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

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Summary

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 we interviewed 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 the implementation of forest restoration, 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.

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 initiative to bring 30 million ha 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 *c.* 10 million ha of forests every year and an even larger area was being degraded (FAO 2020b); 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 in order 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 2020b), to date, there are few examples of truly extensive forest restoration. Most experiences in forest restoration do not exceed 1000 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) has also explored the conditions leading to forest regrowth over the last 200 years.

Understanding and addressing the obstacles to scaling up forest restoration are fundamental, as is understanding the factors that have facilitated these restoration processes. 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 for Brazil and Murcia et al. 2016 for Colombia).

Here, we aim to use experiences from 10 cases to understand the factors enabling forest restoration at the national or subnational scales, focusing on governance and economic factors that facilitate positive change in forest cover. Ecological success factors have been identified by, for example, 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 and 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 the 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.

Methods

To understand the 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 an expansion of forest cover (as per reported national data) and/or a slowed rate of deforestation accompanied by policies towards forest expansion. The cases were selected for (1) restoration having been sustained over at least 5 years (so that sufficient data were available) and (2) cases relating to areas exceeding 10,000 ha. They were also selected to represent diverse geographical regions, contexts and approaches. Seven cases were national: Bhutan, Colombia, Costa Rica, Georgia, Kenya, Ethiopia and Viet Nam; one case was regional: the Great Green Wall for the Sahara and Sahel (GGW); and two were subnational (Brazil's Espírito Santo State and Madagascar's Fandriana-Marolambo landscape). In two of the national cases (Colombia and Georgia), we also explored a subregion, and in the case of the GGW, we used Niger as an illustrative example. The cases were identified through 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; see Supplementary Material, available online), and we conducted both desktop 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 following 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 (2020a).

Results

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 2020c). The primary motivation in Espírito Santo was to secure water provision. We can also distinguish between exogenous and endogenous factors influencing a governmental

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Table 1. Overview of cases. The forest cover data come from FAO (2020a).

Country/region	Forest cover	Trend	International 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	9000 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
GGW – 11 African countries in the Sahara and Sahel region committed to re-greening 8000 km from east to west		Scattered initiatives across the 11 countries, reporting a 4 millionha 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
Espírito Santo (Brazil)	27%	Increasing forest cover	80 000 ha	Soil and water quality

FLR = Forest Landscape Restoration; GGW = Great Green Wall for the Sahara and Sahel.

Table 2. Identified motivations for forest restoration.

Main motivations	Relevant cases
Provision of a 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	Espírito 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	Espírito 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

GGW = Great Green Wall for the Sahara and Sahel.

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.

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) that are enshrined in their constitutions. Other policies that support restoration are related to payments for restoration. Such payment schemes took place in Costa Rica, Espírito 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 Gestion Locale Sécurisée (GELOSE) was designed in 1996 and was complemented by a law specifically orientated towards the co-management of natural resources (the Gestion Contractualisée des Forêts; GCF).

Financial incentives

The restoration cost in the studied cases varied from US$87 per ha in Ethiopia (Pistorius et al. 2017) to US$6585 per ha in Georgia (Fig. 1; KfW 2017). Payment for ecosystem services (PES) schemes

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Table 3. Political and legal measures identified to have supported the implementation of forest restoration.

Policies, measures and mechanisms	Details
Forest restoration policies	Bhutan: 2008 – Constitution including 60% forest cover target; 2019 – plantation and nursery strategy Colombia: 1996 – Forest Policy including reforestation and restoration; 2015 – National Plan for Ecological Restoration, Rehabilitation and Reclamation of Disturbed Areas Ethiopia: 2007 – Forest Development, Conservation and Utilization Strategy promoting forest restoration; 2011 – Climate-Resilient Green Economy strategy guiding the country's development and aiming to rehabilitate 7 million ha of forest Georgia: 1999 – Forest Code has as its main goals 'tending, protection and restoration of forests'; 2010 – Decree #241 on 'The Rules of Forest Maintenance and Restoration'; 2020 – Chapter XVII of the new forest code on reforestation and 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 5000 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 and degraded hills, forests, coastal alluvial flats and water bodies'; 1992 – partial logging ban; 1998 – Decision 661 on restoration and reforestation; 2011 – green growth strategy including afforestation/reforestation; 2012 – National Action Plan Forest Protection and Development Espírito Santo (Brazil): 2017 – to complement the Brazilian Forest Code, the National Policy on Native Vegetation was developed to promote restoration
Financial incentives and measures	Colombia: 1994 – creation of certificates that pay for tree planting (higher payment for native species); 2017 – adoption of national PES law and 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 and 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 budget to restoration; PES schemes and conservation levies (on water and tourism) Viet Nam: 2011 – decree on payments for forest ecosystem services Espírito Santo (Brazil): 2008 – water fund and 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 the 1968 forest policy setting an increased role for communities in forest management and benefit-sharing schemes Madagascar: 1996 – GELOSE law devolving the management of natural resources to the local level; 2001 – GCF law defining co-management contracts

FLR = Forest Landscape Restoration; GCF = Gestion Contractualisée des Forêts; GELOSE = Gestion Locale Sécurisée; GGW = Great Green Wall for the Sahara and Sahel; PES = payment for ecosystem services.

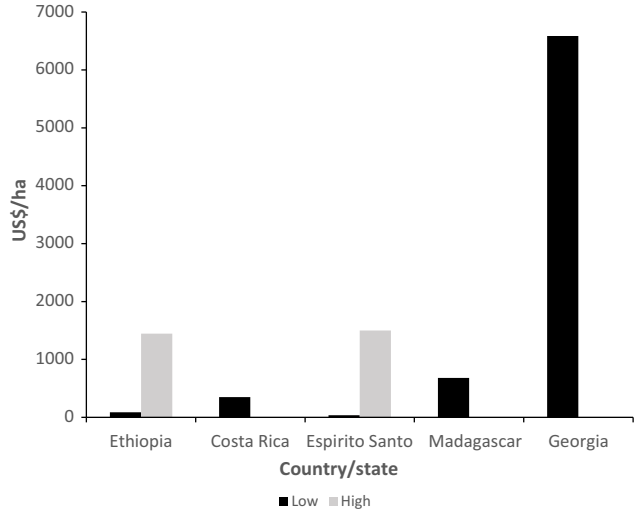

Fig. 1. Estimates of restoration costs in US$ per ha (note that for Ethiopia and Espírito Santo a low value and a high value have been identified).

in Costa Rica and Espírito 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$ .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 the scheme in Espírito Santo, for example, 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 3 years with 50% upfront when there is a revenue potential, whilst they are for 5 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).

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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 Ethiopia's 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 Espírito Santo, a dedicated state agency, the Secretaria de Estado do Meio Ambiente e Recursos Hídricos (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 taxes (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 supporting local communities, and they 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 engaged in tree planting. In Ethiopia's Chilimo Forest Reserve, a 7% increase in forest cover was observed in 2003–2012 thanks to the rollout 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 programmes, 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 organizations (NGOs, both local and international) negotiate participatory forest management contracts and implementation with communities. The Regreening Africa programme, 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 Espírito Santo, the World Bank and NGOs partnered with the state government to develop the restoration programme Reflorestar. 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 Espírito 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 2004 in Niger, 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 2022). 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).

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 roles 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 10 studied 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 favourable 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

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Table 4. Commitments under the Rio Conventions.

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 ha of forests
Bhutan	Implement afforestation/reforestation, agroforestry and 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 9000 ha of pasture to forests in the Caribbean; by 2030, restore 3200 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 by 15% to a figure of 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 and restoration of 427 730 ha of forest land; by 2036, rehabilitate 21 359 490 ha of forest land (stop conversion); by 2026, promote plantation of indigenous species and improve the productivity of 33 452 ha	Expand forest beyond the target of 7 million ha; re-establish forests to sequester CO_2; 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 and standards that promote restoration of the natural forest landscape and climate adaptation and mitigation	By 2030, restore *c.* 1500 ha of degraded forest and reforest *c.* 7500 ha	Afforestation/reforestation on 1500 ha of degraded lands by 2030; if external financial and technical support is available, 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	Stabilize and rehabilitate habitats and ecosystems; develop and implement reforestation programmes; protect and 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 (and 55 000 ha by 2030) of forests and mangroves
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 north-west, highland and south-central regions; timber plantation in 80 000 ha in the north-west and south-central regions. With international support, restore natural forest in 250 000 ha and afforest 100 000 ha in the north-west, highland and south-central regions; timber plantation in 100 000 ha in the north-west and south-central regions	Increase forest cover to 42.0–42.5%; 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

CBD = Convention on Biological Diversity; INDC = Intended Nationally Determined Contribution; LDN = Land Degradation Neutrality; NA = not applicable; NBSAP = National Biodiversity Strategy and Action Plan; NDC = Nationally Determined Contributions; UNCCD = United Nations Convention to Combat Desertification; UNFCCC = United Nations Framework Convention on Climate Change.

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.

Sectoral integration

Sectoral integration is starting to be promoted in a handful of cases. For example, in Costa Rica, the 2016 Politica 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 Espírito Santo, the 1998 water law promotes integrated watershed management. Furthermore, to comply with the Brazilian Forest Code, the

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State of Espírito 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, totalling 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 levying 10% from the corporate social responsibility budgets of different ministries has been proposed. 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.

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 to 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 in the 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, however, identified these factors as relevant, serving to flag the need to consider these dimensions in forest restoration.

Motivation

The 15 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 motivations. 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, are 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 has also been 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 programmes were imposed by the governments of Japan and the Republic of Korea (Meyfroidt & Lambin 2011). Taking this one step further, Brancalion and 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 PES schemes or participatory forest management. PES schemes emerging from forest restoration have played a clear role in Costa Rica and Espírito 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 (Ghazoul & Chazdon 2017, Holl 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., labour, 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 Espírito Santo, legal measures to punish those converting forests have in some cases proven less effective (e.g., in Ethiopia). The combination of such 'carrots and sticks' has been shown to be useful within REDD+ programmes (Duchelle et al. 2017).

Similarly to Melo et al. (2013), Lazos-Chavero et al. (2016), Murcia et al. (2016), Thomas et al. (2017) and Brancalion and 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 fundamentally important 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 well-being (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 *c.* 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 to maintain trees over the long term (Nagendra 2007, McLain et al. 2021). 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.

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Sustaining

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 that are 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 totalling 1 billion ha. While these commitments do not always translate into action, they provide the framing for subsequent national- and subnational-level actions.

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 subnational data present a more positive picture. In all cases, no single factor has enabled large-scale restoration, but rather a combination of factors can achieve this. 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 programmes. 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 otherwise) 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 for achieving rapid and positive outcomes remains to be achieved. 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 to measure their role in achieving restoration. In addition, 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.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/S0376892922000340.

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