado la investigación:

¿Qué desafíos de escala surgen al implementar políticas para cumplir con los objetivos nacionales de restauración, y qué arreglos y estrategias de gobernanza sensibles a la escala utilizan los actores para enfrentar estos desafíos?

La pregunta general se ha subdividido en cuatro preguntas específicas:

RQ1 ¿Qué desajuste entre escalas y desalineación entre niveles surgen en el proceso de implementación de políticas para cumplir con los objetivos nacionales de restauración?
RQ2 ¿Cómo influyen los desafíos intersectoriales en la implementación de políticas para cumplir con los objetivos nacionales de restauración?
RQ3 ¿Qué arreglos de gobernanza sensibles a la escala permiten a los actores de la restauración crear un ajuste entre escalas y una alineación entre niveles para lograr los objetivos de restauración de bosques y paisajes?
RQ4 ¿Qué estrategias de gobernanza sensibles a la escala permiten a los actores de la restauración mantener el rumbo hacia el logro de los objetivos de restauración de bosques y paisajes en un contexto donde surgen nuevos desafíos de escala?

Marco teórico y diseño de investigación

Esta disertación se basa en la literatura de gobernanza multinivel y explora los procesos de toma de decisiones que ocurren a través y dentro de niveles político-administrativos, desde el nivel nacional hasta el nivel regional y local. Esta investigación va más allá de estas dos perspectivas al estudiar también explícitamente la interacción entre escalas, entre los procesos de gobernanza y los procesos ecológicos cuales buscan influir. Los procesos de políticas intersectoriales y a través de niveles que se estudian como parte de la gobernanza multinivel caen dentro de la escala de gobernanza, mientras que los procesos ecosistémicos relevantes que estas políticas buscan influir caen dentro de la escala ecológica. Para estudiar los desafíos que surgen en la gobernanza de la restauración, se emplean tres tipos de desafíos de escala: (a) la falta de reconocimiento de interacciones importantes entre escalas y niveles, (b) la persistencia de desajuste entre escalas y la desalineación entre niveles, y (c) la falta de reconocimiento de la heterogeneidad en la forma en que los diferentes actores perciben y valoran las escalas. Para estudiar la gobernanza sensible a la escala, se hace una distinción entre arreglos de gobernanza y estrategias de gobernanza.

Esta disertación consta de cuatro capítulos empíricos y una revisión sistemática de la literatura. Se estudiaron los contextos nacionales de gobernanza de la restauración de Ecuador y Etiopía para comprender los desafíos entre escalas y entre niveles (RQ1) y los desafíos entre sectores (RQ2) que surgen cuando los objetivos nacionales de restauración se traducen en acciones locales. En cada país, se identificaron dos paisajes montañosos donde se han implementado esfuerzos de restauración. Los resultados de los desafíos entre escalas, niveles y sectores se basan en una revisión de

documentos de políticas y proyectos, 54 entrevistas en Ecuador, 56 entrevistas y 14 discusiones de grupos focales en Etiopía, y observación participativa. Para comprender cómo los actores relacionados con la restauración han superado los desafíos entre escalas y niveles, se enfoca la atención en los arreglos sensibles a la escala (RQ3) y las estrategias sensibles a la escala (RQ4). Los resultados sobre los arreglos sensibles a la escala se basan en una revisión de 84 estudios de casos sobre la gobernanza de restauración publicados en revistas científicas, mientras que los resultados sobre las estrategias sensibles a la escala se basan en una revisión de documentos de proyecto, 48 entrevistas en Ecuador y observación participativa.

Resultados

En los *Capítulos 2* y *3* (RQ1) se estudiaron los desafíos entre escalas y entre niveles que surgen en la gobernanza de la restauración. En Ecuador, surgieron dos desajustes temporales entre los procesos de gobernanza y los procesos ecológicos porque ni (i) los ciclos políticos ni (ii) los horizontes de planificación a corto plazo estaban ajustados con los procesos de restauración a largo plazo. Además, surgieron desafíos entre niveles por el hecho de que (iii) los objetivos nacionales de restauración no estaban alineados con las realidades descentralizadas de planificación del uso de la tierra, (iv) el nivel de gobernanza de los esfuerzos de restauración existentes no estaba alineado con el nivel de gobernanza que predominantemente recibía fondos de restauración del nivel nacional, y (v) existió heterogeneidad entre los niveles de gobernanza en cuanto al alcance espacial preferido de los esfuerzos de restauración. En Etiopía, también se observaron dos desajustes temporales entre los procesos de gobernanza y los procesos ecológicos. Se encontró que tanto (i) las campañas de plantación de árboles a corto plazo y la cuota del gobierno, como también (ii) los horizontes de planificación de los proyectos de desarrollo internacional relacionados con la restauración no estaban ajustados con los procesos de restauración a largo plazo. En términos de desalineación entre niveles (iii) la asignación de presupuesto federal y de la cooperación internacional para medios de vida alternativos desalineaba con el sustento de los procesos de restauración locales; (iv) las políticas forestales y territoriales federales no crearon condiciones seguras de tenencia de la tierra para sustentar los esfuerzos locales de restauración; y (v) existía desalineación de la cartera de restauración de bosques y paisajes en la estructura multinivel del gobierno.

En el *Capítulo 4* (RQ2), se presentan tres desafíos intersectoriales que influyen la manera en que el gobierno federal de Etiopía cumple su objetivo nacional de restaurar 15 millones de hectáreas de tierras degradadas y deforestadas para 2030. Se observó que (i) la seguridad alimentaria domina el marco de la política de restauración y la asignación presupuestaria a expensas de los medios de vida forestales y los beneficios

para la biodiversidad, (ii) los objetivos y metas de la política agrícola y la política ambiental, y sus mandatos para la restauración a nivel subnacional son incoherentes, y (iii) un instrumento de planificación del uso de la tierra sectorial hace que sea difícil encontrar sinergias y negociar compensaciones entre objetivos sectoriales. Los resultados muestran que los desafíos intersectoriales complican aún más el esfuerzo de implementar objetivos nacionales de restauración a nivel local.

En el *Capítulo 5* (RQ3), se propone un marco conceptual de nueve arreglos de gobernanza sensibles a la escala. Estos incluyen (a) agregar, eliminar y mover una jurisdicción de propósito general, (b) mover tareas a niveles de gobernanza más altos o más bajos, (c) organizaciones de tareas específicas, (d) gobernanza policéntrica, (e) coordinación multinivel, (f) colaboración multinivel, (g) aprendizaje multinivel, (h) organizaciones puente, y (i) redes multinivel. Como parte de una revisión sistemática de la literatura, el marco de gobernanza sensible a la escala se aplicó a la literatura sobre la gobernanza de la restauración y se obtuvo evidencia de cómo ocho de estos arreglos de gobernanza se manifestaron en la práctica. Los estudios de caso relacionados con la gobernanza de la restauración en los que se basa la revisión brindan una comprensión fundada cómo se puede crear un ajuste entre la escala de gobernanza y la escala ecológica y una alineación entre los niveles de gobernanza en la restauración de bosques y paisajes. Sin embargo, para algunos arreglos se identificaron varios desafíos relacionados, que indican que la presencia de arreglos sensibles a la escala no es suficiente para garantizar un proceso de restauración sin problemas. Más bien, se necesitan esfuerzos continuos para abordar los nuevos desafíos que surgen cuando se modifican los arreglos de gobernanza.

En el *Capítulo 6* (RQ1 y RQ4), se estudian las estrategias de gobernanza sensibles a la escala que dos fondos de agua ecuatorianos y sus socios implementaron en reacción a los nuevos desafíos de escala. Se identificaron cuatro desafíos de escala, siendo (i) un punto ciego hacia las realidades de los medios de vida rurales, (ii) un desajuste temporal entre los ciclos electorales a corto plazo y los procesos de restauración a largo plazo, (iii) un desajuste espacial entre el alcance de los esfuerzos de restauración y los procesos de degradación de la tierra, y (iv) la heterogeneidad entre niveles con respecto al propósito de la restauración, con diferentes implicaciones espaciales. En respuesta, se identificaron un total de 12 estrategias sensibles a la escala que los dos fondos de agua implementaron o planean implementar en reacción a los desafíos de escala identificados en un intento de recrear ajuste entre escalas y alineación entre niveles. Mientras que un conjunto de estrategias tiene como objetivo cambiar la relación de los fondos de agua con actores con los que ya trabajan, un segundo conjunto tiene como objetivo construir relaciones con nuevos actores, ya sea porque la relación con los actores existentes se volvió improductiva o porque la participación

de nuevos actores podría mejorar la sostenibilidad de los esfuerzos de restauración. Se encontraron similitudes en el tipo de desafíos de escala con los que se enfrentan los fondos de agua. Sin embargo, se observaron diversos grados de éxito entre los fondos en términos de formulación e implementación de estrategias sensibles a la escala.

Conclusiones

Se espera que la atención y las inversiones en la restauración de bosques y paisajes aumenten durante el Decenio de las Naciones Unidas para la Restauración de Ecosistemas 2021-2030. Por lo tanto, es importante comprender los desafíos entre escalas, niveles y sectores que han surgido en la gobernanza de la restauración, como también los arreglos sensibles a la escala que se usan y las estrategias sensibles a la escala que se implementan para superar estos desafíos durante la implementación de los esfuerzos de restauración.

Con respecto a los desafíos entre escalas y niveles, los resultados muestran que los esfuerzos de restauración corren el riesgo de servir principalmente a intereses políticos a corto plazo, de no mirar más allá de sus horizontes de planificación, de no mostrar flexibilidad para aprovechar los esfuerzos de restauración del paisaje existentes, y de no considerar suficientemente las realidades de los medios de subsistencia y los intereses de las comunidades, así como la baja capacidad de implementación local. Demasiado enfoque en alcanzar rápidamente los objetivos nacionales de restauración deja poco espacio para negociar visiones que se alinean con las necesidades, intereses y prioridades locales, y para evaluar y ajustar el alcance temporal y espacial de los procesos de gobernanza para garantizar la restauración a largo plazo de procesos ecosistémicos relevantes. Con respecto a los desafíos intersectoriales, la alineación de los objetivos de políticas sectoriales resulta difícil en la práctica, mientras que la restauración de bosques y paisajes pretende ser un proceso de múltiples actores a través del cual se coordinan varios usos de la tierra.

La identificación de desafíos entre escalas, niveles y sectores abre posibilidades para que los formuladores de políticas mejoren los arreglos de gobernanza existentes y futuros para sostener los esfuerzos locales de restauración. Desafíos de escala particulares que surgen en un contexto determinado pueden tomarse como punto de partida para establecer arreglos específicos que puedan lograr una gobernanza eficaz de la restauración. Sin embargo, es probable que cualquier respuesta al perverso problema de la degradación de la tierra sea provisional e incompleta. Esto está respaldado por el hallazgo de que la presencia de arreglos sensibles a la escala no es una garantía para un proceso de restauración sin problemas, lo que indica que no

se puede obtener un ajuste duradero, ni una alineación duradera. Para mantener el rumbo en la gobernanza de la restauración, se requiere un proceso iterativo a largo plazo a través del cual estrategias de gobernanza sensibles a la escala son desplegadas para crear continuamente el ajuste entre escalas y la alineación entre niveles.

Contribuciones científicas

Esta disertación contribuye con un alto nivel de detalle sobre cómo se desarrollan los desafíos entre escalas y entre niveles en dos contextos nacionales de gobernanza de la restauración, y como parte de los esfuerzos de dos actores enfocados en la restauración. Los varios estudios de caso facilitan la comprensión de cómo coexisten los desafíos entre escalas, niveles y sectores en un mismo contexto, y cómo dan forma a la complejidad de abordar la degradación de la tierra. Demuestra por qué los esfuerzos para mejorar la implementación de los objetivos nacionales de restauración a nivel local deben ser multifacéticos. El análisis detallado de los desafíos de escala que surgen en la gobernanza de la restauración ofrece información sobre los factores que impiden su éxito, así como una base desde la cual mejorar gradualmente los esfuerzos de gobernanza de la restauración existentes y futuros.

Basado en una comprensión fundada de cómo surgen los desafíos de escala en la gobernanza de la restauración, el concepto de *desafío de escala* es subdividido en desajuste entre escalas y desalineación entre niveles. El desajuste entre escalas ocurre cuando el alcance espacial y temporal de los procesos de gobernanza no corresponde con el alcance espacial y temporal de los procesos ecológicos que pretenden influir. Un desajuste puede abordarse mediante esfuerzos que tienen como objetivo crear un ajuste entre escalas. La desalineación entre niveles ocurre cuando no se reconocen interacciones importantes entre escalas y entre niveles, cuando los procesos de gobernanza entre diferentes niveles no están alineados o cuando no se reconoce la heterogeneidad en la forma en que los diferentes actores perciben y valoran las escalas. Tal desalineación puede abordarse mediante esfuerzos que apunten a crear una alineación entre niveles.

La revisión sistemática de la literatura brinda coherencia a la literatura de gobernanza sensible a la escala al reunir los diferentes arreglos de gobernanza que fomentan el ajuste entre escalas y la alineación entre niveles en un marco conceptual integral, que tiene relevancia para la literatura más amplia sobre la gestión de recursos naturales. El marco facilita que los actores adopten un enfoque de gobernanza matizado en el que se fortalecen o crean arreglos específicos de acuerdo con lo que requiere un contexto específico o una fase del proceso de restauración. Los estudios de caso de los fondos de agua contribuyen a la limitada investigación empírica existente que se

enfoca explícitamente en cómo los actores enfrentan los desafíos de escala. Los dos casos demuestran que la gobernanza de la restauración es un proceso continuo e iterativo en el que se deben abordar los desafíos de escala que surgen durante la implementación de los esfuerzos para mantener el rumbo hacia el logro de los objetivos de restauración. Esto está en línea con la literatura de problemas perversos que describe desafíos que no tienen una solución definitiva y deben ser 'resueltos' continuamente.

Recomendaciones

Para mejorar la implementación de los objetivos de restauración, una primera recomendación es centrarse en abordar los desafíos intersectoriales y, en particular, promover la planificación integrada del uso de la tierra como un instrumento para lograr una gama más amplia de funciones ecosistémicas a nivel local. Para estimular a los actores de diferentes sectores a interactuar como parte de dicho instrumento, no deberían tener lugares alternativos para realizar sus objetivos relacionados con el uso de la tierra o considerar cualquier alternativa como menos atractiva. Se podría establecer una agencia dedicada que puede recurrir a la autoridad jerárquica para crear igualdad de condiciones para todos los sectores relacionados con el uso de la tierra y equilibrar los reclamos del uso de la tierra que compiten entre sí. Cuando esto no sea factible, los actores de desarrollo multilaterales y bilaterales podrían fomentar la alineación intersectorial mediante el diseño de iniciativas que estimulen la interacción entre varias agencias relacionadas con la tierra.

Una segunda recomendación es desarrollar la capacidad humana en múltiples niveles de gobernanza para mejorar la capacidad para observar las dependencias e interacciones entre escalas y entre niveles que impiden los esfuerzos de restauración. Esto debería incluir el desarrollo de la capacidad humana para fortalecer arreglos existentes o crear nuevos arreglos sensibles a la escala que sean más adecuados en contextos específicos, y para implementar estrategias que trasciendan escalas y/o niveles.

Una tercera recomendación es que los actores no deben paralizarse ni desanimarse de implementar esfuerzos de restauración cuando se enfrentan a la complejidad de revertir de manera sostenible los procesos de degradación de la tierra. Los profesionales de la restauración involucrados en la restauración a gran escala a menudo no saben por dónde empezar, debido a la naturaleza interdisciplinaria de los desafíos relacionados a la gobernanza de la restauración y el gran alcance espacial de la restauración a nivel de paisajes, que implica la participación de muchos actores con varios intereses. La complejidad de revertir la degradación de la tierra también puede

hacer que los actores implementen soluciones 'simples' que solo se enfocan en un solo aspecto o toman una perspectiva particular y, por lo tanto, subestiman el problema. Para mantener el rumbo en la implementación de esfuerzos de restauración es necesario tener un proceso de gobernanza que mantiene a raya la parálisis y la sobreestimación, centrándose en soluciones parciales factibles que tienen en cuenta la complejidad de los problemas asociados con la reversión de la degradación de la tierra. Tal proceso reconoce que cualquier esfuerzo para promover la restauración no es definitivo, sino que requiere una acción política continua para mejorar gradualmente la implementación local de la restauración.

Annexes

Annexes

Annex A: Semi-structured interview checklist in Spanish (used in Ecuador)

Hay varios marcos de política pública al nivel nacional que se enfocan en la restauración de bosques y otros tipos de ecosistemas en lugares donde habían desaparecido hace tiempo, o en lugares donde los bosques fueron degradados y se encuentran en recuperación. En la Constitución de 2008, la restauración y recuperación de ecosistemas se menciona unas 14 veces y el Código Orgánico Ambiental lo nombra 34 veces. Ecuador ha tenido unos 10 planes y estrategias nacionales que contienen metas de restauración y recuperación, de los cuales la mayoría sigue vigente. Todas estas metas y marcos institucionales ponen un reclamo sobre el uso de la tierra al nivel local, en el territorio de los GAD.

Estoy estudiando 1) las implicaciones de políticas de restauración para las parroquias que conforman la Mancomunidad del Chocó Andino en Pichincha y los cantones que forman la Mancomunidad del Bosque Seco en Loja, 2) qué estrategias se están usando para encontrar espacio en el territorio para más arboles y bosques, y 3) cómo se están reconciliando metas de restauración con los medios de vida de las comunidades.

Lista de preguntas – nivel nacional

Motivación para restaurar

- De que manera su organización esta trabajando con el tema de restauración de paisajes?
- Cuales son las principales motivaciones para sus intervenciones de restauración?
- Cuando y desde donde surgió la importancia para el tema de restauración?
- La restauración se aborda desde diferentes perspectivas. Desde el sector de cambio climático (plan nacional), agua (fondos de agua), biodiversidad (estrategia nacional), bosques (plan nacional), ecosistema (plan nacional), agricultura (plantaciones comerciales). Cuales son los marcos de política pública más relevantes para usted en su trabajo para la restauración?

Mecanismos para implementar la restauración

- Que mecanismos se están usando para buscar sinergias entre la recuperación de cuencas, suelos y biodiversidad por un lado, y medios de vida por otro? Incentivos, esquemas de compensación, restricciones, nuevos sistemas agrícolas?
- A que medida se sigue experimentando para encontrar los mejores mecanismos para promover la restauración?

Interacción multisectorial

- Cuales son las oportunidades que ofrece el ordenamiento territorial para reconciliar las demandas sobre el uso de tierra que vienen de varios sectores? Cual es la importancia de los Planes de Desarrollo y Ordenamiento Territorial (PDOT)? Como funcionan en el proyecto?
- Cuales son los desafíos relacionados al enfoque integrado de biodiversidad, bosques, suelos y agua al nivel local?
- A que niveles se han creado espacios de dialogo, de gobernanza para articular mejor el ordenamiento territorial?
- El Plan Nacional de Restauración Ecosistémica (PNRE) ahora también esta hablando de mesas territoriales. Cual podría ser el éxito de copiar este modelo? Y cuales son los desafíos?

Interacción multinivel

- En su programa, cuales son los actores al nivel local más relevantes:
  - o Gobiernos Autónomos Descentralizados? Provincia, cantón, parroquia?
  - o Otros actores al nivel local? Oficinas técnicas vinculados a los ministerios, mancomunidad, fondo de agua?

- Cuales son los desafíos en relación a la interacción nacional y local para promover la restauración? Y para reconciliar la restauración con los medios de vida? Por ejemplo con el fortalecimiento de los PDOT? Y la capacidad al nivel de los Gobiernos Autónomos Descentralizados (GAD)?
- Se puede ver una clara evolución en los marcos institucionales para promover la restauración?
- Cual es la importancia de los PDOT para guiar las actividades de ordenamiento territorial?
- Que iniciativas existen para llegar a una zonificación integrada del paisaje con otras instituciones?
- Cual es la asistencia técnica que se esta desarrollando para el trabajo con los GAD y las comunidades para promover la conservación, uso sostenible y restauración de recursos naturales?

Próximos pasos en la gobernanza de la restauración

- Como opina sobre la dirección en que se esta llevando a cabo el proceso de restauración en el Ecuador?
- Hay algún tema que no hemos hablado pero que usted considera importante cuando nos enfocamos en los procesos de gobernanza relacionados a la restauración de paisajes en Ecuador?

Lista de preguntas – nivel local (GAD)

Motivación para restaurar

- En el ámbito de la restauración, que actividades esta desarrollando el GAD?
- Cuando y desde donde surgió el tema de restauración?
- Cual es la principal motivación para desarrollar proyectos de restauración? Agua, erosión, biodiversidad, otros?
- Qué tipo de motivación para la restauración no esta muy marcado en el GAD? Agua, erosión, riesgos, biodiversidad, cambio climático?
- Quien genera la demanda para acciones de restauración? Desde que nivel vienen estas demandas? Gobierno nacional, comunidad rural, organización non-gubernamental?
- Considerando la restauración activa a través de plantar árboles y la restauración pasiva a través de la regeneración natural, qué estrategia considera que es la más efectiva? Para qué tipo de objetivos?

Colaboración entre instituciones

- Cuales son los marcos políticos más importantes para su GAD cuando se habla de restauración?
- Con qué instituciones colabora su GAD en actividades de restauración? Oficinas técnicas del MAE, MAG, Senagua? Provincia, Cantón, Parroquia, Mancomunidad? Fondo de agua?
- Que otras instituciones ofrecen más apoyo para ejecutar proyectos de restauración?
- Que opina sobre la importancia que se esta dando a la restauración de ecosistemas / fuentes de agua en la mancomunidad?
- Como ha ayudado la Mancomunidad del Chocó Andino / Mancomunidad del Bosque Seco en promover la restauración en su GAD? Y el fondo de agua? Y la Reserva de Biósfera?
- Que piensa sobre la colaboración entre instituciones (mancomunidad, provincia, MAE y/o fondo de agua) cuando intervienen en su GAD? Se coordinan entre ellos? Y con su GAD?
- Cual es el valor añadido de estar mancomunado? De la Reserva de Biósfera? Del fondo de agua?

Planificación territorial

- Que es lo que menciona el PDOT del GAD con respecto a la restauración? En que medida las metas propuestas en el PDOT están en camino?
- Cuales son los desafíos que todavía hay que superar? Que sería necesario para eso?
- Con que tipo de estrategias o mecanismos se esta trabajando más para lograr la implementación de la restauración? Cual es el papel de las Áreas de Conservación y Uso Sostenible (ACUS)? Bosques Protectores?

- En que medida, el proceso de PDOT ayuda buscar sinergias entre las diferentes metas de restauración? Por ejemplo, agua y biodiversidad?
- En que medida el PDOT de su GAD esta sincronizado con los PDOT de los GAD a otros niveles? Existen desafíos en su GAD con demandas concurrentes sobre el uso de la tierra entre los PDOT (uso productivo vs. conservación / restauración)?

Medios de vida rurales

- Como se esta, o estuvo, reconciliando la restauración / reforestación con los medios de vida de los productores locales / dueños de la tierra? Se presto suficiente atención a esta reconciliación?
- Se está tratando de convencer a los dueños de la tierra / productores locales en el GAD de ceder una parte de la tierra para la restauración?
- Cuales son los desafíos que hay que superar? Ganadería, agricultura? Como se esta tratando de cambiar la matriz productiva? Que sería necesario para eso?
- Se esta dando apoyo técnico para la adopción de practicas sostenibles en las fincas de forma concurrente con la implementación de acciones de restauración? Cual es la inversión en sistemas agroforestales / silvo-pastoriles en el territorio? Y cadenas de valor de productos forestales no maderables?
- En que medida se sigue experimentando para encontrar los mejores mecanismos para promover la restauración mientras se toma en cuenta los medios de vida de los campesinos?

Annex B: Search terms to cover different restoration literatures in Scopus and Web of Science

Governance-related terms
(governance OR governing OR collaboration OR collaborating OR cooperation OR cooperating OR co-management OR co-managing)
AND
Restoration-related terms
(restoration OR restoring OR rehabilitation OR rehabilitating OR regeneration OR regenerating OR recovery OR recovering OR recuperation OR recuperating OR reforestation OR reforesting OR afforestation OR afforesting)
AND
Scale level-related terms
((local AND regional) OR (local AND national) OR (local AND international) OR (local AND global) OR (regional AND national) OR (regional AND international) OR (regional AND global) OR (national AND international) OR (national AND global))
AND
Natural resource-related terms
(nature OR natural OR biodiversity OR land OR landscape OR ecosystem OR ecological OR basin OR watershed OR catchment OR river OR lake OR wetland OR floodplain OR coastal OR forest OR grassland OR rangeland)

Annex C: Inclusion and exclusion criteria

Inclusion criteria
▪ Articles providing evidence of existing, multi-level restoration governance processes AND ▪ Research methods: empirical, both qualitative and quantitative
Exclusion criteria
▪ Articles focused on urban, marine or pollution remediation contexts OR ▪ Articles focused on (a)biotic aspects of restoration, mentioning governance as recommendation (restoration clearly in, while governance is not) OR ▪ Articles focused on conventional natural resource management or conservation, mentioning restoration as recommendation (governance clearly in, while restoration is not)

Annex D: 84 case studies sorted according to dominant governance arrangement, and with location, natural resource type and reference

Code	Case study location	Natural resource type	Reference
B	Moving tasks to higher or lower governance levels		
B1cm	Africa, Cameroon, Dimako Council Forest	Forest (reforestation)	(Ofoulhast-Othamot, 2015)
B2ke	Africa, Kenya, reforestation and forest management	Forest (reforestation)	(Atela et al., 2016)
B3cn	Asia, China, Baoshan Municipality	Forest (reforestation)	(He, 2014)
B4cn	Asia, China, Jingyuan County	Forest (reforestation)	(Chen et al., 2020)
B5in	Asia, India	Forest (reforestation)	(Vijge and Gupta, 2014)
B6id	Asia, Indonesia, Lampung, Moluccas & South Sulawesi Provinces	Forest (degraded forest restoration)	(Herawati et al., 2019)
B7ir	Asia, Iran, Drylands	Other (dryland restoration)	(Jankju, 2016)
B8kp	Asia, North Korea, North Hwanghae Province	Forest (reforestation)	(He and Xu, 2017)
B9ph	Asia, Philippines, Biliran Province	Forest (reforestation)	(Gregorio et al., 2020)
B10vn	Asia, Vietnam, Northern Mountain Region	Forest (reforestation)	(Clement, 2010)
B11vn	Asia, Vietnam, Tay Ninh Province	Forest (reforestation)	(Dang et al., 2019)
B12au	Oceania, Australia, Murray-Darling River Basin	Water (river habitat restoration)	(Ross and Connell, 2016)
B13br	South America, Brazil, Batatais, Paraibuna, Domingo Martins and Sooretama municipalities	Forest (riparian reforestation)	(Schweizer et al., 2019)
B14ec	South America, Ecuador, Chocó Andino and Bosque Seco Landscape	Forest (natural regeneration and reforestation)	(Wiegant et al., 2020)
C	Task-specific jurisdictions		
C1gh	Africa, Ghana, plantations forestry	Forest (plantation forestry)	(Kumeh et al., 2019)
C2*cas*	Asia, Central Asia, Aral Sea Basin	Water (lake habitat restoration)	(Tankibayeva and Adibayeva, 2019)

Code	Case study location	Natural resource type	Reference
C	Task-specific jurisdictions		
C3cn	Asia, China, Minqin County	Water (watershed restoration)	(Mao and Zhang, 2018)
C4ir	Asia, Iran, Lake Urmia Basin	Water (lake habitat restoration)	(Danesh-Yazdi and Ataie-Ashtiani, 2019)
C5*eeu*	Europe, East Europe, Danube River Basin	Water (river habitat restoration)	(Turnock, 2001)
C6*cam*	North America, Central America, Trifinio Fraternidad Biosphere Reserve	Forest (reforestation)	(Holder, 2016)
C7us	North America, United States, Pacific Northwest	Water (river habitat restoration)	(Erickson, 2015)
C8us	North America, United States, Sacramento River Watershed	Water (river habitat restoration)	(Langridge, 2016)
C9nc	Oceania, New Caledonia, Dry forest ecoregion	Forest (natural regeneration and reforestation)	(Mansourian et al., 2019)
D	Polycentric governance arrangements		
D1ne	Africa, Niger, Aguie Department	Forest (natural regeneration)	(Tougiani et al., 2009)
D2*we*u	Europe, West Europe, Rhine River Basin	Water (river habitat restoration)	(Verweij, 2017)
D3us	North America, United States, Puget Sound	Other (ecosystem restoration)	(Koontz, 2019)
D4au	Oceania, Australia, Murray-Darling River Basin	Other (ecosystem restoration)	(Lane et al., 2008)
D5br	South America, Brazil, Extrema municipality	Forest (riparian reforestation)	(Richards et al., 2015)
D6br	South America, Brazil, Paragominas municipality	Forest (reforestation)	(Piketty et al., 2015)
D7co	South America, Colombia, forest ecosystems	Forest (restoration)	(Furumo and Lambin, 2020)
E	Multi-level coordination		
E1gh	Africa, Ghana, Tano-Offin, Tain II and Yaya Forest Reserves	Forest (reforestation)	(Ros-Tonen et al., 2014)
E2mg	Africa, Madagascar, Fandriana-Marolambo Landscape	Forest (natural regeneration and reforestation)	(Mansourian et al., 2016)
E3cn	Asia, China, reforestation	Forest (reforestation)	(Yin and Yin, 2009)
E4id	Asia, Indonesia, Harapan Rainforest	Forest (forest ecosystem restoration)	(Buergin, 2016)
E5th	Asia, Thailand, Chumphon & Samut Sakhon Provinces	Water (mangrove restoration)	(Thompson, 2018)

E6fr	Europe, France, Rhone River	Water (floodplain restoration)	(Barthélémy and Souchon, 2009)
E7it	Europe, Italy, Goro Lagoon	Water (estuary restoration)	(Corbau et al., 2016)
E8it	Europe, Italy, Lombardy Region	Forest (reforestation)	(Secco et al., 2011)
E9it	Europe, Italy, Lazio & Piedmont Regions	Water (wetland restoration)	(Magaudda et al., 2020)
E10nl	Europe, Netherlands, Regge River	Water (floodplain restoration)	(de Boer and Bressers, 2013)
E11nl	Europe, Netherlands, Regge River	Water (floodplain restoration)	(de Boer and Bressers, 2012)
E12nl	Europe, Netherlands, Rijnwaardense Uiterwaarden	Water (floodplain restoration)	(Fliervoet et al., 2017)
E13*nor*	Europe, Nordic countries, Vegetation zones	Other (ecological restoration in general: forest and river)	(Hagen et al., 2013)
E14se	Europe, Sweden	Other (ecological restoration in general: forest and river)	(Borgström et al., 2016)
E15gt	North America, Guatemala	Forest (forest landscape restoration)	(Sales et al., 2016)
E16mx	North America, Mexico, Quintana Roo State	Forest (forest landscape restoration)	(Rantala et al., 2014)
E17us	North America, United States, Flathead Indian Reservation	Other (ecosystem restoration)	(Stumpff, 2006)
E18us	North America, United States, Rogue River Basin	Water (river habitat restoration)	(Margerum and Whitall, 2004)
E19au	Oceania, Australia, Indigenous Protected Areas	Other (ecosystem restoration)	(Godden and Cowell, 2016)
F	**Multi-level collaboration**		
F1bd	Asia, Bangladesh, Sitakunda-Ramgarh Reserve Forest	Forest (natural regeneration and reforestation)	(Chowdhury et al., 2020)
F2in	Asia, India, Tamil Nadu State	Forest (reforestation)	(Kaushal et al., 2005)
F3id	Asia, Indonesia, Meru Betiri National Park	Forest (degraded forest restoration)	(Harada et al., 2015)
F4np	Asia, Nepal	Forest (natural regeneration)	(Gautam et al., 2004)
F5ph	Asia, Philippines, Cogtong Bay	Water (mangrove restoration)	(Katon et al., 2000)
F6vn	Asia, Vietnam, Can Gio Mangrove Biosphere Reserve & Ca Mau Peninsula	Water (mangrove restoration)	(Veettil et al., 2019)
F7pt	Europe, Portugal, Lousã Municipality	Forest (degraded forest restoration)	(Serra et al., 2016)
F8us	North America, United States, Chesapeake Bay	Water (estuary restoration)	(Randall, 2001)
F9us	North America, United States, Gulf of Mexico	Water (wetland and coastal restoration)	(Carollo and Reed, 2010)

Code	Case study location	Natural resource type	Reference
F	**Multi-level collaboration**		
F10us	North America, United States, Shasta County	Other (meadow restoration)	(Kelly and Kusel, 2015)
F11au	Oceania, Australia, Murray-Darling River Basin	Water (wetland and river restoration)	(Owens, 2016)
G	**Multi-level learning**		
G1tz	Africa, Tanzania, Kondoa District	Forest (reforestation)	(Shrestha and Ligonja, 2015)
G2ph	Asia, Philippines, Biliran Province	Forest (reforestation)	(Baynes et al., 2016)
G3ph	Asia, Philippines, Kitanglad Range Natural Park	Forest (reforestation)	(Garrity et al., 2002)
G4fr	Europe, France, Grand Morin Watershed	Water (river habitat restoration)	(Carre et al., 2014)
G5se	Europe, Sweden, Ljusnan River Basin	Water (river habitat restoration)	(Rudberg and Smits, 2018)
G6mx	North America, Mexico, Islands of Western Mexico	Other (invasive species eradication)	(Aguirre-Muñoz et al., 2008)
G7us	North America, United States, Coastal ecosystems	Water (coastal habitats)	(Sutton-Grier and Moore, 2016)
G8us	North America, United States, Seney & Bosque del Apache National Wildlife Refuges	Water (wetland restoration)	(Smith et al., 2008)
G9us	North America, United States, Yellowstone National Park	Other (ecosystem restoration)	(Zahniser and Singh, 2004)
H	**Bridging organisations**		
H1gh	Africa, Ghana, Wassa Amenfi Landscape	Forest (reforestation)	(den Besten et al., 2019)
H2cn	Asia, China, Yangtze River Basin	Water (wetland restoration)	(te Boekhorst et al., 2010)
H3*eh*i	Asia, East Himalaya, Kangchenjunga Landscape	Forest (forested corridor restoration)	(Chettri et al., 2007)
H4*ee*u	Europe, East Europe, Danube River Basin	Water (river habitat restoration)	(Sommerwerk et al., 2010)
H5cr	North America, Costa Rica, Huetar Norte Region & Osa Peninsula	Forest (natural regeneration and reforestation)	(Le Coq and Segura, 2016)
H6bo	South America, Bolivia, Parapeti Basin	Forest (riparian reforestation)	(Alcorn et al., 2010)
H7br	South America, Brazil, Xingu Indigenous Park	Forest (riparian reforestation)	(Schwartzman and Zimmerman, 2005)

I	Multi-level networks		
I1rw	Africa, Rwanda, Rulindo District	Forest (reforestation)	(van Oosten et al., 2018)
I2hu	Europe, Hungary, Tisza River	Water (floodplain restoration)	(Werners et al., 2010)
I3*glo*	Global, Global Partnership on Forest Landscape Restoration	Forest (forest landscape restoration)	(Saint-Laurent and Carle, 2006)
I4us	North America, United States-Mexico, Colorado River Delta	Water (river delta restoration)	(Gerlak, 2015)
I5us	North America, United States, Fire-dependent ecosystems	Other (fire-dependent ecosystem restoration)	(Goldstein and Butler, 2010)
I6us	North America, United States, Great Lakes Region	Other (ecosystem restoration)	(Fischer, 2015)
I7au	Oceania, Australia, New South Wales State	Water (river restoration)	(Mould et al., 2020)
I8ar	South America, Argentina, Ecoregions	Other (ecoregions including grasslands)	(Zuleta et al., 2015)

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Like with any new endeavour that you start – be it migrating abroad, starting a PhD or becoming a father – you have no clue where it is going to take you. Looking back on the past four years, I can safely say that doing a PhD was a tough but enriching journey, thanks to the many inspiring people I was able to interact with along the way. Without them, it would have been hard to complete this learning process.

I am grateful to the Wageningen School of Social Sciences for financing my PhD project, as part of their 2018 Open Call for PhD Positions. The grant has allowed me to study the issue I feel most passionate about. I am tremendously grateful to my promotor Art Dewulf and co-promotor Pieter van Oel, who both supported my application for the PhD grant and helped me to shape up my rough ideas. Since the beginning, you have pushed me further in the development of ideas and in my writing during our countless stimulating supervision meetings. You have given me the liberty to focus on the policy and governance processes that fascinated me most, were approachable when I needed it but also kept your distance to allow me to grow as an independent academic. Your continuous enthusiasm during our supervision meetings and your trust in the progression of my learning process, especially during times I was drowning in the sheer amount of data collected, have helped me to finalise the PhD in (almost) four years.

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I want to thank all the inspiring persons I have been able to interact with during my fieldwork in Ecuador and Ethiopia, who were very generous in giving their time to talk to me about the governance processes they are involved in. Manuel Peralvo, your ability to both be involved in high-level restoration policy processes and practical landscape interventions is truly inspirational. During my fieldwork in Ecuador, you helped me to obtain a multi-level governance perspective and pointed me towards the restoration efforts in the *Chocó Andino* as an interesting case. Thank you Joost van Montfort for connecting me with the environmental leaders of the *Bosque Seco* at an early stage. The landscape leadership of people like Inty Arcos, Ronald Torres, Vicente Solorzano and José Guarnizo added much colour to my

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Education certificate

Daniel Wiegant
Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project-related competences			
A1 Managing a research project			
Writing the research proposal	WUR	2018	3
Writing retreat	WASS	2018	1
WASS PhD introduction	WASS	2018	1
Scientific writing	Wageningen in'to Languages	2018	1.8
'Scale challenges emerging from the implementation of landscape restoration policies in Ecuador'	VIII World Conference on Ecological Restoration, Cape Town, South Africa	2019	1
'Unravelling scale challenges in Ethiopian forest and landscape restoration governance'	WASS PhD Day (online)	2020	0.5
'Cinco desafíos de escala en la gobernanza de restauración de paisajes boscosos en Ecuador'	Andes+ conference (online)	2020	1
'Unravelling scale challenges in landscape restoration governance – evidence from Ecuador and Ethiopia'	ATBC Virtual Meeting (online)	2021	0.5
'Scale challenges and scale-sensitive governance in forest and landscape restoration'	SESAM project PhD group (online)	2021	1
Reviewed a manuscript	Ecology & Society journal	2021	1
A2 Integrating research in the corresponding discipline			
Interpretive policy analysis summer school: conflict and sustainable futures	WASS	2018	3
Consultancy assignment 'small wins in the circular economy and climate adaptation transitions'	PAP	2019	2
Qualitative data analysis & Process Tracing Methods	ECPR summer school, CEU	2020	7
Tropical Forest Restoration & Agroforestry	Yale ELTI	2021	1.5

B) General research related competences			
B1 Placing research in a broader scientific context			
Resilience of living systems: from fundamental concepts to interdisciplinary applications	WGS	2018	1.5
Institutions and societal transformation, CPT57802	WASS	2020	2
Ethics for social sciences research	WGS	2020	0.5
Co-organised the workshop 'Gobernanza multi-nivel y multi-sectorial para la restauración de paisajes forestales en Ecuador'	III Congreso Ecuatoriano de Restauración del Paisaje (CERP 2021)	2021	2
B2 Placing research in a societal context			
Writing an accompanying reflection related to the Ecuador article for WRI's 20x20 Initiative website		2020	0.15
Organising research validation workshops at the office of two Ecuadorian water funds: FONAG in Quito and FORAGUA in Loja		2021	2.5
C) Career related competences / personal development			
C1 Employing transferable skills in different domains / careers			
Scientific publishing	WGS	2018	0.3
Research data management	WUR Library	2019	0.45
Reviewing a scientific paper	WGS	2019	0.1
Teaching 'Designing Innovative Governance Arrangements' and supervising three MSc students	PAP-WRM	2019-2022	4
Supervising BSc & MSc thesis students	Education Support Centre	2020	0.64
Effective behaviour in your professional surroundings	WGS	2021	1.3
Total			**40.74**

*One credit according to ECTS is on average equivalent to 28 hours of study load

About the author

Daniel Wiegant was born in Utrecht, the Netherlands. He has a Spanish mother and Dutch father. At Utrecht University he obtained his BSc Human Geography and Planning (honours), with a major in Development Geography and a minor in Conflict Studies, as well as a MSc in Sustainable Development (cum laude) with a focus on International Development. Research internships brought him to Spain and Morocco to study urban development, and to Bolivia and Nepal to study climate change impacts and natural resource management practices in rural communities in mountain areas.

After cycling the Silk Road from the Netherlands to China, Daniel pursued and obtained an Advanced Master in International Development from the Radboud University in Nijmegen. During this Master programme he worked as a trainee at the Climate, Energy, Water and Environment Department of the Directorate-General for International Cooperation (DGIS) of the Dutch Ministry of Foreign Affairs. Following his traineeship, Daniel started at the Horn of Africa Regional Environment Centre & Network in Addis Ababa, Ethiopia, to support multiple integrated landscape management projects in Ethiopia, Djibouti, Kenya, Somalia, South Sudan and Sudan that were financed by the Dutch development cooperation.

In 2018, he was awarded a four-year PhD grant from the Wageningen School of Social Sciences to conduct research on the governance of forest and landscape restoration, with supervisors at the Public Administration and Policy Group and the Water Resources Management Group. The PhD project brought him to Ecuador and Ethiopia to study the challenges that emerge when national restoration targets are translated into local action. He collaborated closely with the Consortium for Sustainable Development of the Andean Ecoregion (Condesan) in Quito, and the Water & Land Resource Centre (WLRC) of Addis Ababa University.

Daniel has a strong interest in environmental governance and policy processes, and gets the most energy from traveling and spending time hiking and biking in nature. He is currently a postdoctoral researcher studying the governance of Sustainable Development Goal interactions, with a focus on alignment mechanisms in international development cooperation. Daniel is married and lives with his wife and son in Utrecht.

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