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Toward a tenure-responsive approach to forest landscape restoration: A proposed tenure diagnostic for assessing restoration opportunities

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ABSTRACT

The Bonn Challenge, a voluntary global initiative launched in 2011, aims to bring up to 350 million hectares of degraded land into some level of restorative state by 2030. Pilot forest landscape restoration (FLR) efforts indicate that enhancing community and smallholder tenure rights is critical for achieving FLR's desired joint environmental and social well-being objectives. The Restoration Opportunities Assessment Methodology (ROAM) is a decision support tool that has become widely used in national and subnational FLR planning. Although ROAM is structured so as to encourage inclusion of tenure rights and governance analyses, the extent to which ROAM reports actually incorporate tenure issues is undocumented. To address this gap, we report the results of an analysis of the currently publicly accessible ROAM reports from eight countries in Africa and Latin America. We found that the ROAM reports superficially covered tenure and governance considerations. We recommend design elements for a tenure diagnostic that should facilitate more robust tenure and land governance analyses – to complement ROAM and other FLR planning approaches. We suggest the adoption of a rights-enhanced FLR approach so as to capitalize on the motivating force that strong and secure tenure rights provide for landholders to engage in forest restoration design and practice. Although developed in the context of FLR, the proposed tenure diagnostic should have broad utility for other land use initiatives where tenure rights and security are at stake.

1. Introduction

The international community encompassing more than 100 countries, companies, and civil society groups has embarked on major efforts to restore millions of hectares of deforested or otherwise degraded lands. The Bonn Challenge (http://www.bonnchallenge.org/), a voluntary global initiative launched in 2011, aims to bring 150 million hectares into some level of restorative state by 2020, and 350 million hectares by 2030. The World Resources Institute's 20 × 20 Initiative (https://www.wri.org/our-work/project/initiative-20x20) seeks to restore 20 million hectares by 2020 in Latin America, while major large-scale restoration efforts are also underway in Africa under the AFR100 initiative (http://www.afr100.org/). Despite the ambitious targets, major gaps in understanding and barriers to implementation need to be addressed before local restoration efforts can be scaled up to realise national and global commitments (Holl, 2017).

Chazdon et al. (2017) and Meli et al. (2016) call for considering food security, ecosystem services, livelihoods, and knowledge management and sharing, from the local to the national (and vice versa), as essential issues to address for moving beyond hectare-based restoration pledges (see also Mansourian et al., 2017). To this end, active approaches to forest restoration, such as the establishment of commercial tree plantations, should ensure environmental benefits while promoting both social equity and fairness (Brancalion and Chazdon, 2017). Passive approaches, such as protecting naturally regenerated forests and trees on degraded lands, will need to overcome governance, policy and institutional bottlenecks if their long-term permanence in the landscape is to be assured (e.g., Chazdon and Guariguata, 2016; Reid et al., 2017).

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Additionally, appropriate policy and regulatory frameworks may be needed for environmentally and socially sound financial investing in forest landscape restoration (FLR) (Brancalion et al., 2017). Existing national restoration plans typically do not explicitly address these issues (Méndez-Toribio et al., 2017). Yet it is at the planning phase of restoration interventions where detailed information for decision-making is often most important.

Forest Landscape Restoration (FLR) is defined as "a planned process that aims to regain ecological integrity and enhance human well-being in deforested or degraded landscapes'' (Stanturf et al., 2017: 9). The aim of FLR is to bring back functionality and productivity of vast areas of degraded land while contributing to social and economic wellbeing (Sabogal et al., 2015). FLR processes select from a variety of restoration interventions or technological options such as supporting community-managed forests or encouraging agroforestry systems, private woodlots, improved fallows, and farmer-managed natural regeneration (IUCN/WRI, 2014). A suite of land use types, including both existing and restored forests, as well as agroforestry and silvo-pastoral systems, can be established or maintained to achieve specific environmental and social objectives. Additionally, the interests and aspirations of different stakeholders need to be factored in. The terms, "FLR programs" and "FLR projects" are often used to refer to organized efforts by governments or international donor organizations (e.g., US Agency for International Development, World Bank, Swedish International Development Cooperation) to promote the widespread adoption of FLR interventions.

Tools for national and sub-national planning, decision-making, and prioritization of FLR interventions already exist (recently reviewed in Chazdon and Guariguata, 2018). Principal among these planning tools are the Restoration Opportunities Assessment Methodology (ROAM) (IUCN and WRI, 2014), a tool for gathering and assessing detailed spatial information for the purpose of selecting target areas for restoration, and its complement, the Restoration Diagnostic (WRI, 2015), a set of analytical tools for identifying whether key enabling factors for successful restoration are present. At present, ROAM assessments have been completed or are underway in 25 countries (IUCN, 2017).

Recently published guidance for FLR planning and implementation (e.g., Stanturf et al., 2017; Mansourian, 2017) indicates that in much of the developing world, clarifying and enhancing community and smallholder tenure rights is critical if FLR interventions are to achieve both their environmental and social well-being objectives. Tenure is defined as "the set of institutions and policies that determine how land and its resulting resources are accessed, who can benefit from these resources, for how long and under what conditions" (Robinson et al., 2014: 282). Tenure security, which "reflects a landholder's confidence or belief (real or perceived) that agreed-upon rights…will be enforced and upheld by society more broadly" (Robinson et al., 2018: 4), is also crucial. Having clearly defined and enforceable rights to land and natural resources reduces the uncertainties associated with making investments, increasing the likelihood that rights holders will perceive that they will benefit from conservation improvements (Lawry et al. 2016). Governance, which consists of "the ways and institutions through which individuals and groups express their interests, exercise their rights and obligations, and mediate their differences" (Colfer and Pfund, 2011: 26), also shapes the likelihood that FLR interventions can be effectively implemented. Land governance systems affect whether rights can be exercised and whether acquiring land rights will improve social and economic outcomes (He and Sikor, 2017). Because tenure rights and land governance affect how FLR costs and benefits are distributed, they are likely to play an important role in determining whether landholders and land users have sufficient incentive to invest in FLR practices.

Our premise is that the lack of, or weak, tenure rights are likely to inhibit the ability of FLR interventions to fulfill the dual objectives of restoring ecological integrity and enhancing social well being. Experience with Reducing Emissions from Deforestation and Forest Degradation (REDD+) initiatives suggests that paying insufficient attention to tenure rights risks undermining the delivery of desired socioeconomic benefits (Duchelle et al., 2014; Resosudarmo et al., 2014). Although strong tenure rights do not guarantee better ecological outcomes (Yin et al., 2017), they are important from an empowerment standpoint because they place stakeholders who possess them in a far stronger negotiating position than those with no or weak rights (Cronkleton et al., 2017). Given the emphasis that FLR places on multi-stakeholder processes for optimizing the allocation of different land uses, the extent to which local and indigenous communities and individual smallholders have strong and secure tenure rights is likely to significantly affect the degree to which they have a real voice in FLR planning and implementation.

The ROAM process, which already has or will inform national and sub-national FLR planning strategies in many countries, is structured so as to encourage an analysis of tenure rights and the governance institutions that affect those rights. However, the extent to which tenure issues are actually incorporated into ROAM assessments in practice remains undocumented. We address this gap by examining eight ROAM reports (Table 1) to assess the level of consideration of tenure rights and land governance issues. Three questions guided our analysis:

- How and where within ROAM reports are tenure rights and land governance issues incorporated into ROAM analyses?
- What tenure rights and land governance challenges are identified in ROAM reports?
- What solutions for addressing these challenges are identified in ROAM reports?

Based on our findings, we provide recommendations for designing a tenure diagnostic that can be used as a complement to ROAM and perhaps to other FLR planning approaches. Its appropriate application will ensure that tenure rights and governance issues are addressed in a manner robust enough to result in policy and institutional reform recommendations that can be readily operationalized. We conclude by setting forth an agenda aimed at enhancing the incorporation of

Table 1
Restoration Opportunities Assessment Methodology (ROAM) reports assessed for tenure and land governance coverage.

Country in which ROAM report was done (scale at which assessment was done)	Area (in millions of ha/year) committed for restoration under the Bonn Challenge initiative (year country initially committed)	Publication date of ROAM report	Policy and institutional analysis format used in the ROAM report
Ethiopia (Amhara State)	N/A	2017	Restoration Diagnostic
Ghana (national)	2 (2015)	2011	Narrative discussion of policy and legal framework related to FLR
Ivory Coast (national)	5 (2016)	2016	List of laws and policies related to FLR
Malawi (national)	4.5 (2016)	2017	Restoration Diagnostic
Rwanda (national)	2 (2011)	2014	Restoration Diagnostic
Uganda (national)	2.5 (2014)	2016	Restoration Diagnostic
Brazil (Pará State)	N/A	2017	Restoration Diagnostic
Guatemala (national)	1.2 (2014)	2014	Narrative description of legal and policy framework related to FLR

Data source: Bonn Challenge website (www.bonnchallenge.org/commitments)

community and individual tenure rights in FLR planning and programming. Our findings and recommendations have applicability to a broad array of natural resource management contexts (e.g., water, range, marine), where tenure rights influence resource use and management behavior.

2. Methods

To explore how FLR planning is addressing tenure and related governance issues, we examined ROAM reports from countries participating in the Bonn Challenge. We used Google's search engine to locate ROAM reports; we also searched the websites related to Forest Landscape Restoration, such as www.bonnchallenge.org/ and infoflr.org/. Key words used included: forest restoration, forest landscape restoration, restoration opportunities assessment, ROAM, forest restoration diagnostic, and the French, Spanish, and Portuguese translations for these keywords as used in the ROAM handbook series accessed at: www.iucn.org/theme/forests/our-work/forest-landscape-restoration/restoration-opportunities-assessment-methodology-roam. Our search yielded national ROAM reports for 6 countries and sub-national reports for 2 countries (Table 1), six in Africa and two in Latin America. Our sample encompasses reports from 8 of the 35 countries that had made Bonn Challenge commitments as of December 2017, and includes all of the ROAM reports that were publicly accessible at that time. The Ghana Centre for Remote Sensing and Geographic Information Services (CERGIS) et al., n.d.), Guatemala (Instituto Nacional de Bosques, Programa Forestal Nacional et al., 2014), and Rwanda (Republic of Rwanda, Ministry of Natural Resources, 2014) reports were completed during the ROAM development phase and informed the ROAM handbook. The other five assessments (IUCN, 2016; Republic of Malawi, Ministry of Natural Resources, Energy and Mining, 2017; Republic of Uganda, Ministry of Water and Environment, 2016; Nunes et al., 2017; Pistorius et al., 2017; Silva and Nunes, 2017) were completed after the ROAM handbook was published. Some variability in the treatment of tenure and related governance considerations was expected given that several of the reports were pilots, and all of them were completed at a time when the ROAM process was in its infancy. ROAM is still in its early phases of national and/or subnational application and its developers emphasize that new components are likely to be integrated into the methodology as more countries gain experience with its use.

3. Framework for assessing tenure and land governance coverage in the ROAM reports

To develop a set of criteria for assessing tenure and land governance coverage in the ROAM reports, we combined insights from theory and empirical research on the links between property rights and conservation investments with the success factors identified for FLR projects in the ROAM handbook (IUCN/WRI, 2014) and its complement, the Restoration Diagnostic (WRI, 2015). The assessment criteria we identified included tenure rights, tenure security, enforcement capacity, community engagement, policy and legal framework consistency, and multi-scalar/multi-sectoral linkages (Table 2).

3.1. Tenure criteria

Two dimensions of tenure systems with strong potential to influence conservation investment decisions are the type of rights landholders have and the security of those rights (Larson and Dahal, 2012; Robinson et al., 2018).

3.1.1. Tenure rights

Tenure rights potentially provide incentives (or disincentives) for individuals or collectivities to manage land in ways that maintain or enhance ecological conditions (e.g., tree planting, protecting natural regeneration, building exclosures). Both individual and collective rights are relevant to our assessment. Common property rights scholars generally conceptualize property rights as consisting of a bundle of rights, including access, use or withdrawal, management, enforcement, and alienation (Schlager and Ostrom, 1992; Larson and Dahal, 2012). Sikor et al. (2017) propose an updated rights categorization scheme that is divided into three major categories, authoritative, control, and use rights. Authoritative rights include definition and allocation rights; control rights include management, transaction, exclusion, and monitoring rights; and use rights include direct and indirect use rights.

Importantly for forest restoration planning and programming, rights to trees, fodder, and other resources may be separable from the land, and rights to tree products, such as fruits and nuts, may be separable from rights to trees (McLain and Lawry, 2015). Rights-holders sometimes delegate their rights to a second party, creating secondary rights (Elbow et al., 2012). Secondary rights can be obtained in a variety of ways, with access through a family member, leasehold agreements, borrowing arrangements, and sharecropping being some common modes of access.

Rights to land and trees are often thought of as being either statutory (i.e., allocated and enforced through state-sanctioned processes) or customary (i.e., allocated and enforced through local socio-cultural norms or legal systems) (Doherty and Schroeder, 2011). These are referred to as formal and informal rights, respectively. Meinzen-Dick and Pradhan (2001) however, argue that state and customary property rights are just two of a multitude of legal systems that overlap with each other in everyday life, a situation known as legal pluralism. Included among these legal systems is local law, which consists of "the mixture of norms and rules that are expressed and used at the local level" (Meinzen-Dick and Pradhan, 2001:1). If competing claims stemming from overlapping legal frameworks cannot be reconciled, land or resource conflicts may emerge (Doherty and Schroeder, 2011; Unruh, 2008). Meinzen-Dick and Pradhan (2001) argue that it is important to distinguish between rights in law and actual rights because whether and how rights are actualized will affect land investment choices.

Over the past thirty years, an increasing number of countries have recognized existing customary rights or devolved rights to local communities (Yin, 2016). The land and forest rights devolved to communities vary considerably (Larson et al., 2010). Rarely do states devolve all rights, however, and the hybrid arrangements that result might best be considered forms of co-management (Cronkleton et al., 2017). Chimhowu (2018) refers to hybrids as new customary tenure regimes. Yin et al.'s (2016:1) review of the forest devolution literature found that devolution of forests rights has improved forest outcomes in some

Table 2
Framework used to assess tenure and land governance coverage in Restoration Opportunity Assessment Methodology reports.

Tenure/land governance dimension	Indicator of tenure and land governance coverage
Tenure rights	Describes rights and responsibilities (statutory and customary) of landholders and land users vis-à-vis trees, forests, land, and carbon, including rights of women, minorities, and disadvantaged groups Describes community forestry or co-management arrangements
Tenure security	States whether land or resource tensions or conflicts are present and describes the nature of those tensions or conflicts
Enforcement capacity	Describes enforcement capacity (community and government)
Community engagement	Describes community's level of engagement in FLR decision-making
Policy and legal framework consistency	Describes presence (or absence) of policy and legal framework inconsistencies likely to affect FLR interventions
Multi-scale, multi-sectoral linkages	Describes whether and/or how actors at different scales and in different sectors coordinate policy-making, planning, and FLR-related program implementation

contexts, but concludes, "Major weaknesses remain in the evidence generated."

Whether individual or collective, rights to land and trees always come with conditions attached. In Ghana, farmers have the right to harvest trees that they have planted on their land, but only if they have registered the trees with the forestry department when they were planted (Baruah et al., 2016). In Brazil, landholders have the right to harvest trees from Legal Reserves established on their property but they must first get authorization and a license from the forestry department to do so (Ball et al., 2014). Tree registration and licensing requirements have direct and opportunity costs for the landholders, potentially affecting their conservation investment decisions. Similarly, in 14 countries where communities were given forest rights, Larson and Dahal (2012) found that even though communities had the legal right to harvest forest products, costly and complex management plan requirements meant that the communities' ability to exercise those rights was limited in practice.

3.1.2. Tenure security

Research shows that tenure security is as important as the type of rights in shaping conservation investment decisions (Robinson et al., 2018). Secure tenure gives landholders confidence that they will benefit from their conservation investments (Robinson et al. (2018), such as planting a hedgerow or terracing a hillside. The corollary of this is that "rural people with insecure tenure will be unlikely to invest in activities for which they derive little benefit" (Cronkleton et al., 2017: 18). Tenure security is associated with increased conservation investments in many contexts (Ayamga et al., 2016; Bandiera, 2007; Fenske, 2011; Holden and Ghebru, 2016; Lovo, 2016).

It is widely assumed that tenure security is positively linked to possession of a formal title or certificate issued by the state, however, the evidence is mixed. Formalization and secure tenure are most clearly linked in areas where customary systems governing land are weak or breaking down and demand for land is high (Chimhowu, 2018; Grimm and Klasen, 2015). In areas where customary land governance systems remain strong, tenure may be very secure without formalization (Chimhowu, 2018; Lawry et al., 2016; Robinson et al., 2018). Women and migrants, who are more likely to have secondary rights to land, are also more likely to have less secure tenure rights (Agarwal, 2003; Antwi-Agyei et al., 2016; Unruh, 2008).

3.2. Land governance criteria

We drew on studies of REDD+ (e.g., Dokken et al., 2014; Duchelle et al., 2017; Ravikumar et al., 2015; Sunderlin et al., 2014; Unruh, 2008) and pilot FLR initiatives (e.g., Ball et al., 2014; Baruah et al., 2016; Mansourian et al., 2014, 2016; Pistorius et al., 2017a,b, van Oosten et al., 2017) to identify appropriate criteria for assessing land governance coverage in the ROAM reports. Four land governance dimensions frequently mentioned as contributing to the success or failure of large-scale restoration and reforestation/afforestation initiatives included enforcement capacity (Naughton-Treves and Wendland, 2014; Sunderlin et al., 2014), community engagement in land-use decision-making (Duchelle et al., 2017; Saeed et al., 2017), consistency of policy and legal frameworks (Resosudarmo et al., 2014), and the extent to which effective multi-scalar and multi-sectoral linkages exist (Ball et al., 2014). All of the criteria affect tenure rights, tenure security, or both.

3.2.1. Enforcement capacity

Tenure rights need to be enforceable if the rights holder is to benefit from them. A common challenge for many REDD + and pilot FLR projects has been the limited enforcement capacity of both nation-state forestry departments and local communities (Dokken et al., 2014; Sunderlin et al., 2014). In some areas, the problem is less one of lack of capacity as lack of will to enforce regulations (Naughton-Treves and Wendland, 2014; Sunderlin et al., 2014). Either way, the result is the same: when rights are unenforceable, tenure becomes less secure and the incentive to invest in conservation improvements declines (Robinson et al., 2018).

3.2.2. Community engagement

Meaningful community engagement in land and resource decision-making has been identified as a key mechanism for achieving long-term sustainable natural resource management (Baynes et al., 2015; Ostrom, 1990; Schultz et al., 2011; Reed et al., 2017), particularly in rights devolution contexts. However, both REDD + and pilot FLR projects struggle to involve communities in more than a consultative capacity (Ball et al., 2014; Baruah et al., 2016). User group networks have proved to be an effective mechanism for community engagement in some countries. In Nepal, the Federation of Community Forest Users, Nepal (FECOFUN), a widespread and politically influential forest user group network, has successfully pressured the national government to live up to its rights devolution commitments (Paudel et al., 2010) and is advocating now for forest regulatory reforms that will expand opportunities for community forest enterprises to invest in locally-sited value added processing facilities (Gnych et al., 2018).

3.2.3. Consistency of policy and legal frameworks

Inconsistent laws and policies create uncertainty for rights holders, decreasing tenure security and undermining incentives for conservation investments. Inconsistences may exist at multiple levels. Many countries have agricultural policies that incentivize landholders to clear land; at the same time their forest policies seek to retain or replace forest cover (Sunderlin et al., 2014). In Indonesia, forests belong to the state under forest law, but agricultural law recognizes customary rights to clear forests and harvest trees (Resosudarmo et al., 2014). These inconsistencies have created uncertainty over what rights forest dwellers have and have led to conflict between communities and forest officials. In Ethiopia, efforts by forest restoration projects in Amhara State to persuade farmers to plant native species rather than *Eucalyptus* spp. on their land are undermined by state forestry laws that prohibit the harvest and transportation of highly marketable native species (Lemenih and Kassa, 2014).

3.2.4. Multi-scalar and multi-sectoral linkages

Gaps in connectivity between and within scales of governance, as well as between sectors and different types of social actors, contribute to inconsistent policies and laws and make it difficult to align them in ways that would reduce investment uncertainties and the likelihood of conflict. Pilot FLR projects in Ghana (Baruah et al., 2016; Foli et al., 2018), Madagascar (Mansourian et al., 2014, 2016), and Brazil (Pinto et al., 2014) have sought to increase social connectivity among stakeholders by supporting broad-based stakeholder participation and creating multi-stakeholder groups that meet regularly to exchange information and ideas. Insufficient connectivity between governance levels and/or sectors is identified as a barrier to scaling up forest restoration in Ghana (Foli et al., 2018), Madagascar (Mansourian 2014), and in some parts of Brazil (Ball et al., 2014).

3.3. ROAM success factors related to tenure and land governance

The ROAM handbook and Restoration Diagnostic list a set of enabling factors (which the authors refer to as success factors) grouped according to whether they motivate restoration investments, enable investments, or ensure that implementation takes place over the long term. Eleven of the success factors relate directly to tenure and land governance. Table 3 shows how these success factors align with the tenure and land governance criteria identified through our literature review.

Table 3
Success factors related to tenure and land governance dimensions addressed in the Restoration Opportunity Assessment Methodology (ROAM) Handbook and Restoration Diagnostic mapped against the tenure and land governance dimensions used as assessment criteria in this study.

Tenure/land governance dimension	ROAM guidance success factor
Tenure rights	Local people enjoy restoration benefits
	Positive incentives and funds for supporting restoration exceed the disincentives
	Law requires restoration
	Clearing of natural forests is subject to regulations
	Local people have the power and authority to make restoration decisions
Tenure security	Land and resource tenure are secure
	Forest clearing regulations are widely enforced
	Policies related to restoration are consistent and streamlined
Enforcement capacity	Law requiring restoration is widely understood and enforced
	Forest clearing regulations are widely enforced
Community engagement	Local people have the power and authority to make restoration decisions
	Restoration roles and responsibilities are clear
Policy and law framework consistency	Policies related to restoration are consistent and streamlined
Multi-scalar, multi-sectoral linkages	Institutions coordinate effectively with each other

*Some success factors fall into multiple categories. Data source: IUCN/WRI, 2014.

4. Overview of the ROAM report development process

To put the ROAM report analysis in context, it is useful to know what ROAM is, how it is structured, and the guidance that its developers provide regarding where and how to incorporate tenure and governance considerations. The following overview focuses on the use of ROAM at the national level and draws from the ROAM (IUCN/WRI, 2014) and Restoration Diagnostic (WRI, 2015) handbooks as well as from the ROAM reports listed in Table 1.

4.1. Developing a ROAM assessment

ROAM is a decision support tool designed to help users "rapidly identify and analyse forest landscape restoration (FLR) potential and locate specific areas of opportunity at a national or sub-national level (IUCN/WRI, 2014: 6)." It is intended for use at the highest governmental level within countries or, in some cases, is used at the regional level. It is designed as a planning tool, rather than an FLR implementation tool. ROAM developers characterize ROAM assessments as data collection, analysis, and gap identification processes that rely on broad-based stakeholder engagement to create a shared understanding of what FLR is and its benefits. The ROAM process seeks to generate a sense of ownership and political support for FLR interventions at multiple scales and across multiple sectors. The World Resources Institute's (WRI) Restoration Diagnostic (WRI, 2015), a tool for assessing whether the institutional and policy conditions in place are favorable to implementing FLR, is frequently used in ROAM processes. The ROAM process was designed to take place over the course of a few months; in practice it has taken anywhere from a few months to a year or more to complete.

Although there is no standardized format for operationalizing the ROAM processes, the assessment processes described in the eight reports included in our analysis tended to incorporate most, if not all, of the following elements. Each process began with a multi-stakeholder workshop to identify potential FLR interventions and assessment criteria. Next, a working group developed maps showing where each intervention type might feasibly be implemented over a large geographic area. Field visits and sub-national workshops elicited input from sub-national and local stakeholders. Many countries incorporated one or more of the following analyses into their assessments: a cost-benefit analysis of proposed restoration interventions, a carbon sequestration value analysis, a restoration finance and sourcing assessment, and a policy and institutional analysis. Five of the assessments used the Restoration Diagnostic to guide their policy and institutional analyses; three used a customized approach. A national workshop held after the analyses were complete gave an expanded set of stakeholders the opportunity to discuss, validate, and further refine the results. The core team then produced the final ROAM report summarizing the results and providing recommendations for national FLR plans or strategies. As mentioned above, there is no standard format for ROAM reports and substantial differences in form and content occurred in our sample. Additionally, it is important to recognize that the ROAM reports may not reflect the full scope of the activities undertaken. Moreover, in some cases, the results of ROAM reports included in our analysis may have been influenced by external partners, notably the IUCN and, in some cases, the WRI.

4.2. ROAM guidance on tenure and governance

In addition to the 11 enabling factors described in the ROAM guidance documents discussed in Section 3.3, the ROAM handbook identifies several other points in the assessment process where tenure and governance issues can be brought into the analyses.

4.2.1. Assessment criteria

The ROAM handbook recommends that when participants select assessment criteria, they consider whether to include what land tenure regimes are present in targeted areas, whether local landowners and users have expressed an interest in restoration, and whether any conflicts over land or resources exist.

4.2.2. Geospatial analysis

The ROAM handbook recommends that the geospatial analysis include community-managed and sacred forest locations, the distribution of statutory and customary land and resource rights, and restoration and forest policies that affect targeted areas.

4.2.3. Restoration finance and resourcing analysis

The restoration finance and resourcing analysis component guidance describes how to assess potential investment sources, ranging from private-for-profit to payments for ecosystem services to public expenditures. Undefined or poorly defined land rights, burdensome customs regulations, and corruption, all of which relate to tenure and governance, are included in the list of investment barriers that assessment participants should take into consideration.

Tenure and land governance are not mentioned in the guidance for the cost-benefits or carbon sequestration values analyses.

4.3. Tenure and land governance coverage in ROAM analyses

We rated each ROAM report for its tenure and land governance coverage using a 3-point scale (very limited, limited, or moderate but narrow in coverage of tenure and land governance). Table 4 lists the definitions for each point on the scale. As described below and summarized in Table 5, the reports varied considerably in their treatment of tenure-related aspects of FLR. As is the case for all written accounts of an event or series of event, the reports provide only a partial picture of what actually took place and was discussed during the assessments. Supplement 1 provides a much more detailed look at the tenure and land governance coverage in the reports.

4.3.1. Geospatial analyses

All of the reports included a geospatial analysis through which potential FLR sites were identified. Guatemala's map was published as a separate document. Protected area boundaries were the only tenure data

Table 4
Rating system used to assess tenure and governance coverage in the Restoration Opportunity Assessment Methodology (ROAM) reports.

Rating of tenure and land governance coverage	Rating criteria
Very limited coverage	Brief mention of tenure issues in one or more sections with little detail; does not include a list or discussion of key laws or policies likely to affect tenure incentives for engaging in FLR; does not describe statutory rights and responsibilities with respect to trees or land; does not describe customary rights and responsibilities with respect to trees or land; information lacks the specificity needed to identify appropriate policy reforms or accompanying measures
Limited coverage	Mentions tenure issues in one or more sections but provides limited detail; lists key laws or policies that affect tenure incentives for engaging in FLR; provides a sense of which groups have weak or no tenure rights, provides some information about rights and responsibilities with respect to trees and land under statutory or customary law or both, information on tenure lacks the specificity needed to identify appropriate policy reforms and accompanying measures
Moderate but narrow coverage	Provides a substantive discussion of tenure issues in one or more sections; lists or discusses key laws or policies that affect tenure incentives for engaging in FLR, provides a sense of which groups have weak or no tenure rights, provides some information about rights and responsibilities with respect to trees and land under statutory or customary law or both, information on one or more key tenure issues is sufficiently specific that it is possible to identify appropriate policy reforms and accompanying measures

layers included in all but the Pará State report, which incorporated data layers for Legal Reserve and Areas of Permanent Protection that had been registered in Brazil's Environmental Rural Registry (CAR in Portuguese). These data layers became available with the implementation of Brazil's Native Vegetation Protection Law of 2012 (see Brancalion et al., 2016 and Azevedo et al., 2017). The other reports stated that additional national level tenure data layers were not available.

4.3.2. Restoration finance analyses

The Rwanda, Malawi, Pará, and Guatemala reports discussed restoration finance. All four reports described national and international investment sources external to communities. The Rwanda, Malawi, and Pará reports also stated that incentivizing smallholders to invest in restoration on their holdings was essential. They identified support for small and medium enterprises as the key mechanism for doing that. Guatemala's report also called for strengthening small and medium forest enterprises, but focused on the key role that community forest concession rights have played in incentivizing community members to harvest timber sustainably in protected areas. Malawi's report explored community-based financing as an option. It identified village forest management committee funds as one possible funding source.

4.3.3. Carbon value analyses

All of the reports except Guatemala's included carbon value analyses. The Rwanda and Ghana reports provided brief discussions of carbon rights; the other reports were silent on the topic.

4.3.4. Cost-benefit analyses

Seven reports included a cost-benefit analysis for FLR interventions. Five of the reports used a quantitative approach in which it was assumed that individuals or collectivities that planted or protected trees would have the right to harvest and sell the trees or their products. This assumption does not account for situations where individuals or communities do not have these rights. Additionally, the analyses do not appear to have included the transaction costs associated with obtaining forest product harvesting or transportation permits. Both types of permits are common requirements in many countries. These costs are potentially substantial and could affect whether it makes economic sense for a farmer to plant or protect trees. The cost-benefit analyses did include costs of enforcement for interventions involving community or state managed forests.

The reports from Ghana and Ivory Coast used a qualitative approach for their cost-benefit analyses. Both reports included a list of items that would need resolving to implement FLR on different land categories (e.g., high forest zone, savanna zone, mangrove forests, agricultural mosaic, etc.), with the items in the list being considered costs. A list of expected benefits also was developed for each land category. Neither report attached monetary values to the costs or benefits. Both reports included tenure and governance issues, such as migrant farmers lacking rights to trees and weak enforcement of tree felling restrictions, among the costs.

4.3.5. Policy and institutional analyses

As expected, the policy and institutional analysis sections provided the most robust discussions of tenure and governance. Five of the reports used the Restoration Diagnostic to guide their policy and institutional analyses; the other three used customized frameworks. All of the policy and institutional analysis sections mentioned tenure and governance issues. The degree of detail, however, varied greatly. Some reports merely listed laws related to FLR whereas others described the key provisions of relevant laws. Some reports included only summary statements of tenure issues, such as "insecure tenure" or "weak enforcement"; others described which segments of the population had insecure access to land (e.g., migrant farmers in Ghana, women in Malawi and Uganda), which institutions lacked capacity or authority to enforce forest laws, or which laws in particular were difficult to enforce. Only the Uganda and Malawi reports mentioned gender differences in rights to trees and land. Uganda's report stated simply that women lacked rights to trees and provided no additional details. The Malawi report, which was developed with the use of an explicitly gender responsive approach, was the most comprehensive in its coverage of tenure and land governance considerations affecting women. Specifically, the report noted that women were less likely than men to have land titles and described changes in women's roles in village forest management committees.

None of the reports included a systematic description of the rights and responsibilities of individuals or communities to trees, forests, or land under either statutory or customary law. Likewise, none of the reports described how pastoralists' rights or secondary users' rights, other than those on state or community-managed lands, fit into FLR. All of the reports identified tenure insecurity, the lack of tenure rights, or both as barriers to FLR implementation.

4.4. Major tenure challenges and examples of proposed solutions as reflected in the ROAMs

Despite the limited depth and breadth of their coverage of tenure and land governance, when considered as a group, the ROAM reports provide useful insights about the tenure-related challenges that practitioners are likely to encounter as they plan and implement FLR interventions (Table 6). They also describe proposed solutions to those challenges (Table 6). Key challenges included weak enforcement, limited community involvement in forest decision-making, and lack of coordination between sectors, actors, and scales. Lack of rights and weak rights were mentioned in most of the reports as impediments to scaling up FLR to national levels. The reports from African countries emphasized the need to recognize or devolve rights to traditional authorities and expand community participation in forest management both on and off forest reserves. All of the reports identified land registration of

Table 5
Summary of tenure and land governance coverage in each section of the Restoration Opportunities Assessment Methodology (ROAM) reports.

Country	Rwanda	Uganda	Malawi	Ethiopia (Amhara)
Overall assessment of tenure coverage	Very limited coverage	Limited coverage	Moderate but narrow coverage	Moderate but narrow coverage
Geospatial analysis	Park and reserve locations	Park and reserve locations	Protected areas	Protected area boundaries
Restoration finance analysis	Notes that Rwanda's Financial Sector Development Program supports electronic land registration with the goal of increasing landholder willingness to make land investments; emphasizes support for small and medium forest enterprises as tool for encouraging restoration	Restoration finance analysis not included	Suggests creating village level forests with leadership from traditional authorities as a means to incentivize restoration; emphasizes support for small and medium forest enterprises as a tool for encouraging restoration	Does not have a restoration finance section but conclusion calls for engaging private sector in restoration investments; emphasizes that this will require resolving tenure and land rights issues
Carbon analysis	Describes carbon rights for projects on public lands; requirements for coordination with government agencies on projects	Notes that carbon market has emerged but does not describe how carbon rights are allocated	Carbon analysis is integrated into an economic and financial analysis included in an appendix; does not describe carbon rights	Does not describe carbon rights
Cost-benefit analysis	Mentions restoration may have negative impacts on forest products access and need for incentives to promote FLR; unclear if the analysis assumed landholders and users have rights to trees; unclear if analysis included protection costs	Describes poaching as a problem for natural forests and incorporates costs of protection from poachers; unclear if the analysis assumed landholders or users have rights to trees	Incorporates costs of protection from poachers for natural forests; assumes that degraded woodlands have low tenure security and factors lower input and output into calculations for those lands; unclear for other lands if analysis assumed landholders or users have rights to trees	Includes costs for community to monitor land for Participatory Forest Management sites; unclear if the analysis assumed landholders or users have rights to trees
Policy and institutional analysis or Restoration Diagnostic (RD)	Used RD. Doesn't list or describe laws likely to affect FLR. States private tenure is secure because most landholders have titles; describes tension between state and customary claims to forests. Mentions lack of capacity to enforce existing forest laws; need for coordination between scales and sectors	Used RD. Lists laws that are relevant to FLR but doesn't specify how they are relevant. Identifies weak tenure rights and weak law enforcement as problematic; identifies need to clarify rights under the customary "mailo" system and improve women's rights to trees and land	Used RD. Includes a detailed description of laws and policies likely to affect FLR. Mentions need for policy recognizing customary rights to land and resources; enhancing tenure security on private and communal lands and co-managed reserves, including for women; providing local people a greater role in restoration decision making; and developing forest clearing restrictions and a more effective enforcement system	Used RD. Doesn't list laws likely to affect FLR but describes which interventions are suitable for major tenure types. Mentions that many individuals have land certificates, which has provided an incentive for them to establish woodlots; lack of rights to timber hampers co-management of forests; describes capacity to implement FLR as weak
Country	Ivory Coast	Ghana	Brazil (Pará)	Guatemala
Overall assessment of tenure coverage	Limited coverage	Moderate but narrow coverage	Moderate but narrow coverage	Moderate but narrow coverage
Geospatial analysis	No tenure variables included in spatial analysis	Forest reserve and national park boundaries	Boundaries of indigenous territories and conservation areas; locations of Rural Environmental Registry (CAR in Portugese) parcels that have a Legal Reserve deficit or Permanent Protection Areas	Map published in separate document
Restoration finance analysis	Restoration finance analysis not included	Restoration finance analysis not included	Restoration finance is discussed at multiple points in the report; CAR registration seen as means to incentivize landholders but challenge is that many parcels lack titles and cannot be registered in the CAR; sees support for small and medium producers as important for FLR success but need workable payments for ecosystem services mechanisms	No restoration finance section, but restoration finance discussed at multiple points in the report; providing rights to trees and timber identified as FLR incentive; sees support for small and medium forest enterprises as important for FLR success
Carbon analysis	Does not describe carbon rights	Highlights need for carbon rights legislation. Report completed in 2011 before many countries had laws or policies regarding carbon rights	Integrated into cost benefit analysis; does not describe carbon rights per se but identifies payments for ecosystem services to small and medium holders as essential for FLR success	Carbon analysis not included in document; carbon rights not addressed in discussion of tenure rights
Cost-benefit analysis	Used a qualitative approach listing costs and benefits of FLR. Tenure costs: identifying and mapping, community forests, developing management capacity; issuing land certificates. Benefit: state-recognized rights to community forests will be an incentive for people to plant or protect trees	Used a qualitative approach similar to that described for Ivory Coast. Social costs related to tenure that were listed included: migrant farmers lack rights of access and ownership of land which, in turn, means they lack rights to trees; inadequate forest agency capacity also identified as a challenge.	Analyzes cost of restoring Legal Reserves; compared values for five restoration practices; looks at differences by harvesting intensity; cost of restoring APPs. Unclear if assumed landholder can harvest trees for sale. Describes some of Forest Code restrictions on area that can be planted in exotics. Mentions	Cost-benefit analysis not included

(*continued on next page*)

Table 5 (*continued*)

Country	Ivory Coast	Ghana	Brazil (Pará)	Guatemala
			uncertainties as to levels of compliance with the Forest Code	
Policy and institutional analysis or Restoration Diagnostic (RD)	Did not use RD. Tenure security identified as an important intervention. Sees tenure rights as motivation for planting and managing trees on private lands and sacred forests; recommends participatory forest management; strengthening community management capacity; and providing greater authority to customary/community authorities	Did not use RD. Describes statutory tree tenure rights for individuals and communities. Identifies tenure barriers to FLR: migrant farmers lack rights to trees; community rights to forests/trees need recognition, and communities need to be involved in forest protection; law that trees on farms belong to the state deters farmer managed natural regeneration	Used RD. Focuses on Environmental Rural Registry system, emphasizing lack of compliance; does not describe rights landholders have to trees and forest products, or whether a management plan or permits are needed to harvest trees and other forest products commercially. Identifies need for land titling to reduce land conflicts; additionally, notes that landholders lacking titles cannot register their land	Did not use RD. Lists major laws and programs related to FLR; describes legal incentives for municipalities to derive tax revenues from forest concessions; case studies describe tenure and governance;, emphasizes positive links between FLR and communities' access to forest concessions and commercial harvesting rights to trees

individually held lands, communally held lands, or both as potential solutions to tenure insecurity. Another common theme was the need to expand commercial harvesting rights for trees and other forest products as a way to increase incentives for landholders and land users to invest in FLR interventions.

5. Recommendations

Two types of recommendations emerge from our analysis of ROAM reports. Both are tentative given the limited size of our sample. One set of recommendations seeks to strengthen ROAM processes and similar FLR assessments by outlining what a tenure-responsive ROAM analysis might look like. The other sets forth a tenure-responsive FLR agenda that builds on lessons from community forestry and REDD + initiatives over the past two decades.

5.1. A tenure diagnostic for ROAM

Successful FLR implementation requires that governments address a multitude of tenure and related governance issues (Guariguata and Brancalion, 2014; Mansourian, 2017). Although the ROAM handbook and Restoration Diagnostic provide guidance on incorporating tenure and governance, the eight reports we assessed provide data that are too general for effective use during the planning stages of on-the-ground FLR interventions. A diagnostic specific to tenure and that sheds more light on governance and equity issues, offers a possible solution. We propose a rights actualization model (depicted in Fig. 1) as a starting point for developing a tenure diagnostic for identifying where tenure is likely to favor or inhibit adoption of FLR interventions and what types of tenure and governance reforms are needed to support large-scale restoration.

Rights in law, whether statutory or customary, are the starting point of the model (Element A). These rights are typically conditioned in various ways (Element B). The conditioned rights are further conditioned by perceptions of tenure security and land governance conditions (Elements C and D), resulting in actual rights (i.e., the rights that rights holders have in practice) (Element E). We posit that it is their actual rights, rather than rights in law, that incentivize people to make choices (Element F) about investments in improving land or natural resources (G).

Drawing on research that shows that internal and cross-scalar social networks are key factors contributing to successful forest rights devolution (Baynes et al., 2015; Paudel et al., 2010); we propose that investments in social capital (Element H) should be considered a type of FLR intervention. We argue that the actual rights of landholders influence their social capital investments, as well as their land investments. If unsatisfied with their actual rights, landholders may try to leverage their strengthened social capital (Element I) to influence the land governance system (e.g., improve enforcement capacity, expand community engagement, reconcile inconsistent policies) (Arrow 1) so that their actual rights align more closely with their rights in law. Alternatively, they may choose to use their strengthened social capital to change the conditions on their rights in law (Arrow 2) or the rights in law themselves (Arrow 3), thereby potentially affecting their actual rights. Ultimately, the land management and social capital investment choices that people make based on their actual rights are what lead to socio-ecological outcomes (J), and the success or failure of initiatives, such as the Bonn Challenge, to restore deforested and degraded lands.

To operatioenure and land governance analysis should answer two key questions:

1 Given the tenure and land governance arrangements in the target area, where and by whom are FLR interventions likely to be adopted on a broad scale?
2 Given the tenure and land governance arrangements in the target area, where and for whom will FLR interventions have a negative impact? In answering this question, secondary rights holders would be a particular concern, as would primary rights holders in areas with overlapping claims or where rights to land and pasturage, or land and trees are separable.

Through answering these questions, the analysis should identify the tenure and land governance characteristics likely to affect the spatial and demographic patterns of FLR intervention adoption as well as their benefits and costs. Use of our proposed rights actualization model should facilitate the development of systematic descriptions of the rights that landholders or land users have in practice as well as in law. A robust description of actual rights should enable the identification of FLR interventions appropriate for different types of rights. For example, it is unlikely in many areas that a long-term renter would have the right to plant trees, but they might feel secure enough in their tenure to invest in soil conservation technologies to reduce erosion and improve their crop yields. A person who owns their land would likely not be interested in planting trees for construction wood if the forestry code doesn't allow landowners to harvest their trees. However, they might agree to plant fruit trees if a viable market for the fruits exists. That same landowner also might be interested in joining a regional forest user association that advocates for forest code changes so that landholders have the right to harvest trees they plant on their land.

5.2. Recommendations for a tenure-responsive FLR implementation agenda

Although a tenure-responsive ROAM can facilitate the identification of implementable interventions, a need also exists for a rights-enhanced paradigm for FLR implementation. While rights devolution doesn't guarantee improved social and ecological outcomes (Ribot et al., 2010), it has the potential to catalyze investments in local governance capacity, public infrastructure, and private enterprises, with associated social and ecological benefits (Baynes et al., 2015). Drawing on the tenure and

Table 6
Major tenure and land governance challenges and proposed solutions identified in the Restoration Opportunities Assessment Methodology (ROAM) reports.

Tenure and land governance challenge	Reports mentioning challenge	Examples of proposed solutions to tenure and governance challenges
Lack of rights, weak rights, or insecure rights to trees and forests for communities.	All but Pará	Customary rights recognition; community forest registration or certification; sacred forest certification; co-management of forest reserves or protected areas; community forest concessions
Lack of rights, weak rights, or insecure rights to trees and forests for individuals	All except Rwanda	Land registration or certification
Lack of rights, weak rights, or insecure rights for women	Malawi Uganda	Promote the empowerment of women and women's rights, including those governing access to and control over land; structure FLR monitoring and evaluations so as to produce and distribute sex-disaggregated data
Inequitable sharing of benefits in co-management or benefit-sharing schemes	Amhara Ghana Malawi	Increase revenue share to communities; give communities the rights to harvest commercial timber; give traditional authorities/village forest management committees a greater role in decision-making
Lack of statutory requirement for landholders to restore degraded lands	Malawi Rwanda Uganda	Develop a law requiring restoration
State issues concession rights that conflict with customary rights	Ghana Malawi	Share authority over concessions with traditional authorities; strengthen social responsibility agreement enforcement; conduct a review of policies and laws as a first step toward reforms that would provide women with secure tree and forest tenure
Conflicts over forest reserves or woodlots between state and communities	Ghana Malawi Rwanda Uganda	Expand rights of communities to harvest in forest reserves; adopt participatory approaches to forest management; greater involvement of traditional authorities in planning and decision-making
Weak enforcement capacity	All	Closer involvement of traditional authorities or community leaders in forest decision making; support for the adoption of community by-laws
Communities insufficiently involved in forest decision making	All	Adopt participatory approach to forest management; develop legislation giving traditional leaders greater authority in co-management contexts
Lack of coordination between sectors, scales, actors	All	Establish and/or strengthen cross-sector and multi-stakeholder working groups
Inconsistent policies that undermine incentives for restoration	Pará Ghana Guatemala Malawi Rwanda	Establish a rolling policy and legal review process to identify and address inconsistencies with FLR and mainstream FLR into existing and new policies and laws; revise policies to be consistently in support of restoration

governance literature cited earlier in this article, the findings of the ROAM reports, and the authors' experience with reforestation and tenure issues in Latin America, Asia, and Africa, we propose that three elements are critical to a rights-enhanced approach.

5.2.1. *Rights and tenure security*

Rights combined with tenure security provide the foundation of a rights-enhanced FLR. Critical components of a rights-enhanced approach to FLR include rights recognition/devolution and rights actualization.

5.2.1.1. Rights recognition/devolution. In cases where customary rights have not been formalized, securing formal recognition of those rights is a way to provide landholders with greater confidence that they will be able to influence and benefit from FLR interventions. Formal recognition of customary tenure can also potentially help protect landholder rights from being eroded or taken away if FLR interventions increase the value of the land or resources on it. Policy interventions that support rights devolution rather than recognition may be more appropriate where informal customary rights do not exist or have been greatly weakened.

5.2.1.2. Rights actualization. These interventions should seek to facilitate the ability of landholders to exercise their rights in law, and reduce conditions on those rights that lead to tenure-related disincentives to restoration. Mechanisms for doing so include interventions that improve accountability within land governance systems, provide accessible and affordable conflict resolution processes, enhance judicial competencies, and build local-level enforcement and management capacities.

Additionally, a rights-enhanced approach to FLR needs to explicitly incorporate rights recognition and actualization interventions that provide women, migrants, pastoralists and other often-marginalized groups with rights or that strengthen their existing rights to land and trees.

5.2.2. *Enhancing connectivity between scales, sectors, and social actors*

A common theme in the ROAM reports is the existence of important gaps in connectivity between and within scales of governance, as well as between sectors and different types of social actors. A key focal area for social connectivity enhancements for FLR governance is support for the development of community-based user group networks with strong internal and external links to other stakeholders. Other areas to focus support include: strengthening the connectivity between national and sub-national levels of government; between forestry, agriculture, and land administration stakeholders; and between communities and private sector stakeholders (Reed et al., 2016; Sayer et al., 2013). Multi-stakeholder platforms, such as the Atlantic Forest Restoration Pact, a coalition of dozens of stakeholders including governmental agencies, private sector, NGOs, academia and research institutions committed to restoring the Atlantic Forest Biome in Brazil (Pinto et al., 2014), have proved useful for building and strengthening links among actors within and between governance scales and sectors. Brouwer et al. (2016) articulate a set of key principles for building effective multi-stakeholder partnerships, including embracing systemic change, transforming institutions, working with power, dealing with conflict, promoting collaborative leadership, fostering participatory learning, and communicating effectively. Their guidebook includes a set of resource tools that can help facilitate implementation of these principles.

5.2.3. *Program designs that generate widely shared benefits*

The inequitable distribution of benefits emerged as a concern in many of the ROAM reports. Despite the presence of social safeguards, inequities in benefits distribution have plagued REDD + projects (many of which are included in Bonn Challenge restoration commitments), with indigenous peoples, women, and poorer households tending to be

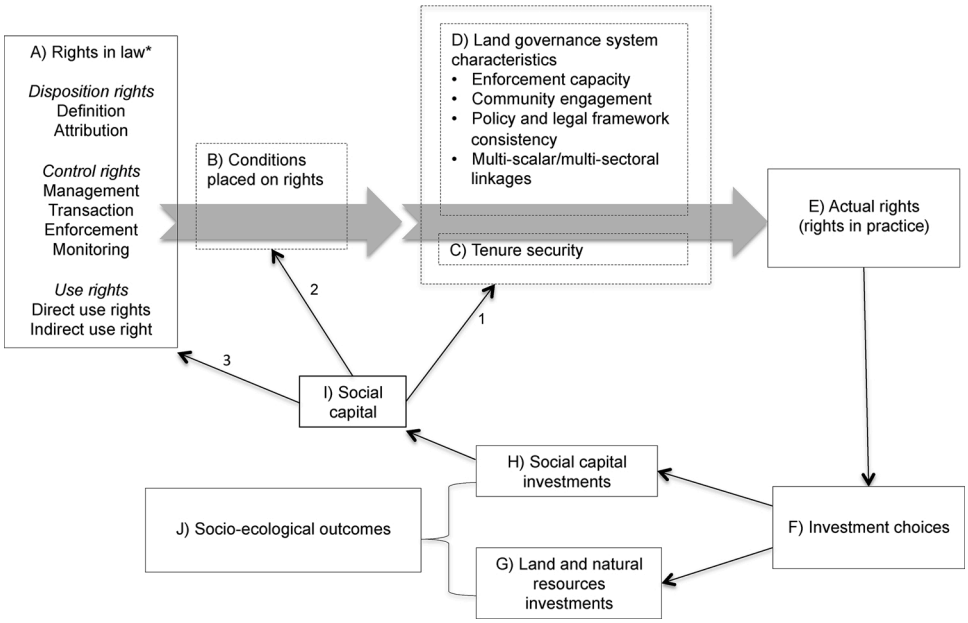

Fig. 1. Rights actualization model for a restoration opportunities tenure diagnostic; A) Rights in law (*formal or customary); B) Conditions placed on rights in law; C) Tenure security; D) Land governance characteristics that affect conditioned rights in law; E) Actual rights after rights have been conditioned and influenced by tenure security and land governance characteristics; F) Investment choices taken in light of incentives (or disincentives) provided by actual rights; G) Investments in land and natural resources; H) Investments in social capital; I) Increased social capital resulting from investments in social capital; Arrow 1) Use of social capital to influence tenure security and land governance characteristics; Arrow 2) Use of social capital to influence conditions placed on rights; Arrow 3) Use of social capital to influence rights in law; J) Social and ecological outcomes of investments in land and social capital.

left out (Ickowitz et al., 2017; Larson et al., 2015; Sarmiento Barletti and Larson, 2017). Inequitable benefits distribution is also likely a potential issue for FLR interventions that fall outside the REDD + umbrella since FLR interventions in many areas will have high opportunity costs for agriculture or may negatively impact secondary rights holders' access to resources. Providing strong forest-based benefits through devolving rights to harvest trees and other forest products for commercial use can help offset the high opportunity costs of forests in relation to agricultural land uses.

6. Conclusion

Given the ROAM handbook's guidance on assessing the tenure and land governance context for FLR and the additional details provided by the Restoration Diagnostic, we were surprised to find that tenure and land governance were not analyzed in a more substantive fashion. One possible explanation is that, although the ROAM handbook and Restoration Diagnostic identify the key elements needed to do a tenure and land governance analysis, they do not provide a framework that shows how those elements are connected to each other or to specific types of FLR interventions. By visualizing those relationships, our model should help planners better understand those connections and lead to the design of FLR programs that are tailored to the tenure and land governance context in which they are implemented. An alternative explanation for the limited coverage of tenure and land governance in the ROAM reports could be related to the composition of the assessment teams, which appear to be composed primarily of individuals with experience in natural science fields. Including at least one land tenure expert with field research experience on the core team is one possible solution; training core team members in how to do a tenure and land governance analysis is another option.

As with any model, ours simplifies reality. The elements and relationships we have depicted are influenced by other factors such as opportunity costs of investing in FLR, social and wealth status, and distance from forest product markets, among others. How these factors interact with the elements of the model, how and when landholders or land users build social connections and activate them to influence land governance and tenure dimensions, and what the outcomes of the activation of social connections are on actual rights and investment choices are all areas in need of additional research. A logical next step is to test the model to see how well it works in practice at national and sub-national scales.

Although developed in the context of ROAM assessments, the rights actualization model we propose has applicability beyond ROAM or other forest restoration assessments. The general principles should hold true for any planning context where tenure rights and security are at stake. It is, therefore, equally useful as a potential tool in other natural resource sectors, such as range management, agricultural development, and fisheries management, where planners seek to affect land and resource management behavior.

Declaration of conflict of interest

The authors declare that they have no conflicts of interest

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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.2018.11.053.

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