



Key challenges for governing forest and landscape restoration across different contexts

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ABSTRACT

Governance arrangements directly influence decision making processes and the degree to which different stakeholder groups are engaged in planning, implementing, and receiving benefits from Forest and Landscape Restoration (FLR). Narrow institutional and agency mandates must be better aligned to permit new ways of governing landscapes that are centered on the needs and capacities of local stakeholders. This special issue highlights challenges and opportunities for governing FLR at different scales and under different contexts across a range of tropical and subtropical forest biomes. In this introductory paper, we explore common threads from diverse studies comprising the special issue to highlight key challenges for effective governance of FLR across many different contexts. We discuss enabling factors and conditions that can help to overcome deficiencies in governance processes and outcomes and illustrate how these conditions are linked to the six principles of FLR. We conclude by emphasizing several gaps in understanding how governance arrangements influence the planning, implementation and monitoring of FLR.

The declaration of the 2021–2030 UN Decade of Ecosystem Restoration signals a new phase of global recognition and commitment to address the urgent need to restore ecosystems and their functions in ways that provide multiple socio-economic benefits. The concept and practice of forest and landscape restoration (FLR) addresses these challenges at the landscape scale, with the goals of regaining ecological integrity, improving resilience to climate change, enhancing human well-being, and improving productive and protective functions in deforested or degraded forest landscapes (Maginnis and Jackson, 2007; Mansourian et al., 2005; Stanturf et al., 2019). Fundamentally, FLR interventions aim to balance environmental and social-economic needs through integrating different types of land uses and restorative activities, from promoting natural forest regeneration to establishing commercial tree plantations and agroforestry systems (Kumar et al., 2015).

Forest and landscape restoration is recognized by the United Nations Convention on Biological Diversity's 2011–2020 Aichi Biodiversity Targets, and is widely viewed as a means to reach the United Nations Sustainable Development Goals, the National Determined Contribution of countries to the Paris Climate Agreement, The New York Declaration

on Forests, the Land Degradation Neutrality of the United Nations Convention on Combating Desertification, and the Bonn Challenge to bring 350 million ha of deforested and degraded land into restoration by 2030 (Chazdon and Brancalion, 2019). Regional FLR-based initiatives are underway across Latin America (<https://initiative20x20.org/>), Africa (<https://afr100.org/>), and Asia (Appanah et al., 2016). Despite the increased attention on FLR during the past decade, progress towards reaching internationally-agreed goals and national commitments has been limited (Brondizio et al., 2019; Díaz et al., 2019; Fagan et al., 2020).

Governance, as a basic social function through which actors interact to influence decisions, processes, and outcomes, is central to the design, implementation and monitoring of FLR (Brondizio et al., 2009; Lemos and Agrawal, 2006). The term 'governance' is defined and used in different ways in the FLR literature, leading to a diversity of interpretations and understandings (Mansourian and Sgard, 2020). Furthermore, concepts of governance and of FLR are highly contextual and complex, and their association leads to widely differing expectations and potential outcomes. How landscapes and larger-scale jurisdictions

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are governed directly influences short and long-term FLR decisions, levels of engagement of different stakeholder groups, and levels and distribution of benefits. Here, we adopt a broad perspective that views governance as both a process and an outcome (Mansourian, 2017). Particular governance processes and outcomes can either promote or obstruct the development and effective functioning of institutions, public-private partnerships, stakeholder engagement and behavior, and corruption-free markets and supply chains (Chazdon and Brancalion, 2019; Walters et al., 2020).

FLR governance processes and outcomes influence and are affected by: (1) how incentives and interventions influence the land-use decision-making processes of different groups of actors and stakeholders; (2) how conflicts resulting from the overlap of formal and informal rules around resource use are negotiated; (3) whether specific types of interventions, such as Payment for Ecosystem Services, will reinforce synergies or promote conflicts across property and resource ownership systems, and between land use systems; and (4) whether national policies and legislation and local arrangements can converge towards mutual benefits from FLR. Although much of the FLR literature does not distinguish “actors” from “stakeholders,” we consider actors to be those stakeholders who hold power, influence, and decision-making capacity (Buckingham et al., 2020). Fundamentally, the literature and on-the-ground experiences are based on the premise that FLR programs should adopt participatory, integrated and multi-level approaches to planning, implementation, and monitoring outcomes. Furthermore, the implementation and governance of FLR call for social-ecological systems perspectives that account for interactions between landscape scale processes and contextual factors such as local cultures, norms, politics, and environmental realities (Ostrom, 2009; Yang et al., 2018).

The process and outcomes of FLR depend on effective convergence between individual and collective goals and decision-making, which require frequent negotiations, transparency and monitoring, and adaptive management by coordinated groups of stakeholders. Clearly, governance issues are paramount (Mansourian and Parrotta, 2019). Governance issues encompass gender considerations, power imbalances, and other social equity issues, which are often overlooked in planning and implementing of FLR (Basnett et al., 2017). The relative importance of particular governance issues varies however, depending on context and the scale of implementation of FLR. At the project level, for example, within-group governance issues rise to importance. The ability of a local community forestry group to implement landscape restoration effectively within a local watershed requires skills in leadership, organization, conducting meetings, keeping financial records, and maintaining active engagement of community members (Baynes et al., 2015). Developing these skills within a community in Biliran, Philippines took several years (Gregorio et al., 2020). At larger scales, governance issues such as corruption of agency officials, land tenure, engaging all relevant stakeholder groups, and addressing power imbalances become more important (Baynes et al., 2016).

The governance challenges presented by landscape-scale approaches are well recognized and apply to a wide range of initiatives (Ros-Tonen et al., 2018). Among these challenges is defining the biophysical and jurisdictional boundaries of the unit of landscape intervention, which may vary widely in extent, topographic and ecological complexity, and social diversity. Landscape units for practice of FLR can be defined by criteria as diverse as clan structure, customary lands, indigenous territories, adjacent private land holdings, watershed boundaries, resource management units, or municipality boundaries.

As an array of actors, authorities, and stakeholders are engaged in FLR, polycentric governance approaches have often been used—explicitly or not—to facilitate and align multiple centers of authority and decision-making across a network of institutions, agencies, and organizations (Bixler et al., 2018). A focus on how governance arrangements operate in a given jurisdiction or context is often needed prior to implementing restoration activities (Baynes et al., 2016; Le et al., 2014). As a social learning process, good governance practices

take time to implement. Consultation, inclusion, identification of beneficiaries and non-beneficiaries, capacity building of actors, leadership, among other functions, are often costly activities and demand sustained commitment across diverse groups of stakeholders. As such, investments in these supportive actions are often ignored or sidelined in favor of rapid, if not rushed, project-level implementation, which are dictated by political and/or donor timelines (Mansourian et al., 2019; Walters et al., 2020). Assessment of governance arrangements are typically excluded from the metrics that donors and implementers use to gauge short-term success of projects. Enabling the wide distribution of ecological and social benefits that FLR aims to deliver takes time and requires building the capitals and capacities needed to sustain efforts in the long term.

The issues raised above suggest a need to build effective governance arrangements for FLR across diverse contexts using relevant experiences as a foundation. The current compilation of papers builds on three recent collections that focused on governance aspects of forest restoration and integrated landscape initiatives using case studies (Guariguata and Brancalion, 2014; Ros-Tonen et al., 2018; Wilson and Cagalan, 2016). This special issue explores the challenges facing effective governance of FLR at different scales and under different contexts across a range of tropical and subtropical forest biomes. The collection of papers spans temporal, spatial, and organizational scales at which FLR is being planned and implemented. The studies included use a variety of methods, including literature reviews, ethnographic research, interviews and surveys, meta-analyses, institutional and historical analyses, ecological analysis, and network analyses. They examine the context-specific drivers of FLR; the relationship between perceptions, motivations, and actions for FLR; the politics of FLR; specific governance strategies and enabling factors associated with FLR; and the local to global synergies and resistances. In this introductory paper, we explore common threads from diverse studies comprising the special issue and weave them together to highlight key challenges and barriers to effective governance of FLR. We discuss enabling factors and conditions that can help to overcome the governance challenges highlighted by papers in the special issue. We conclude by outlining several gaps in understanding how governance arrangements influence the planning, implementation and monitoring of FLR.

1. Key challenges for governing FLR

The diversity of papers presented in this special issue point to a common set of governance issues that pose obstacles to achieving the multiple objectives and the long-term sustainability of FLR. Spanning a range of geographies including Asia, Africa and the Americas, these challenges emerge from local project to national scales, across types of restorative interventions and from bottom up projects to those implemented as part of a systematic government program. Despite this variation, three cross-cutting challenges have become apparent (Table 1): 1) Poor alignment across levels and sectors of government; 2) Environmental and social heterogeneity; and 3) Lack of enabling conditions and implementation capacity. Several of these challenges are also recognized as obstacles to implementing REDD + initiatives (Angelsen et al., 2018; Gritten et al., 2019; Kane et al., 2018).

1.1. Poor alignment across levels and sectors of government

Restoration initiatives can be hampered by sectorial management silos (e.g., forestry, agriculture, water, conservation), unaligned policies, and power and information imbalances between and within levels of government (Buckingham et al., 2020; Sapkota et al., 2020; Sayer et al., 2020; Schweizer et al., 2020; von Kleist et al., 2020). Studies from several countries illustrate how FLR implementation may be challenged by siloed agency mandates and agendas (Sayer et al., 2020) and sectoral organization of water, energy, agriculture, fisheries, mining, infrastructure, and conservation interests. Viewing restoration of degraded or deforested land solely as a technical problem often leads to a narrow

Table 1

Common governance challenges for Forest and Landscape Restoration identified by papers in this special issue and related publications.

1. Poor alignment across levels and government agencies Unaligned policies and power and information imbalances within and across levels of government Government policies to support economic growth and profits from export commodities continue to drive deforestation and forest degradation Inadequate support from government programs for sustainable livelihoods Mismatch between short and long-term ecological and economic goals Channeling of capital subsidies to companies for massive land-use change causes displacement of local communities
2. Environmental and social heterogeneity Economic and ethnic diversity of actors and stakeholders can create challenges for collective action Imbalance of power and needs among stakeholders Fine-scale geographic information may not be available or accessible for use by local stakeholders in planning and implementation Unbalanced distribution of land and tree tenure rights impede the planning and implementation of FLR Indigenous and local knowledge is often overlooked in planning and implementing restoration activities Gender roles and capacities require different types of engagement for men and women
3. Lack of enabling conditions and implementation capacity Lack of supportive legal instruments and policies present barriers to developing local capacity for decision-making and adaptive management Short-term projects that may fail to build the local capacity and leadership needed to drive effective long-term implementation of restoration plans Poor understanding of social networks and stakeholder relationships within landscapes Bottom-up, participatory approaches that emphasize social learning and reflection on management outcomes are less commonly applied in the context of the global FLR agenda Lack of bridging organizations or institutions to facilitate integrated landscape management Indicators used in monitoring FLR are not useful for tracking incremental progress toward long-term objectives

approach, which can marginalize the interests of legitimate stakeholders, such as local communities (Sayer et al., 2020). Policies and incentives to promote economic growth within and across government sectors often undermine lower priority policies and initiatives in support of conservation and restoration and customary land rights. While FLR commitments focus on reversing environmental degradation, action on the ground is often confronted with contradictory government policies, which on the one hand may support conservation and restoration but, on the other hand, can undermine restoration projects by driving continued deforestation and forest degradation (Abessa et al., 2019; Lambin et al., 2014). Often, economic development goals marginalize poor and ethnic minorities, despite the language in national pledges to restore land and to recognize the rights of indigenous peoples and local communities (McLain et al., 2020; Welch and Coimbra Jr, 2020). In northern Thailand, support from government programs for sustainable livelihoods is insufficient to address the development needs as reported by local community members and civil society organizations (Sapkota et al., 2020).

Mandates of different government agencies (and their norms and regulations) focusing on a given land use type are often poorly aligned, hampering sound management. In Peru, land-use *planning* falls under the Ministry of Environment, but land use *change* falls under the Ministry of Agriculture, who is responsible for issuing titles and permits. As a result, the Ministry of Environment often has little leverage to support forest conservation (including natural regeneration in fallow lands) in spite of being the responsible entity for implementing avoided deforestation payments (Kowler et al., 2016). In Indonesia, forestry agencies largely control 'degraded' forests and often channel capital subsidies to companies for massive land-use change while at times displacing local communities (Barr and Sayer, 2012).

Forest Landscape Audits can be employed to assess the coherence and effectiveness of multi-sector governance arrangements. In the

Sendang landscape of South Sumatra, Sari et al. (2019) designed an audit of effectiveness of governance arrangements, to assess how actors from different sectors and levels interact and influence each other. Their analysis exposed major weaknesses in governance arrangements that arise from competing regulations and limited authority of different government ministries and agencies. The lack of a cross-sectoral institution that has authority to govern within the landscape poses major barriers to any kind of integrated landscape initiative (Sari et al., 2019).

Lack of coordination and harmonization of mandates of different government sectors can lead to conflicting outcomes and inadequate actions (van Oosten et al., 2020v). In Indonesia, forest conservation policies can create disincentives for restoration, but as numerous external agencies attempt to provide solutions they end up compromising the effectiveness of an already complex governance arrangement (Sayer et al., 2020). In the Philippines, national-level disregard for local practices can impede successful community engagement (von Kleist et al., 2020v). Aligning national priorities (and investments) and local goals is key to overcoming issues faced by actors on the ground that can impede FLR efforts, such as a lack of infrastructure, limited market knowledge and access, and weak implementation capacity (Techel et al., 2020; van Oosten et al., 2020v; von Kleist et al., 2020v). Successful landscape restoration efforts benefit from a coordination of multi-level governance approaches in forest restoration and environmental governance more broadly (Guariguata and Brancalion, 2014; Sapkota et al., 2020; Sayer et al., 2020; von Kleist et al., 2020v). Factors that advance restoration initiatives include a combination of participation of non-state actors, attention to material and non-material benefits, regulatory flexibility, and market-based instruments.

Commonly, the planning and implementation of FLR suffers from a mismatch between short and long-term ecological and economic goals, which transcends the political time of most government and/or the cycles of donor-driven project and programs (Wiegant et al., 2020). Many indicators of progress and FLR assessment reports are driven by short-term outcomes at the expense of longer-term outcomes (Coppus et al., 2019; Dudley et al., 2018; Gregorio et al., 2017; Le et al., 2012; Murcia et al., 2016; Sanches et al., 2020; von Kleist et al., 2020).

1.2. Environmental and social heterogeneity

Although diversity of actors is often viewed as a positive attribute in decision-making processes, it can also create challenges for collective action in FLR, in some cases impeding progress and leading to conflicts. Not surprisingly, the most successful community forest projects tend to be those involving homogeneous populations, which share strong customary institutions and can negotiate more easily on rules and norms, goal setting, and benefit distribution (Baynes et al., 2017; Chang and Andersson, 2020). Ideally, decision-making teams that are planning landscape-scale restoration can access and apply fine-scale geographic information regarding spatial variation in ecosystem properties, extent of land degradation, and co-production of ecosystem services. This level of information may not be available or accessible, or local stakeholders may lack the capacity to process and apply these data in the planning process (Potts, 2019).

Restoration at the landscape scale requires bringing together different groups of stakeholders that live or work in the landscape or in areas of influence around the landscape. These groups differ, not only in terms of their land use, economic status and property rights, but also their cultural traditions, ethnic identity and values towards the landscape—a challenge identified by studies around the world (Buckingham et al., 2020; Sanches et al., 2020; Welch and Coimbra Jr, 2020). Lack of clarity and/or unbalanced distribution of land and tree tenure rights (access, use, management, exclusion, and alienation) directly impede the planning and implementation of FLR (McLain et al., 2020). The clarity of tenure and security of rights on land and associated resources is a foundation of FLR (Sapkota et al., 2020). Agreement on tenure rights of land and other resources enables identification of roles and

responsibilities of stakeholders, and influences benefit sharing of restoration outcomes. Users with secure property rights are often more likely to undertake restoration actions when they are more certain to be able to realize the long-term benefits (Chang and Andersson, 2020). But empirical evidence does not support the assumption that assuring legal tenure with full property rights is the sole decisive factor (de Jong et al., 2018). Although FLR may be feasible under a range of different tenure systems, understanding and securing rights in a way that is most appropriate and beneficial for a given context is a common challenge faced by restoration projects. McLain et al. (2020) suggest adopting a rights-based approach to FLR as a means to engage right-holders in FLR design and practice. Further, they propose a diagnostic that can be applied during the planning stages of a FLR intervention, particularly in cases where both tenure rights and security are at stake.

Indigenous and local knowledge are often overlooked in planning and implementing restoration interventions, despite their local relevance and often proven effectiveness (Reyes-García et al., 2019). Fire management through controlled burning, native tree regeneration strategies, and use of tree species mixtures are just a few examples of indigenous practices with direct application to large-scale landscape restoration initiatives (Sanches et al., 2020; Welch and Coimbra Jr, 2020). Adopting indigenous and local knowledge rewards active participation, acknowledges stakeholder experience and wisdom, promotes cultural values, and enables adaptive management for long-term sustainability (Reyes-García et al., 2019). Welch and Coimbra Jr (2020) clearly demonstrate that tenure security is key for maintaining and gaining societal respect for the application of traditional management practices such as controlled fires, used to maintain and restore productivity of native vegetation.

1.3. Lack of enabling conditions and implementation capacity

The absence of enabling conditions and implementation capacity from local to national levels pose a major impediment to FLR. Institutional and policy linkages at multiple levels are fundamental for the interactions between social agents involved in landscape governance (Brondizio et al., 2009). Yet, FLR initiatives are often compromised by the lack of focus on identifying and creating enabling conditions, from local to national levels and also across temporal scales (Guariguata and Evans, 2019; Hanson et al., 2015). Sayer et al. (2020) and van Oosten et al. (2020) stress the urgency of enhancing human capacities at multiple levels to design, implement and monitor FLR outcomes. They and other authors also highlight the need for new arrangements that can create bridging institutions and facilitate integrated landscape management (Buckingham et al., 2020; Chang and Andersson, 2020; McLain et al., 2020; Sapkota et al., 2020; Techel et al., 2020; Walters et al., 2020). For instance, in Northern Thailand, lack of information on landscape conditions, lack of access to financial resources, and lack of supportive legal instruments present barriers to developing local capacity for decision-making and adaptive management (Sapkota et al., 2020). The prevalence of top-down, short-term FLR “projects” supported by “intervening agents” may fail to build the local capacity and leadership needed to drive effective long-term implementation of restoration plans (Techel et al., 2020; Walters et al., 2020).

Understanding the social landscape and relationships among actors is key to building the social capital to enable FLR (Buckingham et al., 2020). Analysis of the structure of social networks has been applied to understand governance in three key ways: 1) to identify levels of trust, 2) to identify skills and capacity, and, 3) to identify who holds social capital. Social network analysis can also be used to identify vulnerable or marginalized populations. In Rwanda, for example, farmers play an important role in restoration, but are not consulted during implementation or when rules must be enforced. Network analysis also revealed that stakeholders with interests in biodiversity conservation are poorly connected to the network hubs (Buckingham et al., 2020).

A common issue facing FLR is integrating top-down, national plans

with effective local implementation and participation. No blanket solution can be applied, as different contexts dictate different solutions (Chang and Andersson, 2020). Restoration at the local project scale is impacted by the choice of local implementing bodies (intervening agents), which can include government or non-government organizations (Walters et al., 2020). Villagers and communities at the heart of implementing FLR may lack trust in government agencies or in local NGOs, which can hinder efforts (Walters et al., 2020). In contrast, bottom-up, participatory approaches that emphasize social learning and reflection on management outcomes seem less commonly applied in the context of the global FLR agenda (Evans et al., 2018). But self-governed efforts are the most likely to sustain strong support from local communities, to recognize and respond to local needs, and exercise adaptive management (Sanches et al., 2020). In the Xingu River Basin of Mato Grosso State, Brazil, collective action among multiple and social-culturally diverse stakeholders promoted innovative technological alternatives for the recovery of riparian forest areas, generating income for local communities of indigenous and small farmers (Sanches et al., 2020). However, the benefits of the initiative are perceived very differently by different actors, potentially compromising the expansion of the program. As illustrated by Mansourian and Sgard (2020) and Walters et al. (2020), the long-term commitment involved in FLR requires strong local institutions, inclusive and effective communication, local capacity building, and community organizations that enable flexibility and adaptation over time.

2. Key enabling factors for FLR

In practice, effective implementation of FLR requires a major transformation of entrenched and narrow ways of thinking and acting based on project-cycle requirements, short-term outcomes, and command and control operations (Sayer and Boedhihartono, 2018; Chazdon and Brancalion, 2019). Here, we consider lessons learned and examine approaches to overcome barriers to landscape-scale and people-centered restoration interventions with sustainable, varied, and shared benefits.

In 1990, Elinor Ostrom outlined a series of eight design principles that facilitate the sustainable governance of multiple types of common pool resources, particularly at the local level (Ostrom, 1990). The Ostrom design principles—including social and physical boundaries, types of collective arrangements, conflicts resolution mechanisms, types of control and monitoring, types of sanctions, and nested arrangements—have been widely applied to forest conservation and management and continue to be revised based as new knowledge of governance arrangements emerge (Cox et al., 2010).

With respect to FLR initiatives, (Besseau et al., 2018) presented a set of six core principles to guide design, implementation and monitoring of FLR projects, programs, and processes. Similar core principles are also being applied to implementation of a wide range of Nature-based Solutions (Cohen-Shacham et al., 2019). But a guiding framework to link these principles with governance processes and outcomes is lacking (Mansourian, 2016). Here, we examine how the six core FLR principles are linked with eight enabling actions and conditions to guide more effective governance and more effective restoration outcomes (Fig. 1). Principles serve as a leverage point for each other. For instance, principle 2 (engage stakeholders and support participatory governance) and principle 5 (tailor to the local context using a variety of approaches), can be operationalized through all eight of these enabling actions. Enabling conditions of shared and accessible information, participatory monitoring, and accessible tools and guidelines help to promote principle 6 of adaptive management for long-term resilience (Fig. 1). Below we elaborate on these key enabling factors for overcoming governance challenges based on the studies presented in this special issue and elsewhere.

2.1. Multi-stakeholder platforms

FLR is a multi-stakeholder process that requires an accessible

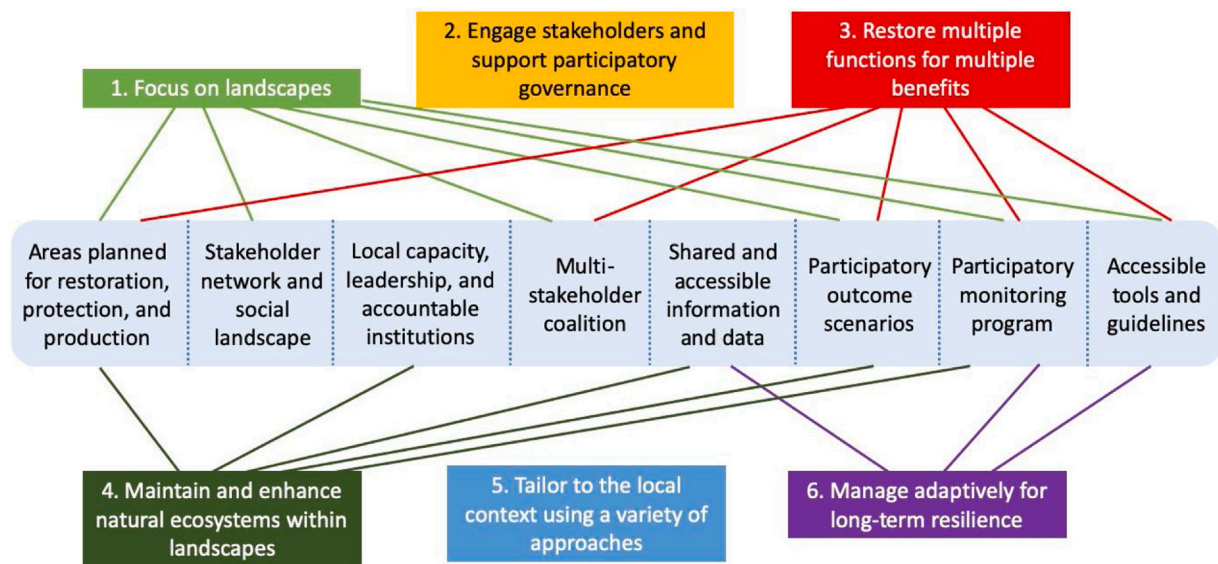


Fig. 1. A diagram to illustrate how eight enabling conditions (in the middle blue area) are linked to the six principles of Forest and Landscape Restoration (in rectangles) as described by Besseau et al. (2018). All eight of the enabling conditions are linked to Principles 2 and 5 so those lines are not shown. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article).

platform for institutional coordination to align and integrate the decision-making processes of planning, monitoring, and evaluation within the area designated as the landscape (Kusters et al., 2018; Sapkota et al., 2020). The social-ecological boundaries of this multi-stakeholder platform rarely align with existing administrative boundaries and jurisdictions (Ros-Tonen et al., 2018; van Oosten, 2013v). Building multi-stakeholder platforms and developing new bridging institutions at the landscape scale creates an enabling environment for participation, coordination, and decision-making that overcome existing obstacles (Duraiappah et al., 2014). To be effective, these landscape entities should be empowered and supported by higher levels of government, local government agencies, and by non-governmental organizations. Enhancing this broad engagement requires effective dialog and balanced negotiation (Sapkota et al., 2020).

Multi-stakeholder platforms can also be decentralized across large spatial scales, with coordination at higher levels. The Atlantic Forest Restoration Pact in Brazil has functioned successfully since 2009 as a multi-stakeholder movement to restore 15 M ha of degraded and deforested land by 2050, including a 1 M ha commitment to the Bonn Challenge (Brancaleon et al., 2013). A recent analysis found that approximately 700,000 ha of native forests were restored in the Atlantic Forest from 2011 to 2015 (Crouzeilles et al., 2019). This success is due, in part, to communication and articulation strategies that engage and integrate multiple stakeholder through working groups, regional units, and an accessible online platform (Pinto et al., 2014).

The quality of a multi-stakeholder platform determines its effectiveness. Kusters et al. (2018) propose a participatory method to aid planning, monitoring, and evaluation of multi-stakeholder platforms, based on experiences in Ghana and Indonesia. The criteria for assessing processes within these platforms include three principles of good governance (representation, participation and equity, and accountability and transparency) and eight conditions for effective operation (capacities, resources, adaptive management, leadership, theory of change, facilitation and communication, trust, and commitment).

2.2. Accessible tools and guidelines

Tools are now available for assessing restoration opportunities and planning of FLR approaches (IUCN and WRI, 2014) and spatial prioritization (Strassburg et al., 2019), but few tools focus on governance

aspects, capacity building, and development of tailored guidelines fit to purpose (Chazdon and Guariguata, 2018). Techniques for visualizing landscapes and future scenarios are powerful tools for stakeholder engagement, conflict resolution, and long-term planning (Onitsuka et al., 2018; Sayer and Boedhihartono, 2018). Guidance and tools for planning and monitoring are also available, including the Restoration Diagnostic (Hanson et al., 2015), a diagnostic for collaborative monitoring (Guariguata and Evans, 2019), tools for mapping social landscapes (Buckingham et al., 2018) and identifying actor networks (Sayer and Boedhihartono, 2018), and a guide for identifying priorities and indicators for restoration monitoring (Buckingham et al., 2019).

2.3. Knowledge sharing and capacity building

Improving knowledge sharing and implementation capacity at multiple scales can enable greater participation, leading to more effective monitoring and information flow for adaptive management. Knowledge sharing builds social and human capital, and can help to resolve legal issues, and access to incentives. Building communities of practice for FLR can be an effective way to develop knowledge sharing platforms (Watkins et al., 2017). Bridging organizations or individuals can enhance knowledge flow and capacity, while also promoting networks across different stakeholder groups that encourage knowledge exchange and technical transfer, and bringing external financing to support local restoration activities. Capacity building efforts for FLR are most effective when they include the following four components: 1) Activities tailored to stakeholder needs and context; 2) Knowledge and applied experience incorporated from diverse sources and disciplines; 3) Skill sets for selecting among a suite of restoration interventions; and 4) Multiple subjects and skill sets in addition to technical and ecological themes (Bloomfield et al., 2018).

2.4. Advancing polycentric governance approaches

Adopting governance approaches based on a polycentric arrangement can facilitate and align multiple centers of authority and decision-making across institutions, agencies, and organizations affecting FLR (Bixler et al., 2018). Effective polycentric governance can also enhance adaptive management as different groups of agents can respond to changing conditions in a given part of the landscape while considering the potential implications of these changes at another level, and

vice-versa. The alignment of adaptive management responses depends on the degree of information and knowledge sharing, local capacity for decision-making, recognition of local decisions by higher level institutions, and institutions able to bridge levels of governance (Duraiappah et al., 2014; Long et al., 2018).

2.5. Private-sector engagement and development of public-private partnerships

Some restoration initiatives begin as private-sector approaches involving value chains that have their own governance mechanisms (Brancalion et al., 2017). For example, in 2009, Guayakí became the first Fair Trade Certified yerba mate (*Ilex paraguariensis*) company in the world. Guayakí built relationships with growers of yerba mate that are committed to sustainable forest production. Guayakí's partners sustainably harvest organic yerba mate from reforestation and forest restoration projects, generating a renewable income stream, which enables local communities to improve their lives and restore their lands (Brancalion et al., 2017). Such activities can provide synergies to landscape-scale governance arrangements (Ros-Tonen et al., 2018). Private sector engagement can boost the economic and livelihood benefits of FLR for local communities (Sayer and Boedhihartono, 2018). Multi-stakeholder platforms and public-private partnerships can bolster support and capacity building for FLR.

3. Research gaps

The studies presented in this special issue and related publications highlight research gaps that often impede full implementation of FLR and provide further insight into how limitations can be overcome in a governance context. Filling these research gaps can motivate better enabling conditions for FLR (Fig. 1), which we identify as those regarding effective monitoring, capacity development, inclusion and gender roles, implementation of different types of restorative activities, and participatory scenario development.

Having actors collect monitoring data at different scales can facilitate polycentric governance by deploying information at the right scale when it is needed (Bixler et al., 2018). While many international initiatives have developed FLR monitoring frameworks for selecting indicators and assessing progress, these are mostly oriented toward compliance (i.e. not performance or outcomes) and are mostly top-down (Buckingham et al., 2019; Dave et al., 2019). Further, the indicators used in monitoring FLR are often poorly matched to tracking incremental progress toward long-term objectives. These include an emphasis on lagging indicators designed to meet short-term objectives rather than inclusion of leading indicators that point to the likelihood of a certain future impact (Suding and Hobbs, 2009). As already mentioned, emphasis on short-term indicators and an overall lack of a bottom-up monitoring culture in FLR hampers social learning and adaptive management, often at the expense of longer-term outcomes (Coppus et al., 2019; Guariguata and Evans, 2019; Murcia et al., 2016). Existing global monitoring frameworks for FLR may benefit from using multi-scalar approaches in order to distill emerging lessons. Research on multi-party, multi-site monitoring across governance scales can help to identify bottlenecks on information flows when implementing FLR (Guariguata and Evans, 2019; Scarlett and McKinney, 2016).

Further work on assessing lessons learned on capacity development approaches to FLR is also warranted. For example, which kinds of arrangements are the most effective for fostering collaboration and mutual learning across disciplines and among relevant institutions in the context of FLR? Implementing FLR requires understanding of the interplay between restorative actions at the plot level with the large-scale, social-ecological dynamics of human-transformed landscapes, socioeconomic drivers of both habitat transformation and restoration success, and collaborative planning, implementation and monitoring. The challenges of restoring millions of hectares of degraded or else

deforested area raised by the wide range of international initiatives and country aspirations call for enhancing human capacities through innovative, inter- and trans-disciplinary approaches, such as supported by 'network governance' models (Scarlett and McKinney, 2016).

Further research is likewise needed to understand how gender issues can be better incorporated into the design and implementation of FLR, especially on facilitating the equitable involvement of women and men, recognizing the different roles that men and women play, and the gender-specific impacts of restoration activities (Villamor et al., 2014). For example, studies in India and Nepal provide strong and clear evidence of the importance of including women in forest management groups for better resource governance and conservation outcomes, but there has been scant research undertaken in other countries (Leisher et al., 2016).

Information on key issues and lessons learned regarding the governance of specific types of restorative activities such as commercial tree plantations, biofuel plantations, assisted natural regeneration, and agroforestry is notably lacking in the context of FLR planning and implementation. As mentioned, FLR aims to integrate and balance different land uses—protection of natural forests, natural forest regeneration in formerly deforested land, establishment of commercial tree plantations and agroforestry systems—all of which are intended to generate specific environmental and socio-economic assets (Chazdon et al., 2017). Planted forests for timber and pulp across many regions are often associated with negative social impacts (Gerber, 2011) and often play a marginal role in satisfying local development needs (Andersson et al., 2016; Schirmer, 2007), which in turn are contingent on the species planted (Pirard et al., 2017). The extent to which environmental governance frameworks (Kanowski, 2000) and the standards, guidelines, and codes of conduct for planted forests (Brotto et al., 2016), align with the six principles of FLR (Besseau et al., 2018) and those of broader landscape approaches (Sayer et al., 2013) merits further analysis. Likewise, future work is warranted to enhance FLR in the context of implementation of different types of agroecological approaches (Mansourian et al., 2019; Miccolis et al., 2019).

Finally, more attention is needed regarding the development of participatory and multi-scale future scenarios of FLR (IPBES, 2016; Metzger et al., 2017). Participatory scenarios have the potential to bring different perspectives to the consideration of possible landscape outcomes – mitigation potential, economic potential, ecosystem services – associated with the visions and goals of different stakeholder groups involved in FLR.

4. Conclusion

Forest and Landscape Restoration is a response to failures of traditional sectoral and discipline-focused approaches to natural resource management (Mansourian et al., 2019; Sayer and Boedhihartono, 2018). Traditional approaches and narrow institutional mandates must broaden to include new ways of governing and improving landscapes based on a balance of approaches and centered on aligning the needs and capacities of local stakeholders with the goals of large-scale restoration programs. Rather than focusing on planting a trillion trees, the focus should be on creating a million restoration systems in landscapes across the planet—systems that are self-governing, deliver multiple benefits and long-lasting outcomes, and enable adaptive management in the face of climate, social, and political change (Chazdon and Brancalion, 2019). Achieving the multiple goals of FLR requires paying attention to governance in its many manifestations. To reach the large-scale need for restoring ecosystems, landscapes, and human well-being, governance solutions may need to be scaled down rather than scaled up, to address the challenges presented by a wide range of local contexts. The papers in this special issue provide insights into these challenges and solutions.

Author Statement

All authors participated actively in editing papers for the special issue, conceiving and drafting this manuscript, and editing the revised

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.landusepol.2020.104854>.

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