



Diverse interpretations of governance and their relevance to forest landscape restoration

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ABSTRACT

Faced with ongoing forest loss and degradation, the world's decision-makers are turning to forest landscape restoration (FLR) as a solution to many land use challenges. At the same time, governance is being promoted as an important concept in relation to forests, landscapes, land use and increasingly, FLR. Yet, both terms – governance and FLR – are complex, and their association creates widely differing expectations. In this article, we analyse uses of the term 'governance', and in particular, its use in relation to FLR in published articles, as well as related literature on forest governance, landscape governance and environmental governance. Our intention is to better understand how the term 'governance' is used in the FLR literature and to demonstrate the diversity of interpretations and understandings, and subsequent fuzziness in its application. We explore the categories of meanings associated with governance, and also characterize trends in the use of the term in the FLR literature. Finally, we conclude by identifying specific challenges intrinsic to the concept of FLR related to the landscape, multiple objectives and the influence of multiple spatial and temporal scales, that in turn influence governance of FLR.

1. Introduction

Forest loss and land degradation are persistent and perceived as global problems by diverse stakeholders, including politicians, scientists and global citizens. Impacts are felt at multiple levels, in terms of both biodiversity and livelihoods (IPBES, 2018; FAO, 2018). In response, there is a growing desire among global leaders to design policies that can meet multiple objectives, such as climate change mitigation, food security, biodiversity conservation as well as contributing to the sustainable development goals (SDGs). Forest landscape restoration (FLR) is increasingly seen by many policymakers and civil society organizations as a means to reach these multiple objectives (Chazdon et al., 2015; Mansourian, 2018). Governance in the context of the FLR process has however, only recently appeared as an issue at international conferences (e.g. at the World Conservation Congress in 2016 or in 2017 at the CIFOR-led workshop on 'Forest Landscape Restoration: The need for a rights-based approach') and in a few scientific publications (Guariguata and Brancalion, 2014; Mansourian, 2016; 2017). To date, there is limited experience or research specifically on FLR and governance, yet 'governance failure' appears as a cause for forest loss

and degradation in many restoration and FLR projects and programmes (Holl, 2017; McLain et al., 2017). While our understanding of governance in the context of a resource, such as a forest, is relatively advanced (e.g. Cashore, 2002; Agrawal et al., 2008; Arts et al., 2014), governance in the broader context of a process such as restoration that takes place in a large scale and over a long period of time, transforming a landscape, is much more ambiguous.

Forest landscape restoration was defined in 2000 by a group of experts representing different social and ecological sciences as "*a planned process that aims to regain ecological integrity and enhance human wellbeing in deforested or degraded landscapes*" (ITTO and IUCN, 2005; Mansourian et al., 2005; Lamb et al., 2012). Several other definitions have since been proposed perhaps in recognition of the complexity of this definition (Sabogal et al., 2015; Mansourian, 2018), however, for our purposes we refer to the original definition. Key aspects of this definition are: 1. its dual focus (social and ecological), 2. its spatial and temporal scales.

The last 20 years have seen significant research on governance generally, and specifically on the environment as well as forests (e.g. Lemos and Agrawal, 2006; Agrawal et al., 2008; Ros-Tonen and

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Kusters, 2011; Colfer and Pfund, 2011). Nevertheless, there are numerous interpretations of the term 'governance', within and across disciplines. Governance is "often used very loosely to refer to a host of what can in practice be rather different things" (Jordan, 2008). Nonetheless, there is broad agreement that governance relates to decision-making and that it is distinct from government (Kooiman, 1993). Fundamentally, governance has emerged as a popular term to reflect the demise of the power of the state, and a shift towards both higher (international) and lower (local) scales of decision-making (Masson-Vincent, 2008).

Prominent governance questions that emerge when scaling up forest restoration, include: who is involved in the restoration process? Who is in the landscape and who is excluded? who decides what to restore, why, where and how? How are influences from other administrative scales considered? How are cross-sectoral influences considered? How is long term management secured for these new forests and trees? Furthermore, the specificities of FLR, in particular the spatial and temporal scales and the trade-offs between social and ecological objectives, add complexity. This complexity is further exacerbated by a lack of consensus on key terms such as 'forests', 'landscape' or 'degradation' (Chazdon et al., 2016).

The purpose of this article is to provide an analytical basis for future work on governance and FLR by improving understanding of how the term 'governance' is used in the context of FLR and building on the existing body of knowledge on forest governance, environmental governance and landscape governance. The ultimate aim is to inform future FLR initiatives.

2. Methods

Acknowledging on the one hand fuzzy definitions, and on the other, the limited literature on governance and FLR, the method proposed is two-phased¹. First, we reviewed specifically the (English language) literature on FLR (excluding other forms of restoration) and governance. Then, because of the limited dataset and in order to benefit from the broader literature, we expanded our review to 'environmental governance', 'forest governance' and 'landscape governance'. The broader analysis yielded general frameworks related to governance, environmental governance, forest governance and landscape governance which we applied to help our understanding as concerns governance and FLR.

In a second phase, we focused on the articles dealing explicitly with governance and FLR. A search for 'forest landscape restoration' in either the title or the topic in the ISI Web of Science yielded 60 results over the period 2005-2017. Within these results, a search for 'governance' again in both title and topic fields reduced the number to 15 between 2012 and 2017 (see reference list where they are marked with an asterisk). This second phase thus provided a second group of 15 articles which we examined in greater detail. Each article was coded according to its category, aim, the governance terminology it used and the definition (if any) it used for the term 'governance'. Although some aspects of governance can be found in the FLR literature (e.g. stakeholder engagement) for the purposes of this article, we purposefully limited our analysis to use of the term 'governance'.

We classified these journal articles as case studies (3); comparative case study analyses (3), frameworks (3), lesson learning (1), reviews (6), syntheses (1) and literature reviews (2). It should be noted that the

total number is higher than 15, as some papers could be classified under two categories. As a caveat, most of these articles do not explicitly intend to explain or understand the relationship between governance and FLR, although they all use both of these terms. Thus, the definitions and interpretations of both governance and FLR are varied and not necessarily comparable across articles.

The next section associates the findings from both stages of our review to understand how the question of governance is taken into consideration by FLR specialists and to assess emerging challenges from bringing together FLR and governance.

3. Results and discussion

The first part of this section explores the use of 'governance' in the related areas of our research: environmental governance, forest governance and landscape governance.

3.1. Governance: one word, multiple meanings

The concept of 'governance' emerged in the 1990s and entered into the environmental literature towards the beginning of the 2000s. Governance has become popular to a large extent because of the shift in the late 20th century away from centralized governments as being the only power-wielding and decision-making centres (Kooiman, 1993). This shift is summarized by Burris et al. (2008) as a change in: 1. institutions making the decisions, including through greater decentralized approaches (e.g. Lemos and Agrawal, 2006), 2. methods of power, away from 'command and control' to self-regulation and market-based forces, (or as suggested by Lemos and Agrawal (2006), the increased role of market-based instruments); and 3. the nature or effectiveness of constraints which may be adapted due to the changing situation.

For Kooiman (1993) governance is "the patterns that emerge from the governing activities of social, political and administrative actors". Others focus on the organizational and coordination aspects of governance "the governance concept generally implies some degree of self-regulation by societal actors, private public cooperation in solving societal problems, and new forms of multilevel policy." (Biermann and Pattberg, 2008). Somewhat similarly, but more abstract, Burris et al. (2008) define governance as "the management of the course of events in the social system".

Two broad and comprehensive reviews of uses of the term 'governance' are insightful as they explore in a comparable way uses of the term across disciplines and provide a good characterization of the term: Rhodes (1996) identified six uses of the term 'governance', while Van Kersbergen and van Waarden (2004) highlighted nine ways in which governance is interpreted. Removing the overlaps yields a total of 10 uses (Table 1).

This first phase of research reveals two key elements: the diversity of definitions reflecting notably the evolution from governance being associated with the role of a centralized government to a more dispersed vision in which governance is the outcome of the interactions of a much larger number of diverse actors. Secondly, it also highlights distinctions in spatial and political scales, with emphasis for example, in some interpretations, on international and multilateral efforts.

We use these two elements as we explore the related contexts of 'environmental governance', 'landscape governance' and 'forest governance'.

3.1.1. Environmental governance

There has been much interest in the concept of environmental governance starting in the early 2000s, although a search in the online database Scopus reveals early work already as of 1947. For Lemos and Agrawal (2006) "environmental governance is synonymous with interventions aiming at changes in environment-related incentives, knowledge, institutions, decision making, and behaviors.(...) "environmental governance"

¹ This work benefitted from wider research undertaken in the context of a PhD project, which also explored some individual project databases to see how FLR or restoration projects considered governance (Mansourian, S., 2017. *Tackling Governance Challenges of Forest Landscape Restoration* (PhD thesis, under the supervision of Prof. Anne Sgard). Geneva: Geneva University).

Table 1
Comparison of reviews of uses of the term "governance".

	Van Kersbergen and van Waarden (2004)	Rhodes (1996)
1	In the context of 'good governance' which can be likened to (western) democratic principles.	'Good governance' in the context of public sector reforms.
2	In international relations and in the context of treaties and conventions.	
3	Self-organization which does not require the intervention of the state.	As minimal state, introducing reforms to reduce central governments' role. Self-organizing networks of public and private sector actors collaborating.
4	The institutions that make up economic governance and regulate markets.	
5	Private sector governance referring "to the system of direction and control of business corporations".	Corporate governance associated with principles of 'good governance'.
6	Introducing 'good governance' in the public sector.	As new public management associated with improved steering of public institutions.
7	Public, private and hybrid forms of network governance.	
8	Multilevel governance.	
9	Inter-company cooperation.	
10		Governance as a "socio-cybernetic system" which recognizes the loss of centralized power in favour of a more polycentric form of governance.

(...) [refers to] the set of regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes." Other definitions also emphasize the shift to diverse centres of decision-making at different spatial scales (e.g. Cashore et al., 2007; Newell et al., 2012). Yet others focus on the organizational and coordination aspects of governance: "the governance concept generally implies some degree of self-regulation by societal actors, private public cooperation in solving societal problems, and new forms of multilevel policy." (Biermann and Pattberg, 2008).

A review of the diversity of definitions and uses of the term 'environmental governance' suggests that the term re-groups at least three main aspects: 1. people (stakeholders, actors, groups, individuals, networks, private-public partnerships etc.), 2. decision-making actions (e.g. shaping, deciding, influencing etc.) and 3. tools that enable people to make those decisions (e.g. rules, regulations, institutions, policies etc.).

Furthermore, five key areas of emphasis can be distinguished in the environmental governance literature:

1. the literature on institutions and their role in environmental governance as exemplified by Elinor Ostrom's seminal work (e.g. Ostrom, 1995, 2011);

2. the international dimensions (global or regional) of environmental governance, with an emphasis on environmental conventions and agreements intended to address the frequently transboundary dimension of natural resources such as water or forests (e.g. Kanowski et al., 2011; Biermann et al., 2012; Bernstein and Cashore, 2012; Akhtar-Khavari and Telesetsky, 2016);

3. the growing role of non-state actors (e.g. the business sector and communities) in response to weakening governments (Kooiman, 1993; Lemos and Agrawal, 2006);

4. the emphasis on the structural and organizational aspects of environmental governance in the context of decision-making structures or bodies (e.g. Wilson and Cagalan, 2016).

5 the legislative dimensions associated with governance (e.g. Telesetsky, 2012; Akhtar-Khavari and Telesetsky, 2016).

The vast literature on environmental governance demonstrates the complexity of governance dimensions and the broad spectrum covered. It reveals a predominant focus on the diversity of actors operating at different spatial scales.

3.1.2. Forest governance

The interest of forest managers in governance also emerged at about the same time as that of environmental specialists, with an exponential growth in scientific publications in the last 30 years. Yet within this literature the focus and diversity of interpretations also vary.

The late 1990s and early 2000s saw mounting concern over the governance of forests related to over-extraction of the resource at the expense of local livelihoods and loss of national revenue. In this context, governance has been seen as a means of improving the management of a valuable resource. Multiple actors have appeared on the stage extending governance of forests well beyond the role of public actors. A shift was seen in the early 1990s with the expanding role of the private sector (Lemos and Agrawal, 2006) notably through certification of sustainable forest management (Cashore, 2002) described as "a complex hybrid mix of international law, soft law and non-government performance-based measures" (Bernstein and Cashore, 2012). Also, non-governmental organizations felt the need to defend the rights and roles of forest communities (e.g. the Forest Peoples Programme) (Newell et al., 2012; Arts et al., 2014). Principles and criteria were established for 'good' forest governance spearheaded by the World Bank (World Bank, 2009) but also by the World Resources Institute (WRI) and the UN's Food and Agriculture Organization (FAO) (Kanowski et al., 2011) that include such things as accountability, transparency and stakeholder participation. 'Good governance' suggests a subjective definition of the qualities required for governance to be 'good', something which may differ significantly in different contexts, leading to what Masson-Vincent (2008) calls an 'imperialistic' or normative approach. Although generally associated with some normative definition of good practices in diverse aspects of governance, 'good governance' can also be associated with the delivery of successful results (if and when these can be measured) or in terms of both outcomes and process (Burrus et al., 2008). Three points emerge from this analysis: the introduction of new actors (the private sector, NGOs, local communities etc.) both as political actors and as prescribers of rules, norms and definitions; the frequently normative dimensions of forest governance and finally, the introduction of a natural resource, here forests, in the discussion on governance.

3.1.3. Landscape governance

Research linking landscapes and governance is more recent. The term 'landscape' generates complexity as it straddles many disciplines - including landscape ecology, geography, conservation science, architecture and art. Natural and social sciences approach the term in distinct ways, and a multitude of definitions reflect this diversity (Bell et al., 1997). The landscapes may be interpreted as a spatial scale (Pfund, 2010), as a platform to reconcile social and ecological objectives (Sayer et al., 2013) or as a social construct which helps us to organize the way we perceive our environment (Sgard, 2011).

Geographers have taken the lead on landscape governance (Görg, 2007; Gerber and Knoepfel, 2008; van Oosten, 2013; Ros-Tonen et al., 2014; Dawson et al., 2017). Landscape governance emphasizes the multi-scalar and multi-stakeholder nature of decision-making (Beunen and Opdam, 2011; Kozar et al., 2014; Dawson et al., 2017) and has been influenced to a large extent by work on social-ecological systems (SES) (Ostrom, 2007, 2009; Fischer, 2018). It recognizes that multiple scales and multiple actors interact within a given 'space' (Kozar et al., 2014). At the same time, it also acknowledges the mismatch in scales -

both temporal and spatial - between ecological and social systems (Cash et al., 2006; Dawson et al., 2017; Fischer, 2018). In the last decade, landscape governance has “*become generally accepted as referring to the multi-stakeholder process of negotiation and decision making about policies and programmes for effective conservation and sustainable use of forests, and for implementing the planned measures within spatial landscape units.*” (van Oosten et al., 2014).

3.1.4. Emerging findings for governance and FLR

This overview of related terminology and uses of the term ‘governance’ in the context of the environment, forests and landscapes, highlights the diversity of ways that ‘governance’ is used and applied. Related research on governance does not seem to be directly applicable to FLR even if there are elements that may be of use. Work on forest governance is limited by its focus on the sector and the resource; work on environmental governance is widely divergent - ranging from the collaborative dimensions, to the international legislative dimensions and the emphasis on ‘good governance’; and landscape governance faces the challenges associated with the differing interpretations of landscapes.

The development of FLR is inserted in this context of research and debate among actors on scales, power and decision-making modalities. As a concept emerging from the conservation community, FLR was initiated with a biodiversity focus. With time, in an effort to engage more decision-makers, the focus switched to ecosystem services provided by forests (Brancalion and Chazdon, 2017; Pistorius and Kiff, 2017; Reinecke and Blum, 2018). While the natural sciences shaped the first few years of FLR implementation, a neo-liberal economic focus has shaped the last few years, to the extent that some have suggested the need to bring biodiversity back into FLR (Pistorius and Kiff, 2017).

This first analysis demonstrates that research to date on governance highlights the diversity of actors, institutions and decision-making modes which are of relevance to FLR. Specific elements that emerge are:

- differing understandings and definitions;
- a diversity of actors and stakeholders;
- a subject (FLR) which forces the integration of long-term concerns, including flexibility, resilience and adaptability;
- the dual - human and ecological - dimensions;
- the challenge of temporal and spatial scales:

These first findings guide our analysis of the second set of literature reviewed in the next section.

3.2. Emerging literature on FLR and governance

Turning to the literature search focusing on the terms ‘governance’ and ‘FLR’, we find here too that uses and definitions of the term ‘governance’ are highly variable. The articles that focus on the Collaborative Partnership on FLR in the US, emphasize the collaborative and multi stakeholder dimensions of governance (Schultz et al., 2012; Butler et al., 2015; Urgenson et al., 2017). Pistorius and Freiberg (2014) emphasize the multi-sectorial dimension of these collaborations, crossing private, public and civil society organizations. Broader definitions or uses of the term consider it in the context of decision-making (Schultz et al., 2014; Stanturf et al., 2014; van Oosten et al., 2014; Mansourian, 2016). Another distinction can be seen that focuses on organizations, institutions or structures for the process of governance (Stanturf et al., 2014; Schultz et al., 2014; Monroe and Butler, 2016; Uriarte and Chazdon, 2016) or institutional arrangements (van Oosten, 2013; Pistorius et al., 2017). The concept of spatial (and temporal) scales appears in some definitions, including in the context of formal and informal decision-making (Lazos-Chavero et al., 2016; Mansourian, 2017). Butler et al. (2015) refer to engaging with other stakeholders at diverse stages in the restoration process. In the same way, reference is

made to both the FLR process and the governance process (Mansourian, 2016, 2017). ‘Governance systems’ are defined as organizations and rules that govern resource use by Adams et al. (2016).

Further highlighting the diversity of uses of the term ‘governance’, based on the 15 papers reviewed, it appears that the term ‘governance’ is frequently associated with other terms as evidenced by the 39 terms used in conjunction with ‘governance’ (see Annex). These terms associated with ‘governance’ can be re-grouped based on their meaning as: 1. components of a whole – if governance is seen as a process, then within it there may be different components (e.g. governance dimensions or governance factors), 2. ways of organizing stakeholders – referring to configurations of stakeholders (e.g. collaborative governance, polycentric governance), 3. outcomes (of governance) – whereby a governance process can generate some specific governance outcomes (e.g. governance solutions, or governance obstacles), 4. organizing concepts that seek to frame governance (e.g. governance strategies or frameworks) and 5. spatial dimensions (e.g. governance scale or landscape governance). This categorization is not mutually exclusive, with for example, governance scales being potentially both a way of organizing stakeholders as well as a spatial dimension. Such a plethora of associated terms qualifies governance in different ways, adding to the complexity and to varied interpretations of the term.

Forest landscape restoration is a complex process. Grounded in the review of the 15 papers, we discuss four key features of FLR that impact on the governance-FLR relationship.

3.2.1. Adaptation: FLR is a long-term process that modifies landscapes and is modified by experience

The act of restoration, modifies the landscape, thereby generating changes in its value and creating potential winners and losers (Lazos-Chavero et al., 2016; Mansourian, 2016; Pistorius et al., 2017). Activities undertaken under an FLR programme will entail costs and there may be a need to find mechanisms to compensate ‘losers’ (e.g. Alarcon et al., 2017). In the short term, costs of restoration inputs or opportunity costs of setting land aside for restoration may not easily be compensated by longer term benefits from restored landscapes (Adams et al., 2016). This dichotomy further skews the value of FLR, as short-term needs of stakeholders may have to be addressed, and policies, incentives and other forms of motivation may be necessary in view of anticipated future benefits. For example, in the US where collaboration seeks to engage diverse actors in FLR, there is a recognition that progress is challenged “*in the face of multiple resource management needs and changing societal preferences and values*” (Urgenson et al., 2017).

In many cases, trade-offs may apply between short-term restoration of useful trees, and long-term ecologically valuable trees (Borda-Niño et al., 2017) and it may be necessary to explicitly recognize the different perceptions of the value of restoration (Urgenson et al., 2017). Rules and mechanisms may be needed to ensure that over time, these benefits may accrue to those willing to accept the short-term pain for the long-term gain. In turn, this begs the question: who measures the quality of the outcomes and what mechanisms ensure that objective verification can take place? Over time, the same stakeholders may also change their approach to the land and to restoration (Lazos-Chavero et al., 2016).

The temporal dimension recognizes the dynamic nature of both ecological and social systems. It also concerns values to be generated (and lost) through the explicit modification of the landscape. In turn this modification reflects the different experiences of the landscape and of restoration by different stakeholders (Lazos-Chavero et al., 2016). Previous work “*insufficiently addresses the dynamism of diverse stakeholders and the corresponding economic uncertainty, which necessitate involving all stakeholders in making decisions and building relationships that are resilient to evolving circumstances.*” (Lazos-Chavero et al., 2016).

Because of the diverse scales, both spatial and temporal, and the uncertainty of the long-term process, flexibility and adaptation are important (Adams et al., 2016; Lazos-Chavero et al., 2016). Over time, the relationship between stakeholders and the land and forest evolves, as they are modified through FLR, and as stakeholders' needs change. Traditions, cultures and knowledge shape this evolution. Although Western science and knowledge have been the predominant science applied to recent changes in landscapes, increasingly, traditional forms of knowledge are also being recognized and ways of accommodating them are being sought in land use change and forest management, including in FLR (Lake et al., 2018). Learning is an indispensable component whereby knowledge and 'good practices' are used to develop stakeholders' capacities to adapt (van Oosten, 2013).

3.2.2. Collaboration across multiple stakeholders, and multiple temporal and spatial scales

The 'landscape' is central to FLR. The term 'landscape' delimits an area that is larger than a site but smaller than an ecoregion, and in most cases is shared by different stakeholders who may in turn have different perceptions of where this defined 'landscape' starts and where its boundaries end. Unlike small-scale or site-based restoration, FLR is rarely undertaken on land that belongs to or is used exclusively by a single landowner (public or private). The larger spatial scale, and 'fuzziness' surrounding the boundaries of a landscape, signify that more stakeholders are engaged than for example, on a private farm, or a public forest where restoration activities may take place without contention and disagreement among diverse stakeholders with different interests (Monroe and Butler, 2016). Restoration and agreements related to objectives, research needs, monitoring etc. can create a space for engagement and collaboration (Schultz et al., 2014). However, it also raises the challenge of long-term sustainability and coordination among different actors and sectors (e.g. Adams et al., 2016; Schultz et al., 2014). Tensions and differences may arise concerning who is involved in the planning and who is involved in the implementation. For example, in the Colorado Front Range, special committees deal with monitoring, while data collection is being done by the Colorado Forest Restoration Institute at Colorado State University (Schultz et al., 2014).

Stakeholders are heterogeneous, including at the household level, and it is difficult to classify them according to simplistic groupings (Adams et al., 2016). Furthermore, defining the spatial scope of a restoration project or policy can create new groups or in contrast, split existing groups, leading to social transformation. Effecting change on the ground requires acting not only at the policy level, but also with a diversity of stakeholders at the local level (Pistorius et al., 2017). The disconnect between geographical scales: for planning, implementation and decision-making, compounds complexities surrounding FLR. Typically, decisions are being made at high-level international meetings that will affect the livelihoods of local populations (e.g. Pistorius et al., 2017; van Oosten et al., 2018). Planning is being done at a landscape level, straddling communities (e.g. Mansourian et al., 2016; Monroe and Butler, 2016). Reconciling these different spatial scales represents a significant governance challenge.

Stakeholder temporal scales also represent a challenge, with for example, short term planning cycles by donors and decision-makers (e.g. Adams et al., 2016), as compared to longer-term ecological cycles for restoration (at least 15–20 years are necessary to reach a reasonable level of tree cover in many temperate forests). Further disconnects arise when international bodies attempt to set standards in restoration applicable internationally, while not considering local realities and idiosyncrasies (Higgs et al., 2018).

3.2.3. Multiple tenure systems and property rights

While physical definitions of landscapes generally remain in flux, scaling up forest restoration signifies in most cases, straddling land that

either belongs to different people in a *de jure* sense, or in a *de facto* sense. In many areas needing restoration, there are outstanding claims on land or forests, overlapping tenure systems or insufficient information to clarify tenure rights (e.g. Larson et al., 2008). Larger scales, particularly in the global south, may also equate with more uncertainty over resource rights and tenure, more overlapping jurisdictional and administrative authority (van Oosten et al., 2014; McLain et al., 2017). "As a result, it is becoming increasingly recognised that landscape restoration requires the involvement of multiple stakeholders operating in multiple sectors, and at multiple scales" (van Oosten et al., 2014). These are fundamental obstacles to the definition of restoration priorities, negotiations, and implementation of restoration actions. In Ethiopia, Pistorius et al. (2017) found that local pastoralists could relate to the creation of woodlots on private land where tenure was clear, but not to reforestation for other purposes and in areas where several land users were involved with unclear rights.

While for some (e.g. Nagendra, 2007) security of tenure is important to ensure long term investment in restoration, others identified that unclear or conflicting tenure and rights may prove a deterrent to restoration (e.g. Fortmann and Bruce, 1991; Cotula and Mayers, 2009). For example, in Ghana, secure tree tenure through certificates, creates an incentive to engage in tree planting (Mansourian et al., 2019). Unclear tenure rights have been identified as a driver of forest loss (e.g. Ostrom and Nagendra, 2007; Cronkleton et al., 2012). In contrast, clarifying tenure rights has been identified as a prerequisite for effective and long term restoration (e.g. Xi et al., 2014; van Oosten, 2013) and transfer of tenure or rights was highlighted as an incentive for restoration (Adams et al., 2016). Furthermore, when restoring forested landscapes, tenure concerns the land, the trees, products from the trees and the service (e.g. carbon sequestration, which is monetized) provided by the trees (Fortmann and Bruce, 1991; Peluso, 1996). For example, in Morocco, the valuable argan trees are all owned by the state, even if they are found on privately-owned land (Biermayr-Jenzano et al., 2014). In addition, different property rights (e.g. the right to manage or to sell trees) can be obtained through restoration of landscapes (Adams et al., 2016).

Yet, legality of tenure is not necessarily a panacea, and remains infeasible in many situations, although reducing conflict and finding compromises over rights remains a priority (de Jong et al., 2018).

3.2.4. Striking a balance between social and ecological objectives for restoration

Another element of complexity is that of integrating ecological and social dimensions. Many past restoration efforts have failed because they did not consider the needs of local people (Lazos-Chavero et al., 2016). Setting dual goals, implementing activities to meet them, and monitoring their progress, all require cross-disciplinarity. At times social objectives (e.g. food production) may appear to clash with biodiversity objectives (e.g. habitat conservation). Power relations and inequalities in forest restoration can be revealed through a critical analysis of governance (Rai et al., 2018).

Combining both ecological and social objectives may be tricky, as have demonstrated lessons from 'Integrated Conservation and Development Projects' (ICDPs) (McShane and Wells, 2004). Yet, a landscape approach can overcome the divide between social and ecological sciences, enabling a more holistic view. On the ground, reaching multiple, and at times conflicting, objectives may require the negotiation of trade-offs (Sayer et al., 2008) and 'win-win' solutions may never be achievable (van Oosten, 2013; Lazos-Chavero et al., 2016). More powerful stakeholders may promote different objectives. For example, in Rwanda the government promoted large scale restoration using Eucalyptus species, while rural communities were not satisfied with use of this particular species as they were not consulted in the process, and they preferred mixed cropping systems (van Oosten et al., 2018). In

contrast, in Madagascar, the use of exotic species, such as Eucalyptus, was a way of converting forestland to production purposes and allowed farmers to claim ownership of the land in question (Mansourian et al., 2016). The restoration process is thus often instrumentalized in broader land ownership struggles.

Recognizing that there was as yet no framework to address the social dimension in FLR, Adams et al. (2016) combined four frameworks (Institutional Analysis and Development Framework (IAD), the Socio-Ecological Systems framework (SES), the Millennium Ecosystem Assessment (MEA), and the sustainable rural livelihoods framework) to design a conceptual framework for their purposes. It aims to demonstrate the types of social outcomes FLR can achieve. Similarly, a typology of FLR (Mansourian and Vallauri, 2014) provided categories of potential objectives for FLR covering both human and ecological dimensions. For example, planting trees along the Lower Kinabatangan river in Borneo helped to protect the water from sedimentation for both fish and humans.

Large scale forest restoration requires several stakeholders coming together. It necessitates reconciling different interests and modifying landscapes for the long-term (Lazos-Chavero et al., 2016). Incentivizing collaboration and ensuring its continuity are key challenges.

4. Conclusions: governance and FLR - a two-way relationship

This review of the literature highlighted on the one hand that little attention has been given to date to FLR and governance, and on the other hand, the complexities surrounding the relationship between governance and FLR. Through this contribution we sought to disentangle these complexities and to expose the diversity of issues associated with FLR and governance. We conclude with some discussion points that require further research and which may support both practice and policy.

Uncertainty of outcomes is prevalent in FLR and ecological restoration more generally (Suding, 2011). As a result, FLR implementation requires adaptability and flexibility, neither of which is possible with a mere technocratic approach. The relevance of spatial and temporal scales emerges from this review. The spatial delimitation of the landscape perimeter is rarely made explicit and remains a political decision defining who is in the landscape and who is out. Without transparency and negotiation with stakeholders the landscape becomes a tool to justify political decisions (Sgard, 2014). Because FLR takes place at a scale that is fuzzy, rarely corresponds to an administrative unit, and generally re-groups multiple stakeholders with varying interests in the landscape, influences from other spatial scales will be particularly important, yet how these are integrated in the landscape remains complex (Fischer, 2018). In turn, interventions to modify the landscape, have wider repercussions on proximate and distant landscape interests.

Complexity is also present in the dynamic nature of FLR which does not have a static endpoint, but rather evolves and adapts over time, with consequent changing governance challenges (Mansourian, 2016). As FLR takes place over a period of decades, changes will not only appear in the physical landscape being restored, but also in the social, political and economic contexts, requiring flexible and adaptive institutions (Mansourian, 2017). The fluidity in the concept of FLR, from an ecocentric to an anthropocentric focus, suggests a lack of solid grounding, creating a greater need for an understanding of associated governance processes. It also suggests the need for more integrated approaches across 'communities' – in particular both the development and the conservation communities but also between science and practice (e.g. Adger et al., 2003) and between science and policy (e.g. Menz et al., 2013).

Forest landscape restoration in turn serves to stimulate a wider understanding of governance. The consequences of a long-term modifica-

tion of land use as evident in FLR, requires a flexible yet comprehensive understanding of the dynamics and complexities behind the governance process. For example, returning trees to the landscape can impact on tenure rights in places where tenure conflicts exist or where legislation supports management or use rights over land that is transformed.

Normative approaches to governance have been proposed but they cannot account for the uniqueness of different realities and the evolving dynamics of FLR. At best, imposing one model on many different FLR situations is not realistic, at worse it represents a cultural imposition. Instead recognizing this diversity and the evolution of two processes – governance and FLR – can help to better consider their relationship. Flexible and adaptive tools (e.g. Mansourian, 2017), as well as learning by doing, can provide more effective ways of considering and integrating governance in the FLR process.

Ultimately, implementation of FLR takes place in diverse ecological, cultural, political, social and economic contexts, in which governance differs, and in which the FLR process will take a different course. Governance of FLR is framed in social-ecological systems with unique local cultures, norms, politics and environmental realities. Understanding, integrating and balancing these different contexts is fundamental to both the governance and FLR processes.

Appendix A.

Annex: Terms associated with governance.

Categories	Associated terms
Components of a whole	aspects of governance/governance aspects dimensions of governance elements of governance governance dimension governance elements governance factors governance indicators governance mechanism governance-related activities governance-related guidance
Way of organizing stakeholders	collaborative governance forms of governance governance arrangements (formal and informal) governance model governance process governance structure modes of governance/governance modes network governance polycentric governance self-governance
Outcomes of governance	types of governance governance challenge governance concerns governance obstacles governance products governance solutions governance institutions
Organizing concept	governance framework governance strategies environmental governance theories governance context governance system/system of governance Approaches to governance/governance approaches
Spatial dimensions of governance	governance levels/levels of governance landscape governance local governance scales of governance

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