Governments commit to forest restoration, but what does it take to restore forests?

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ABSTRACT

Forest restoration is receiving increased attention from many public and private actors, but few large-scale experiences exist. We explored 10 cases where forest cover had either increased or stabilized or where there was a significant drive towards forest expansion to understand which factors can facilitate the scaling up of forest restoration. We developed a data collection checklist to search the literature and interview key informants. Our analysis identified 15 motivating factors for forest restoration, including the desire to mitigate land degradation, droughts, or floods or to contribute to biodiversity conservation. We also identified some factors that facilitate implementation, such as a supportive policy framework that includes forest restoration plans, financial incentives, truly collaborative arrangements, tenure rights to forests, trees and specific goods and services from these, the roles of specialized agencies, external stakeholders, local communities and local authorities. For restoration to be sustained, it is necessary to integrate it into national institutions, ensure sectoral integration across landscapes, ensure diversified and long-term financing, and embed it in local institutions.
Keywords: UN Decade on ecosystem restoration; forest restoration implementation; policy; governance

1. INTRODUCTION
The world's decision-makers have renewed calls for the restoration of all ecosystems by 2030 with the launch in 2021 of the United Nations Decade on Ecosystem Restoration. Yet for forests, restoration is nothing new. In recent decades this has been increasingly promoted by leaders. Recent calls to restore forests include: the 2011 Bonn Challenge to restore 350 million ha by 2030; regional initiatives such as the African Forest Restoration Initiative (AFR100) in 2015 to restore 100 million ha; the 20x20 Initiative in Latin America launched in 2015 to protect and restore forests, farms, pasture, and other landscapes by 2030; and the ECCA30 to bring 30 million hectares of degraded and deforested land in Europe, the Caucasus and Central Asia into restoration by 2030 (Ghazoul & Chazdon 2017, Stanturf & Mansourian 2020). Yet, 10 years after the launch of the Bonn Challenge, the world was still losing about 10 million ha of forests every year, and an even larger area was being degraded (FAO 2020a); restoration is not yet at the scale needed to counter these challenges. Global assessments such as that of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) highlight the urgent need to reverse this trend to avert the negative impacts of land degradation that are so severe that they are challenging the coping capacity of society.

Small gains in forest cover pale in comparison to overall negative trends in many regions, however localized improvements, promising pilot initiatives, and knowledge generated can contribute to scaling up forest restoration in the long term. Although there are exceptions, such as Costa Rica's increase in forest cover from 40.5% in 1986 (Calvo-Alvarado et al. 2009) to 59.5% in 2020 (FAO 2020a), to date, there are few examples of truly extensive forest restoration. Most experiences in forest restoration do not exceed 1,000 ha (Menz et al. 2013) or face challenging trade-offs between quality and quantity, as has been the case for example in China and Viet Nam (Cao et al. 2011, Cochard et al. 2020). Rudel et al. (2020) explored the conditions leading to forest regrowth over the last 200 years.

Understanding and addressing the obstacles to scaling up forest restoration is fundamental, as is understanding factors that have facilitated the restoration process. These factors may be ecological (e.g., insufficient knowledge about the ecology of many native species) or socio-political (e.g., conflict over land). Although such factors are context-specific, they may be adapted to suit different conditions. Some national-level attempts have been made to understand issues enabling restoration (e.g. Melo et al. 2013 [Brazil], Murcia et al. 2016 [Colombia]).

Here we aim to use experiences from 10 cases to understand factors enabling forest restoration at the national or subnational scale, focusing on governance and economic factors that facilitate positive change in forest cover. Ecological success
factors have been identified for example by Chazdon (2013) and Stanturf et al. (2014) and are outside our scope. The goal is to contribute to efforts to scale-up forest restoration, particularly in light of the UN Decade on Ecosystem Restoration.

First, we define two key terms relevant to the scope of this article: 'forest restoration' and 'governance'. Several terms refer to the ‘restoration’ of forests (Mansourian 2018). The term ‘ecosystem restoration’ is used within the UN Decade and is defined as “the process of halting and reversing degradation, resulting in improved ecosystem services and recovered biodiversity. Ecosystem restoration encompasses a wide continuum of practices, depending on local conditions and societal choice” (UNEP 2021). We use the term ‘forest restoration’ to refer to areas that reported an increase in forest cover and that are not merely large-scale industrial plantations. We acknowledge that these areas may not necessarily have restored the complete set of ecological and social functions of forests; however, they represent the experiences that have been documented over time.

For our purposes, governance factors are defined using Lemos & Agrawal's (2006) definition for environmental governance as being "synonymous with interventions aiming at changes in environment-related incentives, knowledge, institutions, decision making, and behaviors. (...) refer[ring] to the set of regulatory processes, mechanisms, and organizations through which political actors influence environmental actions and outcomes”. For economic factors that support restoration, we focused on financing, incentives, costs, and benefits.

To define which specific governance and economic factors may have enabled the scaling up of forest restoration, we divided the governance of forest restoration efforts into three distinct phases:(1) A ‘motivational’ phase, whereby we aimed to identify what triggered the initiation of forest restoration. We posit that without a clear motivation to justify the restoration process, the risk of continued degradation pressures remains high; (2) An ‘implementation’ phase, whereby we aimed to understand the factors that enabled or facilitated the implementation of restoration, recognizing that cause and effect are difficult to establish. Implementation factors considered included policies and legislation to support restoration, payments and other financial incentives, identification of costs and benefits of restoration, stakeholders and engagement processes, and institutions promoting restoration including tenure and property rights; (3) A ‘sustaining’ phase, whereby we aimed to understand the factors in place to secure the long-term viability of the restoration effort. This is particularly important given that government terms are limited while forest restoration requires long-term commitment and continuity. We posit that ensuring the long term management and survival of restored forests also requires certain conditions to be in place. The main issues explored surrounding the sustaining of restoration were the roles of formal and informal institutions, sectoral integration and funding.
2. METHODS
To understand enabling governance and economic factors for forest restoration, in the summer of 2020 we studied 10 cases (see Table 1) from around the globe that demonstrated either an expansion of forest cover (as per reported national data) and/or had a slowed rate of deforestation accompanied by policies towards forest expansion. The cases were selected for 1) restoration having been sustained over at least five years (so that sufficient data were available), 2) relating to areas exceeding 10,000ha. They were also selected to represent diverse geographical regions, contexts and approaches. Seven cases were national: Bhutan; Colombia; Costa Rica; Georgia; Kenya, Ethiopia, Viet Nam. One case was regional: the Great Green Wall for the Sahara and Sahel (GGW), and two were sub-national (Brazil's Espirito Santo State and Madagascar's Fandriana Marolambo landscape). In two national cases (Colombia and Georgia), we also explored a sub-region, and in the case of the GGW, we used Niger as an illustrative example. The cases were identified through a discussion among the authors using the group's collective expertise. For each case, we designed a data collection checklist adapted from the four primary sources of Hanson et al. (2015), Mansourian (2016, 2017), and Springer et al. (2021) (Supplementary Material) and conducted both desk-top research and semi-structured interviews with 23 key informants who were identified based on their knowledge and experience of the cases.

The method and data collection checklist were tested on the Costa Rica case and subsequently refined. For each case, a literature review was carried out in Google Scholar and Scopus in English, French and Spanish using the terms: the country name + ‘success’ + ‘reforestation’ or ‘restoration’ or ‘afforestation’ or ‘plantation’ or ‘rehabilitation’ or ‘forest landscape restoration’ or ‘forest cover’ or ‘forest transition’. The literature review was iterative, and a snowball method was used to review literature cited in key texts. Each case was written up (Mansourian, 2020). Where available, plans under the three Rio conventions: the Convention on Biological Diversity (CBD), the United Nations Convention to Combat Desertification (UNCCD) and the United Nations Framework Convention on Climate Change (UNFCCC) were consulted for each case. Forest data were sourced from FAO (2020c).
| Country/region | Forest cover | Trend | Int’l forest commitment | Forest importance |
|---------------|--------------|-------|--------------------------|-------------------|
| Bhutan        | 70%          | increasing forest cover. | None.             | watershed protection and hydropower. |
| Colombia      | 53%          | decreasing forest cover but there are localized improvements | 1 million ha by 2030. | biodiversity and watershed protection. |
| Costa Rica    | 59%          | increasing forest cover. | 1 million ha by 2030. | biodiversity and ecotourism. |
| Ethiopia      | 15%          | decreasing forest cover but there are localized improvements. | 15 million ha by 2030. | protect land from erosion and secure land productivity. |
| Georgia       | 40%          | stabilization of national forest cover with localized improvements. | 9,000 ha by 2030. | timber, fuelwood, mineral water, water and climate regulation, soil protection, medicines, recreational services and hydropower |
| Kenya         | 6%           | increasing forest cover. | 5.1 million ha by 2030. | ecosystem services, ecotourism and water protection |
| Viet Nam      | 47%          | increasing forest cover. | None             | conserve land productivity and water services. |
| Great Green Wall for the Sahara and Sahel (GGW) -11 African countries in the Sahara and Sahel region committed to re-greening 8,000km from East to West. | scattered initiatives across the 11 countries, reporting a 4 million ha increase by 2020. | By 2030, the GGW Initiative aims to have restored 100 million ha of degraded land. | In Niger, forests are important for fodder, fuelwood and soil protection. |
| Madagascar (case study on the FLR project in Fandriana-Marolambo -landscape area: 203,000 ha). | 21% | decreasing forest cover (but at a lower rate than historically) and there are localized improvements. | 4 million ha by 2030. | fuelwood, biodiversity, ecotourism and land protection |
| Espirito Santo (Brazil) | 27% | increasing forest cover. | 80,000 ha | soil and water quality |
3. RESULTS

3.1. Motivation phase

Fifteen reasons were identified that motivated efforts to expand forest cover (Table 2). Water conservation (including water security) and alignment with commitments under global conventions were noted in all cases. Motivations were situated at different spatial scales, with some being localized - such as the role of traditional authorities and village chiefs in Niger in developing rules for managing natural regeneration - and some being situated in the international policy arena (e.g., the global movement and targets on forest restoration). At the national scale, Bhutan and Kenya evidently manage their forests exclusively for soil and water conservation (FAO 2020b). The primary motivation in Espirito Santo was to secure water provision. We can also distinguish between exogenous and endogenous factors influencing a governmental decision to carry out large-scale restoration. For example, in Costa Rica, an exogenous factor, the drop in the international price of beef reduced the attractiveness of cattle rearing and prompted a shift in land use, allowing natural forest regeneration. In contrast, in Colombia, visible forest degradation resulting partly from decades of civil war prompted the government to develop a national restoration strategy in 2015.

Table 2: Identified motivations for forest restoration

| Main motivations | Relevant cases |
|------------------|----------------|
| Provision of wide range of ecosystem services (pollination, water regulation, nutrient cycling, spiritual benefits etc.) | Bhutan, Colombia, Kenya |
| Biodiversity conservation and ecotourism | Bhutan, Colombia, Costa Rica, Georgia, Kenya |
| Land stabilization and erosion control | Colombia, Ethiopia, Georgia, GGW, Kenya, Madagascar, Viet Nam |
| Increasing soil fertility and agricultural yields | Ethiopia, GGW, Madagascar, Niger, Viet Nam |
| Watershed protection/protection of water supply | All |
| Carbon sequestration (and associated financing) | Costa Rica, Ethiopia, Georgia, Viet Nam |
| Mitigating floods | Espirito Santo, Georgia, Viet Nam |
| Mitigating droughts | Ethiopia, GGW, Kenya |
| Securing biomass energy | Bhutan, Colombia, Georgia, Kenya, Madagascar, Niger |
| Safeguarding hydroelectricity | Bhutan, Colombia, Costa Rica, Kenya, Viet Nam |
Reducing vulnerability to climate change
Espirito Santo, Georgia, Viet Nam

International environmental interests and funding
Costa Rica, Ethiopia, Georgia, GGW, Madagascar

International markets
Costa Rica

Timber security
Bhutan, Georgia, Viet Nam

International political commitments (conventions)
All

3.2. Implementation phase

Policy and legislative frameworks

Policies supporting restoration could be direct restoration targets or strategies (Table 3). For example, Colombia and Madagascar developed restoration strategies in 2015 and 2019, respectively; Bhutan developed a plantations strategy in 2019. Bhutan and Kenya have quantified forest cover targets (60% and 10%, respectively) enshrined in their constitutions. Other policies that support restoration are related to payments for restoration. Such payment schemes took place in Costa Rica, Espirito Santo and Viet Nam supported by relevant legislation. A further set of policies concerned the role of rural communities and the definition of rights, duties and responsibilities surrounding forest management, particularly regarding co-management or participatory forest management. For example, Bhutan established in 2010 the national strategy for community forestry that empowers rural community groups to manage the forests for their purposes according to an agreed management plan endorsed by the forest department. In Ethiopia’s 2018 Forest Proclamation and Kenya’s 2005 Forest Policy, participatory forest management is acknowledged as an essential mechanism. Madagascar’s law on local management entitled GELOSE was designed in 1996 and was complemented by one specifically oriented towards co-management of natural resources (the GCF).

Table 3: Political & legal measures identified to have supported implementation of forest restoration

| Policies, measures and mechanisms | Details |
|----------------------------------|---------|
| **Forest restoration policies**   | **Bhutan**: 2008 – Constitution including 60% forest cover target; 2019 - plantation & nursery strategy.  
**Colombia**: 1996 – Forest Policy including reforestation & restoration; 2015 – National Plan for Ecological Restoration, Rehabilitation & Reclamation of Disturbed Areas. |
| Country         | Key Events and Strategies                                                                 |
|-----------------|-------------------------------------------------------------------------------------------|
| Ethiopia        | 2007 - Forest Development, Conservation & Utilization Strategy promoting forest restoration; 2011 - Climate-Resilient Green Economy strategy guiding country’s development & aiming to rehabilitate 7 million ha of forest. |
| Georgia         | 1999 – Forest Code has as its main goals ‘tending, protection & restoration of forests’; 2010 - Decree #241 on ‘The Rules of Forest Maintenance & Restoration’; 2020 - Chapter XVII of the new forest code on reforestation & afforestation. |
| Kenya           | 2010 - new constitution setting a 10% minimum forest cover; 2014 - Forest Act to implement forest policy including restoration. |
| Madagascar      | 2015 - National Development Plan including reforesting 5,000 ha as well as restoring 35,000 ha by 2019; 2019 - National FLR Strategy. |
| Niger           | 2011 – National plan for the implementation of the GGW; 2012 - approval of national forest plan including restoration of 270,000 ha of degraded lands. |
| Viet Nam        | 1992 - Decision 327 on ‘policies for the use of bare land & degraded hills, forests, coastal alluvial flats & water bodies’; 1992 - partial logging ban; 1998 - decision 661 on restoration & reforestation; 2011 - green growth strategy incl. afforestation/ reforestation; 2012 - National Action Plan Forest Protection & Development. |
| Espirito Santo  | 2017 – to complement the Brazilian Forest Code, the National Policy on Native Vegetation was developed to promote restoration. |

| Country         | Key Events and Strategies                                                                 |
|-----------------|-------------------------------------------------------------------------------------------|
| Colombia        | 1994 – creation of certificates that pay for tree planting (higher payment for native species); 2017 – adoption of national PES law & national PES policy document. |
| Costa Rica      | 1969 - Forest Law 4475 making reforestation tax deductible; 1977 - forest law 6184 making banks grant 2% of their loans to reforestation; 1986 - forest law 7032 established tradable Certificates of Forestry Payments for reforestation; 1996 - PES Forest Law 7575 setting payments for reforestation. |
| Ethiopia        | 2018 - forest proclamation providing tax breaks for private individuals & communities who plant trees |
| Kenya           | 2014 – new forest policy includes benefit sharing schemes; 2019 – strategy to achieve 10% forest cover includes requirement by ministerial agencies to contribute 10% of their corporate social responsibility (CSR) budget to restoration; PES schemes & conservation levies (on water & tourism). |
| Viet Nam        | 2011 - decree on payments for forest ecosystem services. |
| Espirito Santo  | 2008 - water fund & PES law; 2016 - PES Law (no. 10583) entrusts the State development bank with channelling funds from the PES scheme to landholders. |

**Mechanisms to facilitate local community engagement in forest management**

- Bhutan: 1979 - social forestry; 2010 - national strategy for community forestry.
- Ethiopia: 2018 – forest proclamation includes participatory forest management
- Kenya: 2005 - first amendment to 1968 forest policy setting increased role for communities in forest management & benefit-sharing schemes.
- Madagascar: 1996 - GELOSE law devolving management of natural resources to the local level; 2001 - GCF law defining co-management contracts.

**Financial incentives**

The restoration cost in the cases varied from US$ 87 per ha in Ethiopia (Pistorius et al. 2017) to US$ 6,585 in Georgia (KfW 2017) (Figure 1). Payment for ecosystem services (PES) schemes in Costa Rica and Espirito Santo acknowledged this...
opportunity cost and set payments accordingly. Benefits provided by restored forests were not always identified. In Kenya, the cost of inaction was estimated at KES 168 billion (~US$ 1.55 billion), much higher than the KES 48 billion (~US$ 442 million) estimated to increase tree cover to 10%. There are no comprehensive data on who bears the costs and who gains from forest restoration; elite capture was reported in Viet Nam (Phuc et al. 2013).

The complexity of payment schemes may vary, with, for example, the scheme in Espirito Santo distinguishing between opportunity costs of setting land aside and land uses where there is a short-term revenue potential (e.g., agroforestry). Payments under that scheme are for three years with 50 per cent upfront when there is a revenue potential, whilst they are for five years and renewable where the payment is to cover the opportunity cost of restoring or protecting forests (Kissinger 2014). Funding for these schemes comes from a tax levied on fossil fuels. Other financial incentives include tax exemptions (e.g., in Costa Rica where, starting in 1996, forest restoration has been tax-deductible) or disincentives that set penalties for forest conversion (e.g., in Ethiopia).

Figure 1: Estimates of restoration costs (US$ per ha). Note that for Ethiopia and Espirito Santo a low value and a high value have been identified.
**Role of stakeholders at different levels**

**Dedicated national agencies**

Having a dedicated national agency or body to manage restoration was considered helpful in many cases. Where this agency was situated made a difference to its success in terms of power (including funding) and respect. In Ethiopia, for example, the lack of a dedicated forest agency until recently was considered one of the possible reasons for continued forest loss. In contrast, the fact that both the forest sector and the environment are grouped under one agency in Costa Rica and Kenya was helpful for restoration success. In some instances, new agencies were created, such as across African countries where specific national GGW agencies were established. In Espirito Santo, a dedicated state agency, the Secretaria de Estado do Meio Ambiente e Recursos Hidricos (SEAMA), has been managing the PES programme. In Costa Rica, a cross-sectoral government agency, the Fondo Nacional de Financiamiento Forestal (FONAFIFO), was established in 1991 to collect the tax (and other income) to fund the PES scheme and to disburse payments.

**Local authorities**

Devolution to local level authorities plays a vital role in restoration. In Kenya, for example, in the early 2000s, transitional implementation plans were developed to help strengthen the role of county governments. In Colombia, the regional branches of the environment ministry (the Corporaciones Autónomas Regionales) are responsible for implementing national restoration plans within their jurisdiction. In the Oriente Antioqueño region of Colombia, the Corporación Autónoma – CORNARE, was a major actor in developing forest restoration. In remote parts of Bhutan, Colombia and Ethiopia, forest extension officers are essential to support the communities and act as a vector to translate national-level policies into local action.

**Local-level communities**

Communities in the landscape were critical for implementation in all cases, particularly as areas prioritized for restoration are frequently remote where rural populations depend more on their natural environment. In Kenya, for example, Mogoi et al. (2012) found that 72% of community forest associations (CFAs) engaged in tree planting. In Ethiopia's Chilimo Forest Reserve, a 7% increase in forest cover was observed in 2003-2012, thanks to the roll-out of participatory forest management. In Madagascar’s Fandriana-Marolambo landscape, 35 community groups (‘communautés de base’ in French or COBAS) were set up to co-manage the forest. Yet, in most cases the restoration engagement process remains largely government-driven with continued power imbalances. In Costa Rica, the main PES agency, FONAFIFO, has been criticized for not having indigenous representatives on its board. In Ethiopia, massive resettlement programs, notably for pastoralists, have generated conflict and led to land degradation due to the loss of traditional land management methods.
External stakeholders

The role of external stakeholders in promoting, funding, and implementing restoration is also prominent in most cases. For example, in Ethiopia, non-governmental organisations (NGOs, both local and international) negotiate participatory forest management contracts and implementation with communities. The Regreening Africa program which is a network of actors including the World Agroforestry Center (ICRAF), World Vision and Oxfam, among others, works across eight countries, including Ethiopia, to promote farmer-managed natural regeneration on small farms. In both Georgia and Madagascar, the World Wide Fund for Nature (WWF) has been instrumental in promoting, facilitating and implementing restoration (Mansourian et al. 2018, Zazanashvili et al. 2020). In Espirito Santo, the World Bank and NGOs partnered with the state government to develop the restoration (Reflorestar) program. In Viet Nam, between 2000 and 2015, the Forest Sector Support Program and Partnership (FSSP) brought together 25 international donors.

Tenure and property rights

In all cases, land and tree tenure systems are complex and subject to tensions between what is de jure and what happens de facto (McLain et al. 2021). Security of tenure and property rights directly affects the likelihood of adopting restoration measures (Mansourian 2016, McLain et al. 2021). In Costa Rica and Espirito Santo, private landowners were the main participants in PES schemes. Although full ownership rights are often not provided by law, diverse rights (e.g., rights of use and inheritance) can be recognized and formalized via certificates. Some of these intermediate options have been promoted in the cases reviewed. For example, in Niger, in 2004, a change in the forest law granted farmers ownership over trees, which created a significant incentive to plant.

Similarly, in Viet Nam, several laws, including the Land Law of 2003, have provided households with the rights to transfer, inherit, mortgage or lease land (for 50 years), thus providing more of an incentive to engage in tree planting (Nguyen & Kull in press). In Colombia, land titling has been identified as a key priority since the 1993 Law 70 on collective land titling. In Madagascar’s Fandriana-Marolambo landscape, land is under customary tenure arrangements with no formal deeds or titles. Although the country is carrying out land reforms to improve land rights, this is a slow process. There remains a disincentive to use native species in restoration since they belong to the state, while exotic trees can be owned by the community (Mansourian et al. 2016).

3.3. Sustaining phase

Identifying key sustaining factors in our cases is compromised by change throughout the restoration process, little long-term (over 20 years) experience in forest restoration and limited rigorous monitoring. However, four elements stood out in the cases reviewed: the role of formal and informal institutions, sectoral integration and funding.
Formal institutions

One important avenue for securing long-term sustainability is to embed forest restoration in long-term institutions. For example, Bhutan and Kenya both have forest targets in their constitutions. Commitments under major environmental conventions (e.g. CBD, UNFCCC) were also considered important sustaining factors as they extend beyond existing governments and potential policy changes. All ten cases referenced restoration in at least two of their three Rio Convention commitments (Table 4). These plans are also necessary as they frame much of the bilateral and multilateral funding. A policy evolution favorable to restoration can be seen in countries such as Kenya and Viet Nam with greater rights going to communities over time, thereby incentivizing them to sustain restoration efforts as they can benefit from them. Such devolution may take many forms, and success is not always guaranteed, depending on other factors. Some cases may lead to degradation or elite capture. In Viet Nam, communities have received rights in different ways, including the allocation of forest land rights to households, mainly leading to a boom in plantations, and the creation of community-managed forests which are often poorly managed (Cochard et al. 2020, McElwee & Nghi 2021).

Informal institutions

Supporting, empowering, and building the capacity of local-level – often informal – associations can serve to maintain restoration beyond the project duration. Acknowledging this, the governments of Bhutan, Ethiopia, Madagascar, and Viet Nam have gradually started to empower local-level stakeholders, both public and private. In Madagascar, traditional chiefs and local associations were critical to engaging local villagers in forest restoration. Similarly, in Niger, local chiefs supported the establishment of rules for farmer-managed natural regeneration (FMNR).

Sectoral integration

Sectoral integration is starting to be promoted in a handful of cases. For example, in Costa Rica, the 2016 Política Agroambiental (agro-environmental policy) seeks to reconcile food security and environmental priorities and Madagascar’s 2019 National Restoration Strategy includes an objective to integrate land use across the forestry and agriculture sectors. In some cases such as Kenya, multisectoral platforms have been established to address forest issues, including restoration. In Espirito Santo, the 1998 water law promotes integrated watershed management. Furthermore, to comply with the Brazilian Forest Code, the State of Espirito Santo set an objective to increase forest cover by 235,000 ha by 2025 (Benini et al. 2016).

Funding

Most countries received significant donor funding for restoration, often in the form of project grants with a relatively short duration. In some cases, such as in Fandriana-Marolambo, donor support may extend over several project phases, totaling a
decade or more. PES schemes are seen as a means of breaking away from dependence on donor funding. Such schemes have been applied in Colombia, Costa Rica, Kenya and Espírito Santo and are being developed in Viet Nam. Funding for the scheme in Costa Rica comes from a levy on energy, while in Kenya, it is proposed to levy 10% from the corporate social responsibility (CSR) budgets of different ministries. In Viet Nam, funding comes from users of ecosystem services, specifically from hydropower and urban water consumers. In such cases, funding can be secured for the long term.

Table 4: Commitments under the Rio Conventions (CBD, UNCCD UNFCCC); NA indicates not applicable; LDN - Land Degradation Neutrality; NDCs - Nationally-determined Contributions; INDC – Intended

| Country         | CBD (NBSAP)                                                                 | UNCCD – LDN                                                                 | UNFCCC – NDCs/INDCs                                                                 |
|-----------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Brazil          | By 2020, restore at least 15% of degraded ecosystems                       | NA                                                                         | By 2030 restore and reforest 12 million hectares of forests                       |
| Bhutan          | Implement afforestation/ reforestation, agroforestry, reclamation.         | By 2035, reforest with native species in open areas on 2500 ha             | Forest fire management and rehabilitation of degraded and barren forest lands.    |
| Colombia        | By 2020 210,000 ha under restoration; by 2025 500,000 ha under restoration; by 2030 1,000,000 ha under restoration. | Restore over 100,000 ha of degraded land nationally; by 2030 restore over 9,000 ha of pasture to forests in the Caribbean; by 2030 restore 3,200 ha of dry forest in Guajira. | Commitment to reduce deforestation in the country. |
| Costa Rica      | By 2025 improve protection and restoration of terrestrial ecosystems.     | NA                                                                         | Natural restoration and regeneration objectives for both mitigation and adaptation. |
| Ethiopia        | By 2020, increase forest cover 15% to 20% of the country and double the area of restored degraded lands. | by 2031, promote community based forest management, forest landscape restoration with indigenous species & restoration of 427,730 ha of forest and; by 2036, rehabilitate 21,359,490 ha of forest land (stop conversion); by 2026 promote plantation of indigenous species & improve the productivity of 33,452 ha. | Expand forest beyond the target of 7 million ha; re-establish forests to sequester CO2; improve and diversify economic options from agroforestry and afforestation of degraded forests; rehabilitate degraded forests for resilience of communities, infrastructures and ecosystems to droughts and floods. |
| Georgia         | By 2030, biodiversity is restored; Adopt forest regulations & standards that promote restoration of natural forest landscape & climate adaptation & mitigation. | By 2030 restore about 1500 ha of degraded forest and reforest about 7,500 ha | Afforestation/ reforestation on 1,500 ha of degraded lands by 2030; if external financial and technical support, by 2030, afforest/reforest up to 35,000 ha and assist natural regeneration. |
| Kenya           | By 2030, enhance ecosystem resilience by restoring at least 30% of degraded ecosystems, including 10% tree/vegetation cover. | NA                                                                         | Kenya is implementing climate change actions in various areas such as afforestation and reforestation. |
| Madagascar      | Stabilise & rehabilitate habitats & ecosystems; Develop & implement reforestation programmes; Protect & restore mangroves. | Include the private sector to scale up restoration of degraded lands and restore 400,000 ha of landscape each year by 2025. | Expand forest by 270,000 ha with indigenous species; in 2020-2030, restore 45,000 ha (& 55,000 ha by 2030) of forests & mangroves. |
| Country | CBD (NBSAP)                                                                 | UNCCD – LDN                                                                 | UNFCCC – NDCs/INDCs                                                                 |
|---------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Niger   | Citizens of Niger value, conserve and restore biodiversity; restore natural forests and degraded areas | Achieve LDN by 2030 and increase vegetation cover from 17% to 19%.          | Restore agricultural/forestry/pastoral lands on 1,030,000 ha; assisted natural regeneration on 1,100,000 ha; plant multiuse species on 750,000 ha; plant Moringa oleifera on 125,000 ha. |
| Viet Nam| By 2030, 25% of degraded ecosystems of national and international significance will be restored; restoration of 15% of degraded critical ecosystems; promote the use of native species for forest enrichment and restoration in the framework of REDD+. | Restore 160,000 ha of natural forest and afforest 275,000 ha in the NW, Highland, S. Central regions; timber plantation in 80,000 ha in the NW, S. Central regions. With international support: restore natural forest in 250,000 ha and afforest 100,000 ha in NW, Highland, S. Central regions; timber plantation in 100,000 ha in the NW, S. Central regions. | Increase forest cover to 42%-42.5%; restore and plant mangrove and coastal protection forests; define areas for restoring natural forests, promote forest regeneration and enrichment planting; improve forest carbon stock quality and volume; develop agroforestry. |

### 4. DISCUSSION

The three phases – motivation, implementation and sustaining - were the basis for our research. In the process of collecting data, we found that it was difficult to make a clear distinction between ‘implementation’ and ‘sustaining’. In many instances, the same policies that supported implementation were vital in sustaining it. Nevertheless, where possible, we sought to clarify the distinction with, for example, some policies clearly about initiating restoration and others about sustaining the effort long-term (e.g., inclusion in national action plans or the country’s constitution). It proved impossible to obtain reliable information on many aspects of interest, notably on equity or conflicts. The tool has identified these factors though as relevant and serves to flag the need to consider these dimensions in forest restoration.

**Motivation**

The fifteen motivations identified through our research help to determine relevant leverage points (Mansourian 2021) and justify the costs involved (including opportunity costs). They span environmental and socio-political reasons. These motivations reflect the position of the State but not necessarily those of other stakeholders, particularly local landscape dwellers. Indigenous groups can be motivated to restore because of the importance of land to their cultural identity (Telesetsky 2019). Importantly, government motivations, or the weighting given to different motivations, may differ from those of poor rural communities. Achieving a negotiated understanding of what motivates restoration, and justifying this long-term process, with its implicit costs, is necessary. Furthermore, official reasons for restoration (e.g., protecting water courses) may differ from unofficial reasons (e.g., timber security).
Implementation

National-level policies that explicitly promote restoration could be found in most of our cases (Bhutan, Colombia, Georgia, Kenya, Madagascar and Viet Nam), as also identified by Melo et al. (2013), Murcia et al. (2016) and Thomas et al. (2017).

Similarly, after the Second World War and the Korean War, mandatory reforestation, tree-cutting restrictions, and economic incentives for forestry extension programs were imposed by the governments of Japan and the Republic of Korea (Meyfroidt & Lambin, 2011). Taking this one step further, Brancalion & van Melis (2017) refer to the need to identify ‘policy triggers’ that can encourage restoration. Other categories of policies are also important, such as those supporting PESs or participatory forest management. PESs emerging from forest restoration have played a clear role in Costa Rica and Espirito Santo in Brazil. Melo et al. (2013) and Thomas et al. (2017) also confirm the importance of long-term funding, notably through diverse economic instruments. Quantifying the costs and benefits of forests provides an essential argument for bearing the costs of restoring forests (Menz et al. 2013) and integrating them into national accounts (Dasgupta 2021). Understanding costs and benefits and to whom they accrue can provide valuable arguments for investing in restoration (Holl 2017, Ghazoul & Chazdon 2017). In the cases explored, where data existed, restoration costs varied significantly. However, it is difficult to compare these costs directly as often different elements are included (e.g. labor, inputs), and the starting social and ecological conditions may be more or less complex. The distribution of costs and benefits is frequently spread across different stakeholders, with less powerful groups often bearing the higher costs (Elias et al. 2022). Although financial measures to promote restoration proved effective in Costa Rica and Espirito Santo, legal measures to punish those converting forests have in some cases proven less effective, in Ethiopia for example. The combination of such ‘carrots and sticks’ has been shown to be useful within REDD+ programs (Duchelle et al. 2017).

Similarly to Melo et al. (2013), Murcia et al. (2016), Lazos-Chavero et al. (2016), Thomas et al. (2017), and Brancalion & Holl (2020), we identified the importance of engaging all relevant stakeholders. Multiple stakeholders at different levels – from local to national authorities, local communities, and international actors – have a role to play in restoration (Mansourian 2016), although each stakeholder group will have a different position of power, ability to influence the outcome, and stake in the process, as well as bearing different costs and obtaining different benefits. Recognizing these diverse ways of interacting with the restoration process is fundamental to designing effective restoration interventions (Elias et al. 2022). Beyond engagement, it is fundamental to truly and effectively respond to local needs and ensure that local populations see restoration as a valuable mechanism that contributes to their social, cultural or economic wellbeing (Elias et al. 2022). Devolution was seen as essential yet in some cases, local authorities may be given the responsibility but not the means to cope effectively (e.g., in Ecuador, Wiegant et al. 2020).
In the context of restoration, tenure rights refer to the rights over not only land but also the trees (e.g., Niger) and, in some cases, the goods and services from those trees (e.g., water in Espírito Santo). Different (and conflicting) tenure rights may apply. The importance of providing clear and secure rights to, and tenure of, land and natural resources (Slobodian et al. 2020) was apparent in our 10 cases. In Niger, for example, Pye-Smith (2013) found that, prior to changes in forest laws, the survival rate of about 60 million trees planted over 12 years was as low as 20%, notably because of unclear tenure over the trees planted. PES schemes were successful in Costa Rica and Espírito Santo, where most of the land is held privately. Without tenure security, local stakeholders do not have such an incentive to engage in restoration or maintain trees in the long term (Nagendra 2007, McLain et al. 2018). In Madagascar, Ranjatson et al. (2019) identified the lack of tenure security for smallholders and populations dependent on natural forests for their livelihoods as a significant constraint to scaling up restoration.

Sustain

The lack of long-term and systemic government support for forest restoration remains a challenge, mainly as it competes with other government priorities such as agriculture or infrastructure, leading to poor sectoral integration (Carmenta & Vira 2018). Sustaining restoration requires visions compatible with the lifecycle of a forest or an ecosystem, the timeframes of which are well beyond most political cycles and those of many stakeholders. Mechanisms are therefore needed to embed restoration into long-term plans, processes, and funding mechanisms. In the cases we reviewed, securing the long-term survival of forest restoration efforts was achieved through funding and high-level political engagement. While the continued dependence on donor funding and project-based approaches severely hamper both the scale and the long-term security of restoration efforts (de Jong et al. 2021), the role of the private sector and market-based mechanisms hold more promise (Löfqvist & Ghazoul 2019). PES schemes can ensure that short-term needs are compensated while trees are growing (e.g., Costa Rica and Espírito Santo) and provide a stable source of funding. The growing role of the private sector in restoration initiatives has been highlighted more generally (Richardson et al. 2016). Embedding restoration in other formal frameworks such as a country’s constitution (Bhutan and Kenya) or its commitments under global conventions (all cases) provide a long-term direction to restoration beyond government cycles. Sewell et al. (2020) counted 115 quantitative commitments on restoration in the three main Rio conventions totaling 1 billion ha. While these commitments do not always translate into action, they provide the framing for subsequent national and subnational level actions.

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5. CONCLUSION

The 10 cases reviewed present different social, ecological, economic, and political conditions. Although the cases were selected because of their positive trends, in some cases, national forest cover continues to decline even as some sub-national
data present a more positive picture. In all cases, no single factor has enabled large-
scale restoration but rather a combination of factors. Our review shows that
governance and economic success factors contribute to a positive shift in forest
cover.

It is apparent from our research that factors across motivation, implementation, and
sustaining phases associated with the governance of forest restoration are all
important and complementary, although there is some overlap between the
implementation and sustaining phases. Acknowledging the complementary roles of
these enabling factors as they contribute to the different phases of the ‘political’
forest restoration process provides the context to design locally appropriate
measures that respond to the motivations identified and can be sustained in the long
term. As per our methodology, these factors cover informal and formal dimensions,
both top-down government-led and bottom-up community-led measures.

Understanding these factors and their relevance is of strategic value for the
promotion, development and maintenance of forest restoration programs. This is
particularly relevant as forest restoration is a crucial component of the UN Decade
on Ecosystem Restoration and contributes to addressing many of today’s planetary
challenges.

Going forward, we identify three points that require further investigation. Firstly, what
is the optimal mix of incentives (financial or other) and disincentives to support forest
restoration? Our cases identified some of the options available but determining more
precisely the value of each and the most locally-efficient combinations in achieving
rapid and positive outcomes remains to be assessed. Secondly, misalignments in
motivations, including between those of different stakeholders, implementation
modalities and those intended to sustain restoration, may need to be considered and
negotiated to ensure coherence in objectives for restoration. For example,
sustainability may be questionable if government motivations to restore forests are
for securing timber supply but implementation is driven by external stakeholders
seeking to offset their own carbon emissions. Finally, defining a clear cause and
effect relationship between the factors reviewed and restoration outcomes is
challenging. Most factors should be considered valuable avenues to scaling up
restoration. In this respect, studies are urgently required to isolate certain factors and
measure their role in achieving restoration. Also, monitoring of restoration success is
urgently needed (as is the definition of ‘success’ in restoration). Time is not on our
side, and enabling conditions such as those identified in this study, provide tools to
contribute to scaling up forest restoration around the globe while recognizing that
they must be contextualized.

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Conflict of Interest

None.

References

Benini R de M, Sossai MF, Padovezi A, Matusmoto MH (2016) Plano Estratégico Da Cadeia Da Restauração Florestal: O Caso Do Espírito Santo. In: Mudanças no código florestal brasileiro: desafios para a implementação da nova lei. Rio de Janeiro: Ipea.

Brancalion PH, van Melis J (2017) On the need for innovation in ecological restoration. *Annals of the Missouri Botanical Garden* 102: 227-236.

Brancalion PH, Holl KD (2020) Guidance for successful tree planting initiatives. *Journal of Applied Ecology* 57: 2349-2361.

Calvo-Alvarado J, McLennan B, Sánchez-Azofeifa A, Garvin T (2009) Deforestation and forest restoration in Guanacaste, Costa Rica: Putting conservation policies in context. *Forest Ecology and Management* 258: 931-940.

Cao S, Chen L, Shankman D, Wang C, Wang X, Zhang H (2011) Excessive reliance on afforestation in China’s arid and semi-arid regions: lessons in ecological restoration. *Earth-Science Reviews* 104: 240-245.

Carmenta R, Vira B (2018) Integration for restoration: reflecting on lessons learned from the silos of the past. In: *Forest Landscape Restoration*, eds. S Mansourian, J Parrotta, pp. 32-52. London: Routledge.

Chazdon RL (2013) Making tropical succession and landscape reforestation successful. *Journal of Sustainable Forestry* 32: 649-58.

Cochard R, Nguyen VHT, Ngo DT, Kull CA (2020) Vietnam’s forest cover changes 2005-2016: veering from transition to (yet more) transaction? *World Development* 135: 105051.

Dasgupta P (2021) *The Economics of Biodiversity: The Dasgupta Review*. (London: HM Treasury)

de Jong W, Liu J, Long H (2021) The forest restoration frontier. *Ambio* 50:2224-37.

Duchelle AE, De Sassi C, Jagger P, Cromberg M, Larson AM, Sunderlin WD, Atmadja SS et al. (2017) Balancing carrots and sticks in REDD+ implications for social safeguards. *Ecology and Society* 22.

Elias M, Kandel M, Mansourian S, Meinzen-Dick R, Crossland M, Joshi D, Kariuki J et al. (2022) Ten people-centered rules for socially sustainable ecosystem restoration. *Restoration Ecology* 30:e13574.

FAO (2020a) *Global Forest Resources Assessment 2020*. Rome: FAO.

FAO (2020b) *The State of the World’s Forests 2020*. Rome: FAO.

FAO (2020c). FAO Forest Resources Assessment 2020 data online. URL https://fra-data.fao.org/Ghazoul J, Chazdon R (2017) Degradation and recovery in
changing forest landscapes: a multiscale conceptual framework. Annual Review of Environment and Resources 42:161-88.

Hanson C, Buckingham K, DeWitt S, Laestadius L (2015) The Restoration Diagnostic. Washington DC: WRI.

Holl KD (2017) Restoring tropical forests from the bottom up. Science 355:455-6.

IPBES (2018) (Scholes RJ, Montanarella L, Brainich E, Barger N, ten Brink B, Cantele M, Erasmus B, et al.) Summary for policymakers of the assessment report on land degradation and restoration of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Bonn: IPBES.

KfW (2017) Ex post evaluation – Caucasus. Frankfurt: KfW.

Kissinger G (2014) Financing Strategies for Integrated Landscape Investments Case Study: Atlantic forest, Brazil. Washington, DC: Ecoagriculture.

Kull CA (2002) Madagascar aflame: landscape burning as peasant protest, resistance, or a resource management tool? Political Geography 21: 927-53.

Lazos-Chavero E, Zinda J, Bennett-Curry A, Balvanera P, Bloomfield G, Lindell C. Negra C (2016) Stakeholders and tropical reforestation: challenges, trade-offs, and strategies in dynamic environments. Biotropica 48: 900-914.

Lemos MC, Agrawal A (2006) Environmental Governance. Annual Review of Environment and Resources 31: 297–325.

Löfqvist S, Ghazoul J (2019) Private funding is essential to leverage forest and landscape restoration at global scales. Nature Ecology & Evolution 3: 1612-1615.

Mansourian S (2016) Understanding the Relationship between Governance and Forest Landscape Restoration. Conservation and Society 14: 267–278

Mansourian S, Razafimahatratra A, Ranjatson P, Rambeloarisoa G (2016) Novel governance for forest landscape restoration in Fandriana Marolambo, Madagascar. World Development Perspectives 3:28-31.

Mansourian S (2017) Governance and Forest Landscape Restoration: A framework to support decision-making. Journal for Nature Conservation 37: 21–30

Mansourian S (2018) In the eye of the beholder: reconciling interpretations of forest landscape restoration. Land Degradation & Development 29: 2888-2898.

Mansourian S (2020) Enabling Factors to Scale Up Forest Landscape Restoration: The Roles of Governance and Economics. Berlin: WWF.

Mansourian S (2021) Disciplines, sectors, motivations and power relations in Forest Landscape Restoration. Ecological Restoration 39: 16-26.

Mansourian S, Razafimahatratra A, Vallaui D (2018) Lessons Learnt from 13 Years of Restoration in a Moist Tropical Forest: The Fandriana-Marolambo Landscape in Madagascar. Paris: WWF France.

McElwee P, Nghi TH (2021) Assessing the social benefits of tree planting by smallholders in Vietnam: lessons for large-scale reforestation programs. Ecological Restoration 39:52-63.

McLain R, Lawry S, Guariguata MR, Reed J (2021) Toward a tenure-responsive approach to Forest Landscape Restoration: A proposed tenure diagnostic for assessing restoration opportunities. Land Use Policy 103748.
Melo FP, Pinto SR, Brancalion PH, Castro PS, Rodrigues RR, Aronson J, Tabarelli M (2013) Priority setting for scaling-up tropical forest restoration projects: Early lessons from the Atlantic Forest Restoration Pact. *Environmental science & policy* 33: 395-404.

Menz MH, Dixon KW, Hobbs RJ (2013) Hurdles and opportunities for landscape-scale restoration. *Science* 339: 526-527.

Meyfroidt P, Lambin EF (2011) Global forest transition: prospects for an end to deforestation. *Annual review of environment and resources* 36:343-71.

Mogoï J, Obonyo E, Ongugo P, Oeba V, Mwangi E (2012) Communities, property rights and forest decentralization in Kenya: Early lessons from participatory forestry management. *Conservation and Society* 10: 182–194.

Murcia C, Guariguata MR, Andrade A, Andrade Gl, Aronson J, Escobar EM, Etter A et al. (2016) Challenges and prospects for scaling-up ecological restoration to meet international commitments: Colombia as a case study. *Conservation Letters* 9: 213-220.

Nagendra H (2007) Drivers of reforestation in human-dominated forests. *Proceedings of the National Academy of Sciences* 104:15218-15223.

Nguyen THV, Kull CA (in press) Politics of smallholder acacia plantation expansion in upland Central Vietnam. *Journal of Peasant Studies*.

Phuc TX, Nghi TH, Zagt R (2013) Forest Land Allocation in Viet Nam: Implementation Processes and Results. *Tropenbos Infobrief* May 2013.

Pistorius T, Carodenuto S, Wathum G (2017) Implementing forest landscape restoration in Ethiopia. *Forests* 8: 61.

Pye-Smith C (2013) The Quiet Revolution: How Niger’s farmers are re-greening the parklands of the Sahel. ICRAF Trees for Change no. 12. Nairobi: World Agroforestry Centre.

Ranjatson P, McLain R, Mananga J, Randrianasolo R, Razafimbelo NT, Lawry S, (2018) *Tenure Security and Forest Landscape Restoration: Results from Exploratory Research in Boeny, Madagascar*. Paper prepared for presentation at the ‘2019 World Bank Conference On Land And Poverty’ The World Bank – Washington DC, March 25-29, 2019

Richardson BJ (2016) Resourcing ecological restoration: the legal context for commercial initiatives. *Restoration Ecology* 24: 686-691.

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

Sewell A, van der Esch S, Löwenhardt H (2020), *Goals and Commitments for the Restoration Decade: A global overview of countries’ restoration commitments under the Rio Conventions and other pledges*. PBL Netherlands Environmental Assessment Agency, The Hague.

Slobodian L, Vidal A, Saint-Laurent C (2020) *Policies that support forest landscape restoration: What they look like and how they work*. Gland: IUCN
Springer J, Campese J, Nakangu B (2021) NRGF Conceptual Framework. Gland: IUCN and CEESP.

Stanturf JA, Mansourian S (2020) Forest landscape restoration: state of play. Royal Society open science 7: 201218.

Stanturf JA, Palik BJ, Dumroese RK (2014) Contemporary forest restoration: a review emphasizing function. Forest Ecology and Management 331:292-323.

Telesetsky A (2019) Motivating ecological restoration by private landowners through special purpose districts. In: Ecological Restoration Law, eds. A Akhtar-Khavari, BJ Richardson, pp. 214-239. London: Routledge.

Thomas RJ, Reed M, Clifton K, Appadurai AN, Mills AJ, Zucca C, Kodsi E et al. (2017) Scaling up sustainable land management and restoration of degraded land. Bonn: UNCCD.

Tuynh VH, Phuong PX (2001) Impacts and effectiveness of logging bans in natural forests: Viet Nam. In: Forests Out of Bounds: Impacts and Effectiveness of Logging Bans in Natural Forests in Asia-Pacific, eds. PB Durst, TR Waggener, T Enters, TL Cheng. Bangkok: FAO.

UNEP (United Nations Environment Programme) (2021) Becoming #GenerationRestoration: Ecosystem restoration for people, nature and climate. Nairobi: UNEP.

Wiegant D, Peralvo M, van Oel P, Dewulf A (2020) Five scale challenges in Ecuadorian forest and landscape restoration governance. Land use policy 96:104686.

Zazanashvili N, Sanadiradze G, Garforth M, Bitsadze M, Manvelyan M, Askero K, Mousavi E et al. (2020) Ecoregional Conservation Plan for the Caucasus: 2020 Edition. Tbilisi: WWF and KfW.