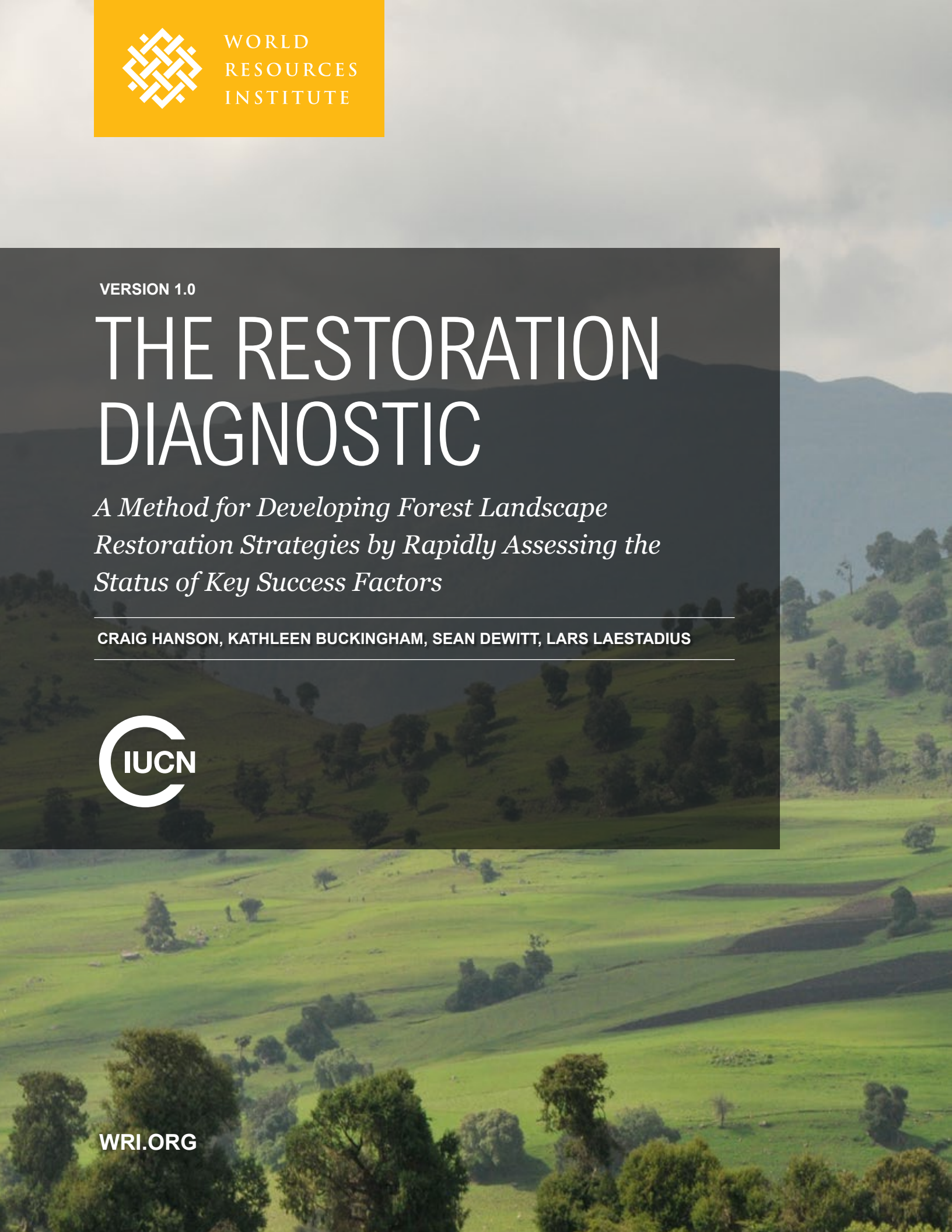

WORLD RESOURCES INSTITUTE

VERSION 1.0

THE RESTORATION DIAGNOSTIC

A Method for Developing Forest Landscape Restoration Strategies by Rapidly Assessing the Status of Key Success Factors

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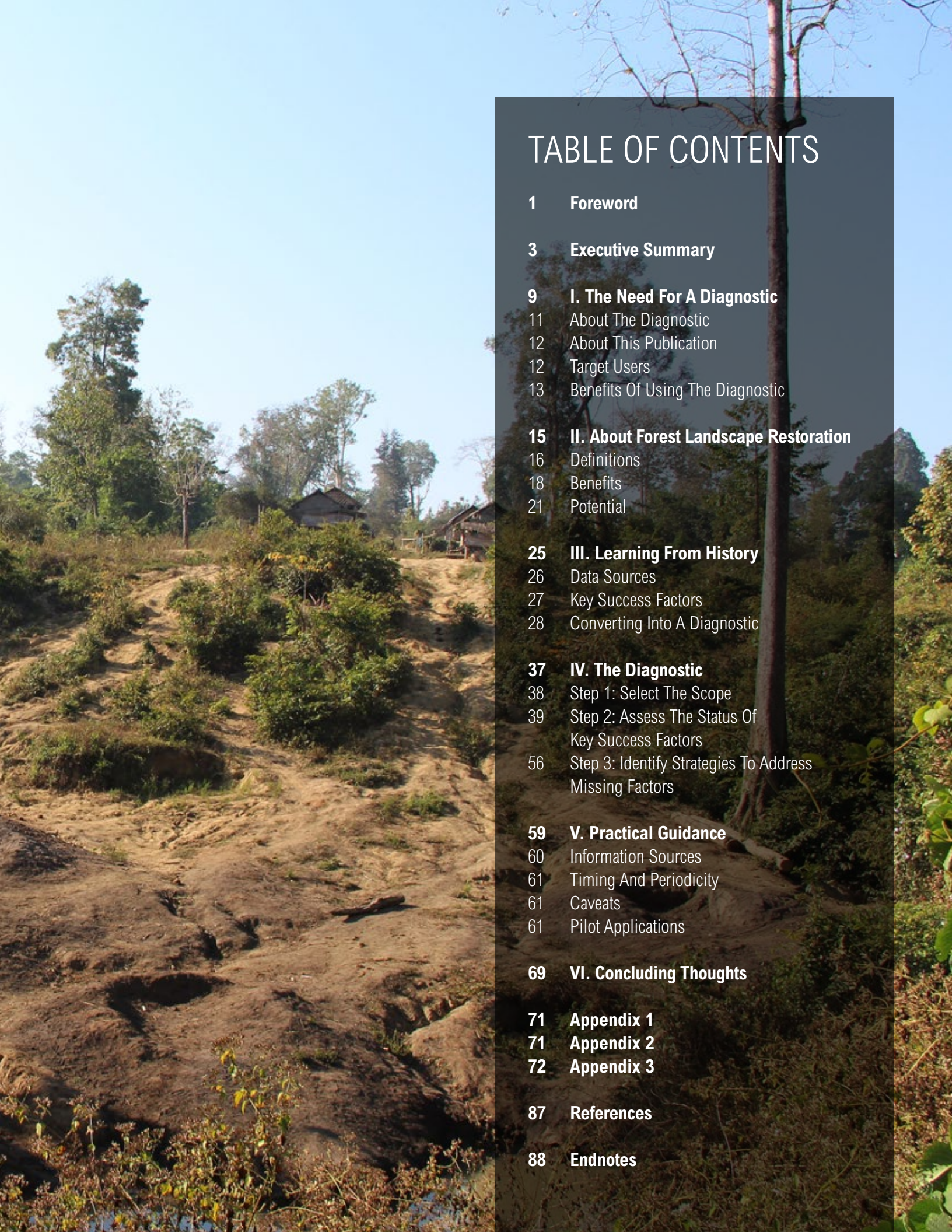

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FOREWORD

"You've convinced my government that embarking on forest landscape restoration is in our national interest, and your global map[1] has inspired us to map our local restoration opportunities. When it comes to restoration, our question now is no longer what, why, or where, but rather how." That was a Central American government official's response to a map created in 2011 by World Resources Institute (WRI), the International Union for Conservation of Nature (IUCN), and research partners now at the University of Maryland. The map showed the potential for forest landscape restoration around the world.

It is with this question in mind that WRI developed The Restoration Diagnostic ("diagnostic"). Governments, civil society, and companies need to get the "how" of restoration right if landscapes are to be restored on a large scale. To gain a better understanding of the "how," we looked back on historical forest landscape restoration experiences to discern the approaches and conditions that appear to facilitate restoration. In this effort, we identified several key factors for successful restoration.

We converted these insights into a diagnostic—a structured self-assessment to comprehensively identify which factors for forest landscape restoration success are already in place and which are missing within a landscape being considered for restoration. This diagnostic can help decision makers and stakeholders identify gaps in key success factors and thereby focus their efforts on the most important of them to get into place, maximizing the return on invested human, financial, and political capital.

It is my sincerest aspiration that readers will use this diagnostic to embark on successful forest landscape restoration and in turn reap the economic, social, and environmental benefits that restoration can provide. In 2011, members of the Global Partnership on Forest Landscape Restoration put forth the Bonn Challenge, a call for nations, civil society, and the private sector to start restoring 150 million hectares of lost or degraded forest landscapes by 2020. And in 2014, a coalition of governments, companies, indigenous communities, and non-governmental organizations made the New York Declaration on Forests, a call to begin restoring an additional 200 million hectares of cleared or degraded forest landscapes by the year 2030. This diagnostic is designed to help those making restoration commitments achieve these goals.

Let the restoration generation begin!

Andrew Steer
President and CEO
World Resources Institute

EXECUTIVE SUMMARY

Most countries around the world have an untapped resource opportunity lying within their borders: the restoration of forest landscapes. “Forest landscape restoration” is the process of regaining ecological functionality and enhancing human well-being across cleared or degraded forest landscapes. It can result in a variety of land uses, ranging from vast tracts of dense natural forests, to high-yield agroforestry systems, to a mosaic of wooded areas amid productive agricultural fields. Forest landscape restoration does not call for increasing tree cover beyond what would be ecologically appropriate for a particular location.

Forest landscape restoration can yield a number of economic, social, and environmental benefits. Economically, it can diversify economies, reduce damages from natural hazards, generate marketable forest and agricultural products, and support recreation and tourism. Socially, it can create jobs, help alleviate local poverty, increase food security, support cultural heritage, and strengthen national pride. Environmentally, it can improve and sustain soil and water quality, conserve biodiversity, and help people mitigate and adapt to climate change. Furthermore, forest landscape restoration can help governments meet several national and international agreements and commitments including those regarding reduced emissions from deforestation and forest degradation in developing countries (REDD+), the Convention to Combat Desertification, the Convention on Biological Diversity, the Sustainable Development Goals, the New York Declaration on Forests, and the Bonn Challenge.

History indicates that forest landscape restoration is possible. Many countries—including Costa Rica, Niger, South Korea, Sweden, and the United States—have recovered forest landscapes during the past century in a manner that could be considered "successful" in terms of being at a significant scale and generating stakeholder benefits. Our analysis of these and other historical case studies—16 in all—complemented by peer-reviewed literature suggests that a successful restoration process exhibits three common themes:

1. **A clear motivation.** Decision makers, landowners, and/or citizens were inspired or motivated to catalyze processes that led to forest landscape restoration.
2. **Enabling conditions in place.** A number of ecological, market, policy, social, and institutional conditions were in place that created a favorable context for forest landscape restoration.
3. **Capacity and resources for sustained implementation.** Capacity and resources were mobilized to implement forest landscape restoration on a sustained basis on the ground.

Within each theme, our research points to a number of factors that were present—either naturally or through human action—in cases where forest landscape restoration processes occurred. We call these "key success factors" for forest landscape restoration (Table ES-1). We do not use this term to necessarily imply causation; establishing causal links requires additional research. Rather, our assessment indicates that a large number of these factors were in place where restoration has occurred in the past.

Table ES-1 | **Key success factors for forest landscape restoration**

THEME	FEATURE	KEY SUCCESS FACTOR
MOTIVATE	BENEFITS	Restoration generates economic benefits
		Restoration generates social benefits
		Restoration generates environmental benefits
	AWARENESS	Benefits of restoration are publicly communicated
		Opportunities for restoration are identified
	CRISIS EVENTS	Crisis events are leveraged
	LEGAL REQUIREMENTS	Law requiring restoration exists
		Law requiring restoration is broadly understood and enforced
ENABLE	ECOLOGICAL CONDITIONS	Soil, water, climate, and fire conditions are suitable for restoration
		Plants and animals that can impede restoration are absent
		Native seeds, seedlings, or source populations are readily available
	MARKET CONDITIONS	Competing demands (e.g., food, fuel) for degraded forestlands are declining
		Value chains for products from restored area exists
	POLICY CONDITIONS	Land and natural resource tenure are secure
		Policies affecting restoration are aligned and streamlined
		Restrictions on clearing remaining natural forests exist
		Forest clearing restrictions are enforced
	SOCIAL CONDITIONS	Local people are empowered to make decisions about restoration
		Local people are able to benefit from restoration
	INSTITUTIONAL CONDITIONS	Roles and responsibilities for restoration are clearly defined
		Effective institutional coordination is in place
IMPLEMENT	LEADERSHIP	National and/or local restoration champions exist
		Sustained political commitment exists
	KNOWLEDGE	Restoration "know-how" relevant to candidate landscapes exists
		Restoration "know-how" transferred via peers or extension services
	TECHNICAL DESIGN	Restoration design is technically grounded and climate resilient
		Restoration limits "leakage"
	FINANCE AND INCENTIVES	Positive incentives and funds for restoration outweigh negative incentives
		Incentives and funds are readily accessible
	FEEDBACK	Effective performance monitoring and evaluation system is in place
		Early wins are communicated

Building on these insights from history, *The Restoration Diagnostic* is a three-step process (Figure ES-1) for developing strategies for successful forest landscape restoration:

1. Users define the scope or geographic boundary within which to apply the diagnostic—such as a country, county, or watershed.
2. Users conduct an assessment to identify which key success factors are already in place—and which are not—within the landscape being considered for restoration.
3. Users identify which policies, incentives, and practices would address the missing factors.

When applied prior to initiating a restoration process, the diagnostic can help decision makers and stakeholders focus their efforts on getting the missing key success factors in place—before large amounts of human, financial, or political capital are invested. When applied periodically as landscape restoration progresses, the diagnostic can help decision makers and implementers sustain restoration progress through adaptive management. As a result, application of the diagnostic may increase the likelihood that forest landscape restoration processes will be successful.

We designed the diagnostic to be used by mid-level managers—and analysts that support these managers—from organizations interested in encouraging forest landscape restoration. Government agencies—particularly those responsible for planning, forests, agriculture, environment, or rural development—comprise one key user group. Nongovernmental organizations that advocate for or help implement restoration are another. Landowners and communities (or their representatives) can use the diagnostic, as can development agencies and financial institutions considering financing forest landscape restoration programs. Furthermore, companies considering forest landscape restoration—such as those needing to meet legal requirements after extractive operations are completed—can use the diagnostic as a planning tool.

The diagnostic is a stand-alone tool as well as a component within the *Restoration Opportunities Assessment Methodology* (ROAM). ROAM provides guidance on identifying where forest landscape restoration is feasible or desirable; quantifying the benefits of restoration; and determining what types of restoration are most appropriate economically, socially, and ecologically for a particular place.

Figure ES-1 | **Steps When Conducting *The Restoration Diagnostic***

STEP	ACTIVITY	END PRODUCT	ESTIMATED TIME	FOR DETAILS
1. SELECT THE SCOPE	Choose the "scope" or boundary within which to apply the Diagnostic. The selected scope will be the "candidate landscape."	Candidate landscape for conducting Diagnostic	A few days	Page 38
2. ASSESS STATUS OF KEY SUCCESS FACTORS	Systematically evaluate whether or not key success factors for forest landscape restoration are in place for the candidate landscape.	List of missing (partially or entirely) key success factors	2-4 weeks	Pages 38-55
3. IDENTIFY STRATEGIES TO ADDRESS MISSING FACTORS	Identify strategies to close gaps in those key success factors that are currently not in place or only partly in place in the candidate landscape.	Set of strategies	2-3 weeks	Pages 56-57

SECTION I

THE NEED FOR A DIAGNOSTIC

Costa Rica is truly a “green phoenix.” In 1943, forests covered 77 percent of the nation’s land area (GOCR 2011). By 1987, this figure had declined to only 40 percent. Yet through a series of restoration efforts, the nation’s forest area climbed back to nearly 50 percent by 2005, yielding a variety of benefits for Costa Rica’s environment, economy, and citizens (Calvo-Alvarado 2009).

The road to recovery, however, was not smooth. The government tried to stimulate tree planting during the 1970s and 1980s, in part through a set of tax and lending incentives. But there was little on-the-ground progress. Inadequate restrictions on deforestation and lucrative cattle ranching outweighed the fiscal incentives for restoration. It was not until the government curtailed cattle subsidies and improved enforcement of anti-deforestation laws in the 1990s that Costa Rica's forest fortunes turned around (Calvo-Alvarado et al. 2009).

The road to restoration in the African country of Niger was not smooth either. In the late 1960s, regions in southern Niger were experiencing severe desertification. In the 1970s and early 1980s, international development agencies focused their forest sector investments on tree planting to battle desertification and replenish stocks of fuel wood, but to little avail. Less than half of the 60 million trees that were planted survived (WRI 2008). Prospects changed after the mid-1980s once farmers perceived that they owned the trees on their land and had a right to the benefits from them—a perception that government policy reforms regarding tree tenure were starting to support (Larwanou et al. 2006).

Since then, farmers have restored more than five million hectares of semi-desert landscape into an open woodland agroforestry system with more than 200 million trees, including the native *Faidherbia albida*, which fixes nitrogen and increases soil organic matter. As a result, crop yields have increased, areas with a high density of on-farm trees have produced a grain surplus even during drought years (Yamba and Sambo 2012), household incomes have nearly doubled, and in some areas, biodiversity has returned to a once-parched landscape (WRI 2008).

The experiences of Costa Rica and southern Niger highlight a range of interacting factors that play a role in stimulating or, in their absence, preventing restoration in forest landscapes. What if decision makers in both countries had fully diagnosed the suite of factors at play in the early 1970s? Restoration might have proceeded more quickly and more efficiently than it ultimately did, since decision makers would have identified that several important enabling conditions for restoration were not in place—despite the best of intentions.

Many countries today have significant opportunities to restore their forest landscapes. But facing scarce resources, decision makers will want the restoration process to be efficient and cost effective. They will want the road to recovery to be as smooth as possible. And they will want to learn from the past so they can achieve successful forest landscape restoration in the future. We designed *The Restoration Diagnostic* (hereafter "diagnostic") to help them achieve these goals.

About the Diagnostic

The diagnostic is a three-step process for developing strategies to increase the likelihood of achieving successful forest landscape restoration. It is based on "key success factors" that we identified in restoration experiences over a wide range of conditions over the past 150 years. As we use it here, the term "key success factors" does not necessarily imply causation. Rather, it refers to factors that may have contributed to forest landscape restoration progress in terms of hectares restored, benefits realized, and stakeholder support.

In the first step, users define the scope or boundary within which to apply the diagnostic. In the second step, users assess which key success factors for forest landscape restoration are missing or are only partially in place within the area being considered for restoration. In the third step, users identify which policies, incentives, and practices would address the missing key success factors and thereby overcome potential barriers to restoration. The diagnostic is thus an analytical process underpinning efforts to remove possible obstacles to forest landscape restoration.

The diagnostic is intended to serve as a rapid yet holistic assessment. It is qualitative yet substantiated with quantitative data where relevant. When applied prior to a restoration process, the diagnostic can help decision makers and restoration stakeholders focus on putting the key success factors in place—before large amounts of human, financial, or political capital are invested. When reapplied periodically as a landscape is undergoing restoration, the diagnostic can help decision makers and stakeholders adjust and refine their strategies as part of adaptive management.

BOX 1 | THE GLOBAL PARTNERSHIP ON FOREST LANDSCAPE RESTORATION

The Global Partnership on Forest Landscape Restoration (GPFLR) is a worldwide network of governments, United Nations and other intergovernmental agencies, nongovernmental organizations, research institutions, and companies dedicated to advancing forest landscape restoration. The partnership provides information, tools, and platforms to strengthen restoration processes around the world and build support for restoration with decision makers and opinion formers, both at the local and international levels. See www.forestlandscaperestoration.org/ for more details about the GPFLR and its membership.

The diagnostic is intended to inform forest landscape restoration strategies. A literature review and analysis of historical experiences of restoration within *forest* landscapes served as the primary foundation for its development. With collaborators, we road-tested draft versions of the diagnostic on forest landscapes in Brazil, Rwanda, and Ecuador, incorporating insights and feedback from these road tests. Consequently, its applicability to the restoration of non-forest ecosystems—such as grasslands or wetlands—is unknown and untested.

About this Publication

This publication begins by defining "forest landscape restoration," its benefits to people and the planet, and the scale of the restoration opportunity.[2] It continues by introducing what we identified through a literature review and analyses of 16 case examples as key success factors for forest landscape restoration. It then presents the diagnostic tool and the three steps of its application. It concludes by providing practical guidance on how to use the diagnostic.

With input from the International Union for Conservation of Nature (IUCN), the World Resources Institute (WRI) developed the diagnostic as a contribution to the Global Partnership on Forest Landscape Restoration (GPFLR) (Box 1). The diagnostic is a component of the *Restoration Opportunities Assessment Methodology* (ROAM), developed by IUCN and WRI (Box 2). ROAM is a broad approach for systematically identifying forest landscape restoration opportunities, agreeing on restoration goals, and designing strategies for implementing restoration at the landscape scale. Among other things, ROAM provides robust guidance on selecting forest landscapes as candidates for restoration, whether at the regional, country, county, or watershed level. For those selected landscapes, users then apply the diagnostic in order to develop appropriate and effective restoration strategies. In situations where a landscape has already been identified as a candidate for restoration or is already in the restoration process (and users seek to refine the restoration strategy), users can apply the diagnostic independently of ROAM.

Target Users

The diagnostic's intended users are mid-level managers—particularly those responsible for strategy development or policy design—and the analysts who support them. Target users may come from a variety of organizations, including:

- Government agencies at national, state, provincial, and/or local levels that are interested in exploring or pursuing forest landscape restoration. Relevant agencies include those responsible for agriculture, environment, forests, planning, rural development, and water.
- Nongovernmental organizations and civil society groups that advocate for and/or help implement forest landscape restoration.
- Landowners and communities, or their representatives, in candidate landscapes.
- Companies exploring forest landscape restoration.
- Development agencies and financial institutions considering financing forest landscape restoration programs and projects.
- Technical advisors or consultants to any of the above.

Benefits of Using the Diagnostic

The diagnostic is designed to help users:

- **Understand key success factors.** Because the diagnostic is informed by peer-reviewed literature and an analysis of 16 case examples of restoration from different geographical contexts over the past 150 years, it enables users to learn what worked and did not work in the past. Armed with these lessons, users can better understand the key success factors for restoration.
- **Identify gaps.** Although there is no generic recipe for restoration, there are ingredients that are common in many cases of successful restoration—the key success factors. The diagnostic can help users identify which of these factors are already in place for the candidate landscape. It can also reveal gaps: key success factors that are partially in place or missing.
- **Focus strategies.** Decision makers typically face constraints and therefore seek to allocate resources efficiently. By identifying the gaps, the diagnostic can help users focus their policies, incentives, and practices.

Combined, these benefits can increase the likelihood that forest landscape restoration will be successful.

BOX 2 | THE *RESTORATION OPPORTUNITIES ASSESSMENT METHODOLOGY*

Developed by IUCN and WRI, the *Restoration Opportunities Assessment Methodology* (ROAM) is an approach for systematically identifying forest landscape restoration opportunities and designing strategies for implementing restoration at the landscape scale. It guides users on:

1. Mapping where restoration is geographically possible
2. Identifying candidate landscapes for restoration
3. Defining the goals of restoration in a candidate landscape
4. Quantifying the economic, social, and environmental benefits of potential restoration
5. Developing strategies for restoring landscapes by identifying which key success factors of forest landscape restoration are missing in the candidate landscape and identifying approaches for addressing them
6. Determining what types of restoration are most appropriate socially and ecologically for a particular area
7. Involving stakeholders in all of the above.

The Restoration Diagnostic is one technical tool of ROAM, providing guidance on item 5 above. IUCN and WRI published a road-test version of ROAM in 2014, which is available at: www.iucn.org/roam.

Because the diagnostic is informed by peer-reviewed literature and an analysis of 16 case examples of restoration from different geographical contexts over the past 150 years, it enables users to learn what worked and did not work in the past.

SECTION II

ABOUT FOREST LANDSCAPE RESTORATION

Without human interference, forests would cover nearly half of Earth's landmass and be the dominant land-based ecosystem. The actual situation, however, differs significantly from the potential. This contrast suggests that about 28 percent of potential forestland has been cleared, making way primarily for agricultural crops and grazing land.

Another 19 percent has been degraded—wherein tree density, diversity, or canopy has declined—often through activities such as selective logging and small-scale agriculture. (Degradation in this sense does not necessarily mean soil degradation or loss of soil nutrients and organic matter.) A significant share, 38 percent, is now secondary or fragmented forests. Only 15 percent is primary, intact forest[3] with vast stretches undisturbed by roads or other clear signs of recent human impact (Figure 1).

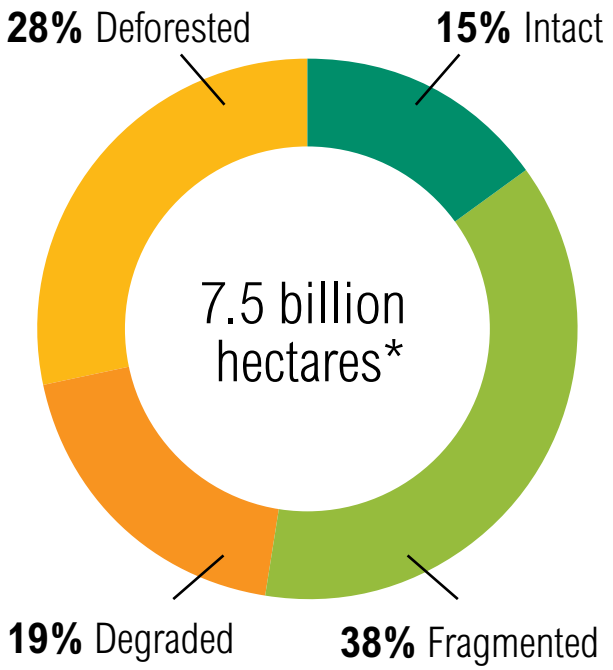
But past losses can be turned into future gains. Through a process called "forest landscape restoration," many of these areas can be restored, generating benefits that grow with the trees.

Definitions

Forest landscape restoration (sometimes referred to as "forest and landscape restoration") is the process of regaining ecological functionality and enhancing human well-being across deforested or degraded forest landscapes (Maginnis et al. 2005). It is about "forests" because it involves increasing the number and/or health of trees or woody plants in an area to a level appropriate for the native ecosystem.[4] It is about "landscapes" because it involves going beyond restoring individual sites to restoring entire watersheds, jurisdictions, or even countries in which many land uses interact and where people live and work. It also recognizes that a landscape might contain several adjacent or otherwise interconnected ecosystem types (not all of which may be forests or should have an increase in tree cover). It is about "restoration" because it involves bringing back the ecological functions of an area in order to achieve a wide range of benefits for people and the planet. Finally, it is about a "process" because it typically takes a long time for a forest landscape to recover, although some of the ecological functions and human benefits provided by restoration may appear early on.

Consequently, the forest landscape restoration process is often "big in space and big in time." It is not necessarily centrally planned, but rather often facilitated by getting the right context or "enabling conditions" in place. When realized in optimal fashion, the process aligns with a number of guiding principles of forest landscape restoration (Appendix 1).

Figure 1 | **Current Status of Lands Where Forests Can Grow**



* This amount is the land area that has climate and soil conditions suitable for forests. The 53% that is "intact" or "fragmented" approximates the 3.9 billion hectares of "forest" identified by the FAO. Intact = forest landscape greater than 50,000 hectares in which no signs of human impact can be observed. Fragmented = forest landscape with visible signs of human impact including roads, villages, and clear cuts, but without visible loss of tree canopy cover at the landscape level. Degraded = forest landscape where tree canopy cover has been visibly reduced at the landscape level but not fallen below 10%. Deforested = potential forest landscape where the actual tree canopy cover is less than 10%. Note that this figure is based on a comparative analysis between potential and actual tree canopy cover. Some areas where the actual tree cover is so much below the potential that they have been classified as "degraded" or "deforested" may be in the process of recovering naturally.
Source: Laestadius et al. (2012); FAO (2010).

People use a variety of terms in relation to forest landscape restoration, such as reforestation, forest recovery, ecological restoration, natural regeneration, rehabilitation, and others. For the purpose of this diagnostic, "forest landscape restoration" encompasses all of these terms (Table 1). What each of these terms share in common is reference to the regrowth of trees on a landscape.

Table 1 | **Some Definitions Relating to Forest Landscapes and Landscape Restoration Processes**

STAGE	CONCEPT	DEFINITION
General	LANDSCAPE	A broad, land-based socioecological system, measured in thousands of hectares or more, typically consisting of a mosaic of ecosystems and/or management units (adapted from Scherr et al. 2013).
	FOREST	An ecosystem characterized by a more or less dense and extensive tree cover, often consisting of stands varying in characteristics such as species composition, structure, age class, and associated processes, and commonly including meadows, streams, fish, and wildlife (Society of American Foresters 2011).
	FOREST LANDSCAPE	A landscape that is naturally capable of supporting forests, woodlands, or tree canopy cover of 10 percent or more. At one end of the spectrum, the landscape has 100 percent tree canopy cover; at the other end, the landscape has 10 percent tree canopy cover and the rest is composed of grasses and/or shrubs.
Before restoration	DEFORESTATION	The conversion of forest to other land use or the permanent reduction of the tree canopy cover below the minimum 10 percent threshold. Deforestation implies the long-term or permanent loss of forest cover and implies transformation into another land use (FAO 2012).
	DEFORESTED LAND	Areas of forest converted to agriculture, pasture, water reservoirs, and urban areas. The term specifically excludes areas where the trees have been removed as a result of harvesting or logging, and where the forest is expected to regenerate naturally or with the aid of silvicultural measures, unless logging is followed by the clearing of the remaining logged-over forest for the introduction of alternative land uses (FAO 2012).
	FOREST DEGRADATION	The reduction of the capacity of a forest to provide goods and services (FAO 2012).
	DEGRADED FOREST	A secondary forest that has lost through human activities the structure, function, species composition, or productivity normally associated with a natural forest type expected on that site (CBD 2001).
Restoration processes	FOREST LANDSCAPE RESTORATION	The process of regaining ecological functionality and enhancing human well-being across deforested or degraded forest landscapes (Maginnis et al. 2005).
	ECOSYSTEM RESTORATION	Restoration and rehabilitation of degraded lands, ecosystems, and landscapes (Hyderabad Call 2012).
	ECOLOGICAL RESTORATION	The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed (SER 2004).
	REHABILITATION	The reversal of site degradation, usually for the purpose of increasing its capacity to provide ecosystem services (Galatowitch 2012).
	RECLAMATION	Improving a locale from a less useful to a more useful condition (Galatowitch 2012).
	FOREST RECOVERY	The process through which a forest gains sufficient biotic and abiotic resources to continue its development without further assistance or subsidy and demonstrate resilience to normal ranges of environmental stress and disturbance (SER 2004).
	REFORESTATION	Any conversion of a non-forested land to forest, whether by planting trees or by natural regrowth (Meyfroidt and Lambin 2011).
	FARMER-MANAGED NATURAL REGENERATION	A management practice in which farmers use silviculture and coppicing techniques to regrow trees from remaining live tree roots, from seed banks in the soil, and seeds in livestock manure (adapted from USAID 2014).
	ACTIVE RESTORATION	Accelerating the process or attempting to change the trajectory of succession via human interventions (e.g., tree planting), beyond merely removing a source of disturbance (Vaughn et al. 2010). In this publication, this term is used interchangeably with "artificial regeneration."
	PASSIVE RESTORATION	Allowing natural succession to occur in an ecosystem after removing a source of disturbance (Vaughn et al. 2010). In this publication, this term is used interchangeably with "natural regeneration."
	NATURAL REGENERATION	The reestablishment of a forest or increased tree cover through spontaneous successional processes. The process by which forest landscapes are restocked by trees that develop from seeds that fall and germinate in situ (UK Forestry 2015).
	ARTIFICIAL REGENERATION	The reestablishment of a forest or increased tree cover by planting trees or other human-assisted processes.
	ASSISTED NATURAL REGENERATION	The reestablishment of a forest or increased tree cover through spontaneous successional processes by removing or reducing barriers to natural regeneration of trees such as soil degradation, competition from weedy species, and recurring disturbances (e.g., fire, grazing, wood harvesting) (adapted from FAO 2014).
Restoration end states	AGRO-FOREST	A complex of treed areas within an area that is broadly characterized as agricultural or as an agroecosystem (CBD 2014).
	SECONDARY FOREST	A forest that has been logged or otherwise thinned or cleared and has recovered naturally or artificially (CBD 2014).
	NOVEL ECOSYSTEM	New, nonhistorical configurations of ecosystems owing to changing species distributions and environmental alteration through climate and land-use change (Suding 2011).

Note: These definitions are compiled from sources independent of this publication and are not necessarily mutually exclusive.

What forest landscape restoration looks like in a technical sense can vary by location along at least four dimensions (Figure 2):

- **Why trees are restored.** Forest landscape restoration can yield one or more ecosystem services, such as reducing erosion, preventing landslides, improving water quality, regulating water flows, storing carbon, or providing habitat for plant and animal biodiversity. Likewise, restoration can yield one or more goods, such as timber, nontimber forest products, or food.
- **How trees are restored.** Forest landscape restoration can occur via passive restoration, where trees regrow spontaneously in an area with no or minimal human interference beyond the cessation of activities—such as livestock grazing, fire, or tree cutting—that were keeping trees from returning to the landscape. Alternatively, forest landscape restoration can occur via active restoration, where people plant trees or seeds and apply silvicultural practices to improve tree health and survival. There are combinations of approaches between passive and active restoration. For instance, people can apply silvicultural practices to trees that were not planted by people.
- **Where trees are restored.** Forest landscape restoration can occur on public lands as well as on privately owned lands (e.g., individual, family, community, business). It can occur on lands where a naturally dense forest would grow and on lands where grass is the natural, dominant vegetation between scattered trees and bushes. Forest landscape restoration, however, does not call for increasing tree cover beyond what would be ecologically appropriate for a particular location.
- **What kinds of trees are restored.** Forest landscape restoration often occurs with only native species of vegetation. Yet in some cases, fast-growing exotic species serve as pioneer species to facilitate growth of native species under the canopy cover and/or to generate short-term income for farmers. Moreover, exotic species such as nonnative fruit trees are sometimes introduced and managed to yield some desired benefit, such as food or fuel.

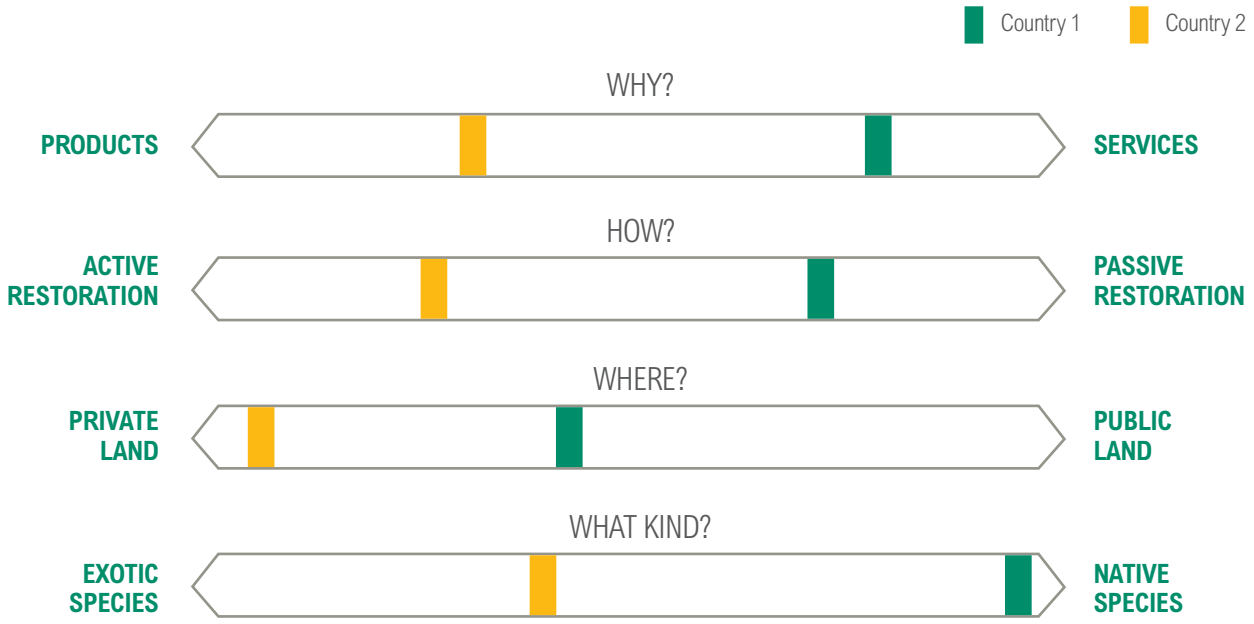
In reality, restoration can occur anywhere along each of these four dimensions (Figure 2). Consider illustrative country 1, where restoration occurred near a national park. The primary rationale was to provide habitat for wildlife and protect the watershed. Most of the trees recovered via passive restoration, although some planting was needed. The lands restored were a mix of public and private lands, and only native species were restored. Contrast this with illustrative country 2, where restoration was into an agroforestry system. The landscape was restored primarily to produce food and fodder, although ancillary benefits included ecosystem services such as increased watershed protection. Trees returned to the landscape primarily through active tree planting on private lands. The farmers planted a mix of nonnative fruit trees along with native nitrogen-fixing trees and shrubs.

Benefits

Forest landscape restoration can generate many economic, social, and environmental benefits (Table 2). Economically, it can diversify local and national economies, avoid or reduce damages from natural hazards, generate marketable forest products, and yield recreation and tourism opportunities. Socially, it can create jobs, help alleviate local poverty, increase food security, and generate a sense of national pride. Environmentally, it can improve and sustain soil and water quality, conserve biodiversity, and contribute to climate change mitigation and adaptation. These benefits can accrue to local people living in and around the restored landscape, to national economies, and to the global commons.

Moreover, forest landscape restoration can help governments meet several national and international agreements and commitments. For instance, climate agreements around REDD+ (reduced emissions from deforestation and forest degradation in developing countries) call for decreasing deforestation and increasing the carbon storage capacity of forests. Planting trees and restoring forests in landscapes are accepted approaches to meeting REDD+ commitments (UNFCCC 2010). Likewise, forest landscape restoration is an important component of a broader strategy for achieving climate-smart landscapes.

Figure 2 | **Forest Landscape Restoration Varies Along Several Dimensions**



Forest landscape restoration also can advance commitments beyond climate change. In 2010, parties to the Convention on Biological Diversity agreed to Aichi Target 15, which calls on countries to restore at least 15 percent of degraded ecosystems globally by 2020 (CBD 2010). The Bonn Challenge (Box 3) calls on countries and other actors to bring into the process of forest landscape restoration 150 million hectares of deforested and degraded forest land by 2020. And the New York Declaration on Forests—a voluntary political agreement among more than 150 governments, companies, indigenous communities, and nongovernmental organizations—calls on the world to begin restoring 350 million hectares of cleared or degraded forest lands by 2030.[5] Forest landscape restoration is an accepted approach for achieving each of these targets.

BOX 3 | THE BONN CHALLENGE

The Bonn Challenge calls on governments, intergovernmental organizations, nongovernmental organizations, and companies to voluntarily bring 150 million hectares of cleared and degraded forests into the process of forest landscape restoration by 2020 (IUCN 2014). This amount is equivalent to the size of Mongolia or three times the size of Spain, and would help counter the 5 million hectares of net deforestation the world experiences annually (FAO 2010). Commitments to the Bonn Challenge involve public and private sector actors publicly committing hectares, developing locally appropriate forest landscape restoration strategies, and beginning implementation by 2020. Achieving the Bonn Challenge would help meet numerous international commitments, such as those on climate change (UNFCCC REDD+), biodiversity conservation (Convention on Biological Diversity, Aichi Target 15), and development (the Sustainable Development Goals). The Bonn Challenge was announced in September 2011 at a ministerial conference co-hosted by the Government of the Federal Republic of Germany and IUCN, in collaboration with the GPFLR. For more information, visit www.forestlandscaperestoration.org.

Table 2 | **Potential Benefits of Forest Landscape Restoration (Not Exhaustive)**

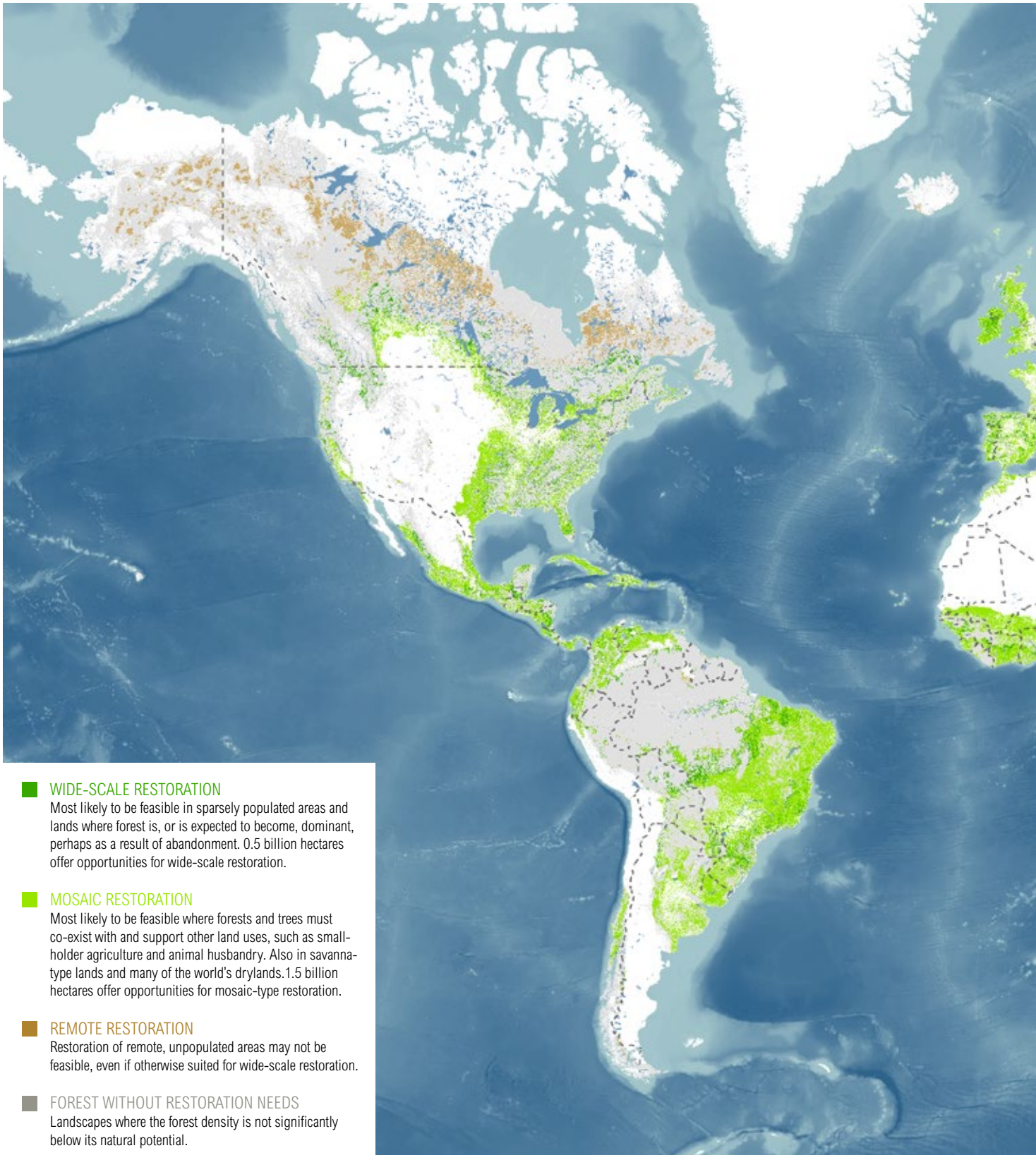
AREA	CATEGORY	BENEFIT
Economic	AVOIDED DAMAGE FROM NATURAL HAZARDS	■ Reduce risk of landslides ■ Reduce intensity and frequency of flooding ■ Reduce coastal impact of storm surges ■ Reduce damage to roads and built infrastructure
	ECONOMIC DIVERSIFICATION	■ Diversify range of economic activities for households, rural communities, and national economies (e.g., timber, nontimber forest products, agroforestry, tourism, payments for ecosystem services)
	FOREST PRODUCTS	■ Yield timber (including certified timber) ■ Provide fuel wood ■ Supply construction poles ■ Generate nontimber forest products
	RECREATION	■ Enable ecotourism
Social	FOOD SECURITY	■ Improve crop yields (through agroforestry) ■ Increase amount of wild food availability (e.g., fruit, nuts) ■ Increase animal feed or fodder (via silvopastoral systems) ■ Increase presence of pollinators ■ Increase presence of natural predators of crop pests
	JOBS	■ Create new jobs (e.g., seed collection, nursery management, tree planting, extension services, forest products production, ecotourism)
	NATIONAL PRIDE AND COMMITMENTS	■ Build national and/or cultural pride ■ Contribute to REDD+ under UNFCCC ■ Achieve Aichi Target 15 under the Convention on Biological Diversity ■ Contribute to the Bonn Challenge
	POVERTY ALLEVIATION	■ Increase and diversify smallholder incomes (through production of timber, nontimber forest products, and/or food)
	HUMAN HEALTH	■ Improve potability of drinking water ■ Save lives by reducing natural hazards (e.g., landslides)
	REJUVENATION	■ Create recreational fishing and hunting opportunities ■ Provide places for hiking, camping, bird-watching, etc. ■ Renew mental and spiritual well-being
Environmental	BIODIVERSITY	■ Reduce habitat fragmentation ■ Promote animal movement and seasonal migrations ■ Create new wildlife habitat ■ Conserve endangered species
	CLIMATE CHANGE	■ Increase carbon sequestration capacity ■ Ameliorate local temperatures due to cooling effect of forest cover ■ Increase adaptive capacity and resilience to climate change (e.g., migration corridors, income diversification)
	SOILS	■ Increase organic matter in soils ■ Increase amount of soil nutrients (e.g., nitrogen) ■ Reduce topsoil erosion
	WATER	■ Reduce topsoil erosion and siltation of reservoirs ■ Recharge groundwater supplies ■ Stabilize water flows ■ Ensure clean, stable supplies of freshwater for downstream water users, including cities ■ Support fish and other aquatic life

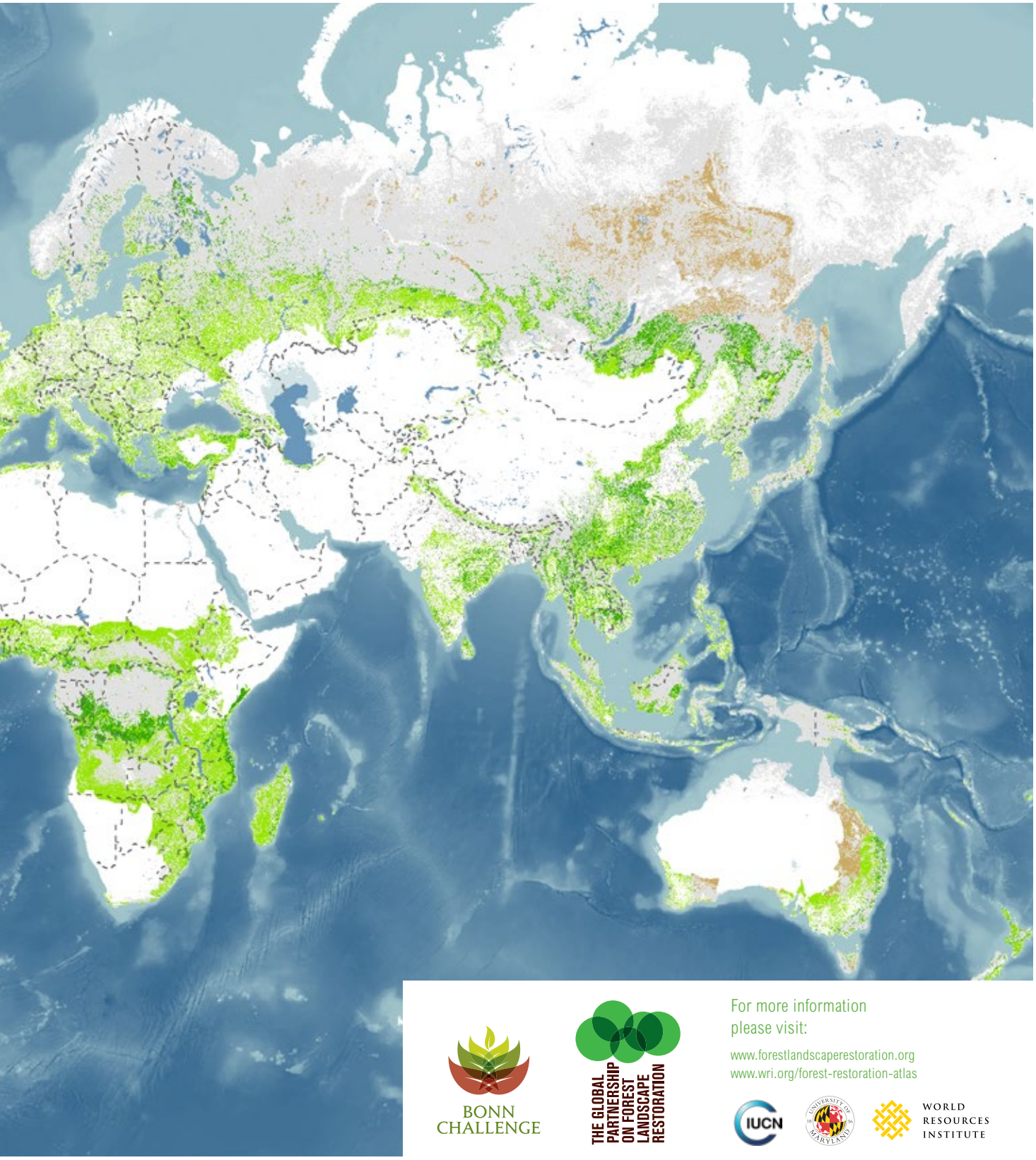
Potential

Forest landscape restoration is possible across a range of locations. To provide the GPFLR with a rough estimate of where and how much restoration is possible, WRI, IUCN, and research partners now at the University of Maryland generated a map of forest landscape restoration opportunities around the world (Figure 3). The analysis found that the area of cleared or degraded forest landscapes containing restoration opportunities is more than two billion hectares—equivalent to twice the size of China. And because this area spans 150 nations, forest landscape restoration is relevant to the majority of the world's countries. *See Appendix 2 for details on the mapping methods.*

The analysis also identified three broad types of restoration opportunity. "Wide-scale restoration" creates contiguous tracts of closed forest canopy. This is possible only in landscapes that have the low human population density and biological capacity needed to support dense forest. "Mosaic restoration" integrates trees with existing land uses, such as smallholder cropping and grazing, resulting in a multifunctional patchwork or mix of forests, trees, and other land uses, including agroforestry, agriculture, and settlements. Areas most suitable for mosaic restoration are those with higher population densities and multiple demands for goods from the landscape, such as food and forest products. Lands that can only support open and savanna-like forest also fall in this category. "Remote restoration" occurs in forests that have been degraded by fire or insects and are more than 500 kilometers from human settlements. These restoration opportunities are mainly in the far northern boreal forests, and because these areas are remote, direct human intervention for restoration is unlikely.

Figure 3 | **Forest Landscape Restoration Opportunities**





BONN CHALLENGE

THE GLOBAL PARTNERSHIP ON FOREST LANDSCAPE RESTORATION

For more information please visit:

www.forestlandscaperestoration.org
www.wri.org/forest-restoration-atlas

IUCN

WORLD RESOURCES INSTITUTE

For more information on how this map was created please see
L. Laestadius, et al. 2011. Mapping opportunities for forest landscape restoration. Unasylva 238, Vol. 62, 2011/2, p. 47-48.

SECTION III

LEARNING FROM HISTORY

History indicates that large-scale forest landscape restoration is possible. South Korea, for instance, restored much of its forests after the Korean War. Between 1953 and 2007, forest cover expanded from 35 percent to 64 percent of the country's total area, even while its population doubled and its economy grew 25-fold in real terms (Bae et al. 2012; World Bank 2014).

BOX 4 | LITERATURE REVIEW

Peer-reviewed literature provided one set of data points for developing the diagnostic. Although some of the literature did not set out to explicitly identify conditions that facilitate forest landscape restoration, their descriptions of restoration experiences from history and what drove these experiences indicated multiple conditions and actions that enabled the reemergence of trees in the countries or landscapes surveyed. Chazdon (2014), for instance, surveys past experience and highlights social, economic, and institutional drivers of restoration. Hecht et al. (2014) evaluate restoration throughout history, identifying cultural, social, and political influences inherent in restoration decisions. Lamb (2014) delves into best practices in large-scale forest landscape restoration. Meyfroidt and Lambin (2011) review forest restoration experiences around the world over several centuries, and summarize findings from other peer-reviewed literature. Gregersen et al. (2011) identify a number of factors after surveying a handful of countries with net forest gain.

The literature highlighted the importance of several features that appear to facilitate forest landscape restoration, including (but not limited to):

- The catalytic role of crisis events
- Presence and articulation of the benefits of restored landscapes to citizens and local people
- The need for the right ecological conditions (e.g., soils, source populations, seeds, seed dispersers, fire regime) for trees to regrow on the landscape
- Reductions in agricultural and fuel wood demand on areas to be restored
- The role of social conditions conducive to restoration
- Appropriate policies to simultaneously encourage restoration and reduce deforestation
- Public and private institutions and coordination among them to enable restoration
- Government and/or local individual leadership
- Transfer of restoration "know-how" among land managers
- Financial incentives for restoration that outcompete financial returns to the status quo land management practices.

South Korea is not alone. The eastern United States experienced a net gain of about 13 million hectares of forests between 1910 and 1960 (USDA n.d.). Puerto Rico's forest cover climbed from 6 percent of the island around 1940 to about 60 percent in 2010.[6] Sweden restored large areas of heathlands into forests starting in the late 1800s (Kardell 2004). Costa Rica and Niger also experienced large-scale restoration (see section I).

When developing the diagnostic, we sought to learn from this track record. Our premise was that forest landscape restoration experiences from history could provide insights into which ecological, social, political, and economic conditions facilitate successful restoration. We believed these insights could inform the design and execution of future restoration initiatives, increasing the likelihood of success.

Data Sources

We started by surveying peer-reviewed literature on forest landscape restoration, summarizing the factors that this research observed as conducive to restoration (Box 4). We complemented this literature review by identifying, researching, and profiling 16 historical forest landscape restoration experiences from around the world (Table 3 and Appendix 3).[7] We selected case examples recommended by GPFLR experts and for which research literature and relevant data were available. Crossing five continents, these case examples span both developed and developing countries. Some of these restoration experiences started in recent decades, while others started more than a century ago. Some cover millions of hectares while others just a few thousand. Some profile wide-scale restoration, while others profile mosaic restoration, including restoration into agroforestry systems. And while some are commonly cited case examples, others are less heralded.

For each, we profiled the restoration that occurred (e.g., hectares, time period, type of restoration); assessed its relative success; and identified factors that appeared to have facilitated it. Assessing the relative "success" of a forest landscape restoration case example is a judgment call, given that no two restoration experiences are the same and performance changes over time. For the purposes of developing the diagnostic, we based our determination of success on three factors: (1) restoration made progress in terms of hectares (relative to the

scale of the landscape); (2) restoration resulted in the generation of benefits (economic, social, and/or environmental); and (3) restoration had long-term stakeholder buy-in or acceptance.[8] Case example analyses included literature reviews and expert interviews. Profiles of each case example are available at www.wri.org/restorationdiagnostic.

Key Success Factors

Through the literature review, case examples, and interviews, we identified three common themes to successful restoration:

1. **A clear motivation.** Decision makers, landowners, and/or citizens were inspired or motivated to catalyze processes that led to forest landscape restoration.[9]
2. **Enabling conditions in place.** A number of ecological, market, policy, social, and institutional conditions were in place that created a favorable context for forest landscape restoration.
3. **Capacity and resources for sustained implementation.** Capacity and resources existed and were mobilized to implement forest landscape restoration on a sustained basis on the ground.

Within each theme, the literature review, interviews, and historical case examples suggest a number of factors that when present—either they were already there naturally or people took steps to make them present—may have facilitated restoration within the landscape. We call these "key success factors" for forest landscape restoration (Table 4).

Table 5 indicates which key success factors we identified as exhibited in each case example. Insights and caveats to note include:

- Our analysis does not prove "causation" between the key success factors and successful restoration. The presence of the key success factors does not necessarily guarantee successful restoration. Rather, we identified factors that were present in the case examples and literature review and that may have contributed to progress in terms of hectares restored, achievement of benefits, and stakeholder support.
- No single factor appears to be necessary or sufficient for restoration success.
- No case example exhibited every single key success factor. Thus it appears that a landscape need not have every key success factor in place for restoration to succeed.
- No case example appeared to exhibit "restoration limits leakage." "Leakage" occurs when restoration of one landscape triggers forest clearing activities to shift to another landscape. However, along with several restoration researchers,[10] we believe that limiting leakage should be an important key success factor if forest landscape restoration is to lead to a net global increase in forest area and quality. Otherwise, countries that restore forest landscapes may merely "outsource" forest clearing for agricultural expansion and other activities to other countries.
- Some key success factors appear to be particularly important for restoration that occurs via passive restoration, while others appear particularly important for active restoration (Box 5).
- In cases where recovery occurred primarily via passive restoration as a result of declining agricultural demand for land (e.g., as was the case in Puerto Rico as the economy shifted from being primarily agrarian to industrial) or of migration to cities or other countries, the key success factors related to "motivate" are less relevant.
- Some of the key success factors are interrelated such that they can impact more than one theme. For instance, performance monitoring is a key success factor for implementation that, in turn, can further motivate restoration when monitoring is used to widely communicate emerging successes and benefits of restoration. Likewise, strong leadership is a key success factor for implementation that, in turn, can motivate restoration when leaders raise awareness of restoration's benefits or respond to crisis events.

- How a key success factor was exhibited varied among case examples, reflecting their unique political, social, economic, and/or environmental contexts. For example, secure land tenure in some places came in the form of private property rights; in others, it was in the form of community land and resource rights.
- We were unable to discern patterns in the chronology of key success factors. They need not necessarily be satisfied sequentially (i.e., motivate, then enable, then implement).
- More quantitative research is needed to fully and accurately understand the relative causal link between the factors in Table 5 and restoration success, to discern the relative importance among factors, and to identify links between certain factors and certain types of restoration. The same holds for evaluating restoration failures, too. In our view, this is an important next step in the research agenda regarding forest landscape restoration.

Converting Into a Diagnostic

After identifying the suite of key success factors, we converted them into a set of simple questions designed to help decision makers and stakeholders quickly but comprehensively identify which factors a candidate landscape already satisfies or has in place, and which are not yet in place. This set of questions forms the core of the diagnostic (see section IV).

To gauge their applicability and ease-of-use, we then tested the diagnostic questions in several locations that are considering restoration: the Brazilian Atlantic forest, the country of Rwanda, and three regions of Ecuador. Based on these pilot applications, we refined the key success factors and how they are bundled together, further clarified their definitions, updated the diagnostic questions, and developed recommendations on how to apply the diagnostic.

Table 3 | **Summary of Case Examples***

CASE EXAMPLE	COUNTRY	DESCRIPTION
Tijuca National Forest	Brazil	Since the mid-1800s, 3,200 hectares of dense forest were restored near Rio de Janeiro to create one of the largest urban parks in the world: Tijuca National Park.
Loess Plateau Watershed Rehabilitation Project**	China	Since the late 1970s, trees and other vegetative cover have been restored on 1.6 million hectares in an effort to slow erosion, increase crop production, and boost incomes.
National forest recovery	Costa Rica	Between 1986 and 2005, forest cover in Costa Rica increased from 40 percent to about 50 percent of the country's land area, boosting the tourism industry, local timber supplies, watershed protection, and biodiversity.
Heath restoration in Jutland	Denmark	Since the 1850s, forest cover on mainland Denmark (Jutland) has increased from 2 percent to 11 percent, reducing soil erosion, increasing local timber supplies, and boosting biodiversity protection.
Humbo Project	Ethiopia	Since the early 2000s, assisted natural regeneration has restored approximately 2,700 hectares of land into natural forests.
Watershed restoration	India	Restoration efforts since the 1970s have addressed soil and water conservation needs across 45 million hectares of arable and nonarable lands.
Nationwide community forestry	Nepal	Restoration through community forestry projects since the late 1950s has resulted in about 1.6 million hectares of restored forest area, benefiting more than 2 million households with improved watershed protection, wood supplies, and livelihoods.
Regreening in Maradi and Zinder	Niger	Since the mid-1980s, farmers in the Maradi and Zinder regions of Niger have restored approximately 5 million hectares of degraded cropland into productive agroforestry landscapes.
Panama Canal Watershed restoration	Panama	Since the 1990s, deforestation in the Panama Canal watershed has been reversed through the reforestation of more than 1.5 million trees, greatly improving watershed protection.
National restoration	Puerto Rico	Since World War II, forest cover in Puerto Rico has increased from just 6 percent of the island's land area to approximately 60 percent, providing a range of economic and environmental benefits.
National restoration	South Korea	South Korea's forest cover increased from 35 percent to 64 percent of the country's total land area—a gain of nearly 3 million hectares—between 1953 and 2007, improving wood supplies, watershed protection, and other environmental benefits.
Reforestation in the southwest	Sweden	Since the late-1800s, Swedish landowners and the government have restored forests on approximately 220,000 hectares across southwestern Sweden.
Woodland regeneration in the Shinyanga District	Tanzania	Since the mid-1980s, local villages have restored 500,000 hectares of woodlands within a 5 million hectare landscape in the Shinyanga District, protecting the land and providing valuable nontimber forest products to local communities.
Forest recovery in New England	United States	Forest cover in New England increased by a net 4 million hectares between 1910 and 1970, providing timber, recreation, watershed protection, and other benefits.
Restoration in the South	United States	Forest cover in the southern United States increased by a net 6 million hectares between 1920 and the mid-1960s, providing forest products, recreation, watershed protection, and other benefits.
National mangrove restoration	Vietnam	Since 1978, a series of programs triggered restoration of more than 18,000 hectares of mangroves across an area of 152,000 hectares, improving the livelihoods of nearly 8,000 families.

* Visit www.wri.org/restorationdiagnostic for profiles of each case example. WRI will be adding profiles of additional case examples over time. If you have a historic case example to add to our database, please contact WRI.
** Two World Bank funded projects that were active between 1994 and 2005.

Table 4 | **Key Success Factors for Forest Landscape Restoration**

THEME	FEATURE	KEY SUCCESS FACTOR	DEFINITION
MOTIVATE	BENEFITS	Restoration generates economic benefits	Restoring the candidate landscape is expected to yield economic benefits (e.g., economic diversification, avoided damages, new marketable products) that create a net positive financial impact (private benefits) and/or net positive economic impact (public benefits) relative to the status quo land use.
		Restoration generates social benefits	Restoring the candidate landscape is expected to yield social benefits, which include those supporting cultural ties and generating political gains.
		Restoration generates environmental benefits	Restoring the candidate landscape is expected to yield environmental benefits.
	AWARENESS	Benefits of restoration are publicly communicated	Benefits that would arise from the candidate landscape being restored have been clearly identified and communicated to land managers, public, and other stakeholders.
		Opportunities for restoration are identified	Candidate areas for restoration have been identified and quantified.
	CRISIS EVENTS	Crisis events are leveraged	The government and/or civil society use the risk or occasion of crisis events to build political and public support for forest landscape restoration.
	LEGAL REQUIREMENTS	Law requiring restoration exists	The government has legislation that requires land managers to allow tree recovery or to replant trees in forest areas that have been cleared in the candidate landscape.
		Law requiring restoration is broadly understood and enforced	The law requiring tree recovery or replanting in the candidate landscape is understood by relevant actors and is enforced in a visible, credible, and fair manner.
ENABLE	ECOLOGICAL CONDITIONS	Soil, water, climate, and fire conditions are suitable for restoration	The candidate landscape's soil, rainfall, and temperature conditions are suitable for forest regrowth, and the fire regime does not hinder forest regrowth.
		Plants and animals that can impede restoration are absent	The candidate landscape is free of unwanted plants (e.g., persistent invasive species) and unwanted animals (e.g., uncontrolled grazing livestock) that can hinder tree growth or recovery.
		Native seeds, seedlings, or source populations are readily available	The candidate landscape has source populations (e.g., sizable patches of remnant native trees), underground root systems, animal dispersal agents, or low-cost sources of native tree seeds and seedlings that can be the foundation for forest regrowth.
	MARKET CONDITIONS	Competing demands (e.g., for food or fuel production) for degraded or lost forestlands are declining	Demand for crop, livestock, fuelwood, and/or biofuel production on degraded or former forestlands in the candidate landscape is declining (e.g., due to productivity improvements elsewhere), thereby "freeing up" land for forest restoration.
		Value chains for products from restored area exists	To the degree that forest restoration in the candidate landscape generates marketable products, value chains are in place allowing these products to get from the restored forest to the end consumer.
	POLICY CONDITIONS	Land and natural resource tenure are secure	Those who manage the candidate landscape have clear and secure rights (e.g., in the form of land ownership or natural resource management rights) to the benefits that would accrue from restoring trees.
		Policies affecting restoration are aligned and streamlined	Relevant public policies are aligned, streamlined (e.g., not too bureaucratic), and mutually reinforcing to support forest restoration in the candidate landscape.
		Restrictions on clearing remaining natural forests exist	The candidate landscape has laws restricting clearing or cutting of remaining natural forests.
		Forest clearing restrictions are enforced	Laws that restrict clearing of remaining natural forests are adequately enforced.

Table 4 | **Key Success Factors for Forest Landscape Restoration (Continued)**

THEME	FEATURE	KEY SUCCESS FACTOR	DEFINITION
ENABLE	SOCIAL CONDITIONS	Local people are empowered to make decisions about restoration	People living in and around the candidate landscape are empowered to become involved in the design of the forest restoration program, help define restoration goals, and play a role in management.
		Local people are able to benefit from restoration	People who live in and around the candidate landscape can capture or enjoy the benefits from restoration (e.g., improved water quality, increased supply of forest products) or have alternative means of livelihood.
	INSTITUTIONAL CONDITIONS	Roles and responsibilities for restoration are clearly defined	Roles and responsibilities for forest restoration in the candidate landscape are clearly defined, understood among relevant actors (e.g., government, civil society, private sector), and coupled with authority.
		Effective institutional coordination is in place	Relevant actors from government, civil society, and/or the private sector are sufficiently trained and coordinated to design, implement, and monitor forest restoration in the candidate landscape.
IMPLEMENT	LEADERSHIP	National and/or local restoration champions exist	Charismatic people (or powerful institutions) exist who can effectively inspire decision makers to pursue restoration, mobilize support, and maintain momentum over time in the candidate landscape.
		Sustained political commitment exists	Commitment from government (at multiple levels if relevant) and nongovernmental institutions to restoration in the candidate landscape exists and is sustained.
	KNOWLEDGE	Restoration "know-how" relevant to candidate landscape exists	Local experts know of or generate research into restoration techniques (e.g., natural and assisted regeneration, traditional knowledge) tailored to the candidate landscape.
		Restoration "know-how" transferred via peers or extension services	Technical assistance and rural extension ("extension services"), farmer-to-farmer visits, and/or other means of awareness raising and capacity building for restoration are in place and adequately resourced in the candidate landscape.
	TECHNICAL DESIGN	Restoration design is technically grounded and climate resilient	Forest landscape restoration plans for the candidate landscape are based on best practices, incorporating the best available science and climate-smart approaches.
		Restoration limits "leakage"	Forest landscape restoration in the candidate landscape avoids transferring forest clearing activities to other landscapes or countries ("leakage"), resulting in a net increase in forest landscape area.
	FINANCE AND INCENTIVES	"Positive" incentives and funds for restoration outweigh "negative" incentives for status quo	From the perspective of the land manager, financial incentives and funds for restoration of the candidate landscape exist and are sufficient to outweigh the financial incentives for activities that prevent trees from regrowing.
		Incentives and funds are readily accessible	Financial incentives and funds for restoration in the candidate landscape are available without excessive hurdles or bureaucracy for the relevant land managers or communities.
	FEEDBACK	Effective performance monitoring and evaluation system is in place	A system for monitoring progress and evaluating impact of restoration in the candidate landscape exists.
		Early wins are communicated	Early restoration successes in the candidate landscape are achieved and communicated to stakeholders.

Table 5 | **Key Success Factors Identified by Case Examples***

THEME	FEATURE	KEY SUCCESS FACTOR
MOTIVATE	BENEFITS	Restoration generates economic benefits
		Restoration generates social benefits
		Restoration generates environmental benefits
	AWARENESS	Benefits of restoration are publicly communicated
		Opportunities for restoration are identified
	CRISIS EVENTS	Crisis events are leveraged
	LEGAL REQUIREMENTS	Law requiring restoration exists
		Law requiring restoration is broadly understood and enforced
ENABLE	ECOLOGICAL CONDITIONS	Soil, water, climate, and fire conditions are suitable for restoration
		Plants and animals that can impede restoration are absent
		Native seeds, seedlings, or source populations are readily available
	MARKET CONDITIONS	Competing demands (e.g., for food or fuel production) for degraded or lost forestlands are declining
		Value chains for products from restored area exists
	POLICY CONDITIONS	Land and natural resource tenure are secure
		Policies affecting restoration are aligned and streamlined
		Restrictions on clearing remaining natural forests exist
		Forest clearing restrictions are enforced
	SOCIAL CONDITIONS	Local people are empowered to make decisions about restoration
		Local people are able to benefit from restoration
	INSTITUTIONAL CONDITIONS	Roles and responsibilities for restoration are clearly defined
		Effective institutional coordination is in place
IMPLEMENT	LEADERSHIP	National and/or local restoration champions exist
		Sustained political commitment exists
	KNOWLEDGE	Restoration "know-how" relevant to candidate landscape exists
		Restoration "know-how" transferred via peers or extension services
	TECHNICAL DESIGN	Restoration design is technically grounded and climate resilient
		Restoration limits "leakage"
	FINANCE AND INCENTIVES	"Positive" incentives and funds for restoration outweigh "negative" incentives for status quo
		Incentives and funds are readily accessible
	FEEDBACK	Effective performance monitoring and evaluation system is in place
		Early wins are communicated

* Key success factors present during the restoration process per country (those arising after restoration had significantly progressed are not marked or checked). The key success factors were identified by researching the case examples. Dots (•) indicate where the authors identified reference to the key success factor in publications or local expert interviews about the case examples. However, absence of a check mark does not necessarily mean that the key success factor was not present, but rather that there was insufficient evidence of that factor in published literature or interviews regarding the case examples.

	CASE EXAMPLES															
	PUERTO RICO—NAT'L	U.S.–NEW ENGLAND	COSTA RICA–NAT'L	BRAZIL—TIJUCA	U.S.—SOUTH	PANAMA – CANAL WATERSHED	NIGER – MARADI & ZINDER	ETHIOPIA—HUMBO	TANZANIA–SHINYANGA	VIETNAM–MANGROVES	INDIA	NEPAL—NATIONAL	SWEDEN—SOUTHWEST	DENMARK—JUTLAND	SOUTH KOREA–NAT'L	CHINA—LOESS
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PREDOMINANTLY PASSIVE RESTORATION — PREDOMINANTLY ACTIVE RESTORATION

BOX 5 | ARE SOME KEY SUCCESS FACTORS PARTICULARLY IMPORTANT FOR CERTAIN TYPES OF RESTORATION?

Are some of the key success factors for forest landscape restoration more relevant or more important than others? We do not yet have a definitive answer to this question. Historical experiences of forest landscape restoration do not lend themselves to empirical methods of removing individual key success factors and observing how the end results might differ. It is therefore difficult to isolate the contribution of individual factors, isolate combinations of factors, or run counter-factual scenarios. Furthermore, given the resources and time constraints, decision makers typically do not run experimental restoration programs at large, countrywide scales and then rerun them with different combinations of factors.

Nonetheless, the literature review and case examples we profiled appear to suggest patterns wherein some key success factors may be particularly important for certain types of restoration. Which of these factors are likely "must haves" differ along one important dimension of restoration: how trees are restored (Figure 2). In other words, they differ between passive and active restoration.

The following key success factors appear to be required for successful passive restoration:

- **Soil, water, climate, and fire conditions are suitable for restoration**. In the absence of human intervention, unsuitability of these physical conditions can prevent natural recovery of trees and ecosystem succession.
- **Plants and animals that can impede restoration are absent.** In the absence of human intervention, invasive plants can crowd out native species and invasive plants, animals, and uncontrolled livestock can prevent natural recovery of trees and ecosystem succession.
- **Native seeds, seedlings, or source populations are readily available.** In the absence of human intervention, the lack of sufficient source populations for seeds and seedlings can prevent the reemergence of native trees in the landscape. Likewise, if seed-dispersing birds and mammals do not have viable populations or are not able to move freely across the landscape, reemergence of trees can be hindered.
- **Competing demands (e.g., food, fuel) for degraded forestlands are declining.** If demand for using a tract of land for crops, livestock, or wood fuel production does not decline, then that tract of land likely will not have an opportunity to revert to permanent forest or increased tree cover. A number of large-scale forest restoration experiences in history were preceded by or coincided with a decline in agriculture and fuel wood gathering on the lands that were restored.

The following key success factors appear to be required for successful active restoration:

- **Secure land and natural resource tenure.** If people are going to take the steps needed to restore trees on a tract of land they manage, then they need to be assured that they have legal or customary rights to the restored trees. Otherwise, there is little incentive to restore them; the results of their efforts and labor would accrue to someone else.
- **Local people are able to benefit from restoration.** If the people living in and around the landscape to be restored are not able to capture any of the benefits of restoration, then they will not find it in their interest to change their land management practices.
- **National and/or local restoration champions exist.** Someone or some organization typically needs to provide the vision and perseverance to drive implementation and follow-through on restoration.
- **Restoration "know-how" transferred via peers or extension services.** Active restoration is premised on people applying particular land management practices that differ from the status quo. Land managers need to understand what these practices are, why it is in their interest to adopt them, and how to implement them.

NOT FOR SALE

SECTION IV

THE DIAGNOSTIC

The Diagnostic is a structured method for identifying which key success factors for forest landscape restoration are already in place, which are partially in place, and which are missing within a country or landscape that has restoration opportunities. When applied prior to a restoration effort, the Diagnostic can help decision makers and restoration supporters focus their efforts on the most important factors to get in place—before large amounts of human, financial, or political capital are invested. When applied periodically every few years once a restoration effort is underway, the Diagnostic can help implementers adjust and refine their policies and practices, as a means of adaptive management.

There are three steps to applying *The Restoration Diagnostic:*

1. **Select the scope.** Choose the "scope" or geographic boundary within which to apply the diagnostic. The selected scope is the "candidate landscape."
2. **Assess the status of key success factors.** Systematically evaluate whether or not key success factors for forest landscape restoration are in place for the candidate landscape.
3. **Identify strategies to address missing factors.** Identify strategies to close gaps in those key success factors that are not in place or only partly in place in the candidate landscape.

Step 1: Select the Scope

During this step, users define clear boundaries within which the diagnostic will be applied. Defined boundaries provide clarity on what will be assessed, avoid irrelevant research, prevent unnecessary work, and ensure that the diagnostic will yield actionable results.

Defined boundaries provide clarity on what will be assessed, avoid irrelevant research, prevent unnecessary work, and ensure that the diagnostic will yield actionable results.

Several considerations can help identify an appropriate scope:

- **What is the geographic area to be restored?** Geography is the most defining aspect of the scope. Useful geographic boundaries to consider include an entire country, state, province, county, municipality, biome, or watershed. It is helpful to consider areas that share similar ecological contexts as one "landscape" and not split them up into multiple scopes for conducting the diagnostic. Otherwise, users will expend time and effort conducting multiple diagnostics that arrive at the same conclusions. Conversely, geographic areas that are quite different ecologically should be defined as different scopes and be the subject of their own diagnostic.
- **Over what time period will restoration occur?** The case examples illustrate that forest landscape restoration occurs over many decades, although some benefits can be generated within a few years. To keep expectations appropriate, it is helpful to have the timing of the recovery process for a landscape in mind when selecting the scope and identifying restoration strategies.
- **What are the goals of restoration?** Some decision makers (e.g., landowners/managers, communities, governments, companies) may know *a priori* that they want to restore the landscape into a particular type of ecosystem—such as a natural native forest—to achieve particular objectives. Others may want to restore the landscape into a mosaic of multiple ecosystems—such as natural forests, wetlands, and agricultural fields—to achieve other objectives. Knowing in advance "into what" the landscape (or portions thereof) is to be restored and the goals of such restoration will influence which restoration strategies to pursue. The ROAM method (see Box 2) provides some guidance on how to define or select the restoration goals of a candidate landscape.

The scope should be defined via a multistakeholder process that involves the people and communities living on or otherwise depending on the candidate landscape for their well-being, as well as representatives from relevant government agencies and civil society.

Step 2: Assess the Status of Key Success Factors

During this step, users evaluate in a rapid yet structured and comprehensive manner whether each key success factor of forest landscape restoration is in place in the candidate landscape. The purpose is to rapidly identify where there might be potential challenges to successful restoration.

The user conducts this status assessment with a simple template that lists the key success factors, a diagnostic question per factor, and supporting information. The template has three tables (Tables 6, 7, and 8), each dedicated to one of the three common themes for successful forest landscape restoration—motivate, enable, and implement. For each theme, the table has the following columns:

- **Feature:** Characteristics defined by and composed of related key success factors.
- **Key success factor:** A factor or condition that, when present, may increase the likelihood that forest landscape restoration will successfully be initiated within the planned time frame.
- **Definition:** The definition of the key success factor.
- **Comment:** An observation that gives further context or clarification to the key success factor. The comments derive from insights from the historic case examples and from road tests of the draft diagnostic.
- **Diagnostic question:** The question users answer to determine whether the candidate landscape has the key success factor in place.
- **Response:** The answer to the diagnostic question. Candidate answers are "yes," "no," and "partly." "Partly" can refer to a key success factor's geographic coverage or degree of realization. Users merely check which response appropriately answers the question. Although it might fail to capture nuance and complexity, having just three answer options is intended to push for clarity in the diagnosis of the status of each key success factor.
- **Notes on response:** A column where users can record any explanation, data points, or other information that substantiates, justifies, or nuances the response given. This column can help remind users at a later date of the rationale underlying their response. Providing detailed notes is particularly recommended for the "partly" responses.
- **Follow-up question:** One or more additional questions that users have the option of answering. These questions give users the opportunity, if desired, to gather additional information regarding a key success factor while conducting the diagnostic.
- **Follow-up response:** A column where users can record a response to the follow-up question. These responses can prove helpful when developing strategies to address the gaps.

Based on their own knowledge and with input from others (see section V), users answer each diagnostic question. To facilitate this process, users can record their responses and their supporting notes in an Excel-based tool that contains Tables 6, 7, and 8 as individual worksheets. This tool is available for free download at www.wri.org/restorationdiagnostic.

Once responses have been completed, users can see which key success factors are already in place ("yes"), which are not in place ("no"), and which are partially in place ("partly") in the candidate landscape. In the Excel-based tool, one of the worksheets automatically converts the responses to the diagnostic questions into a color-coded summary table. In the table, green represents "yes, in place," red represents "no, not in place," and yellow "partly in place." This "traffic-light" display is designed to make it easy to see and interpret the results.

Table 6 | **Motivate: Decision Makers, Landowners, and/or Citizens are Inspired or Motivated to Catalyze Processes That Lead to Forest Landscape Restoration**

FEATURE	KEY SUCCESS FACTOR	DEFINITION	COMMENT
A. BENEFITS	RESTORATION WILL GENERATE ECONOMIC BENEFITS	Restoring the candidate landscape is expected to yield economic benefits (e.g., economic diversification, avoided damages, new marketable products) that create a net positive financial impact (private benefits) and/or net positive economic impact (public benefits) relative to the status quo land use.	■ Review Table 4 to identify possible economic benefits. ■ The financial case for restoration is made when restoration increases the land manager's discounted net cash flows relative to the status quo, or where restoration would help achieve a public goal at less cost than the best alternative approach. ■ The economic case for restoration is made when the full suite of market and nonmarket benefits of restoration would outweigh the costs of undertaking the restoration. ■ Some landowners may be concerned that "restoration" means they will lose their land outright, lose user rights to the land, and/or lose money relative to the status quo. Therefore, one needs to articulate why this would not be the case or how the net benefits outweigh the costs. ■ Be sure to understand and articulate (in "notes" column) who the economic beneficiaries would be.
	RESTORATION WILL GENERATE SOCIAL BENEFITS	Restoring the candidate landscape is expected to yield social, cultural, and/or political benefits.	■ Review Table 4 to identify possible social benefits. ■ Restoration can be beneficial to countries or communities with a historical cultural connection to forests (e.g., forest-based traditions and folklore, forest-based livelihoods and employment). ■ Restoration can be a way for governments to be seen as leaders on the global stage. ■ Restoration can be a way for governments to meet commitments to international agreements (e.g., UNFCCC and REDD+, UNCCD, CBD, Bonn Challenge). ■ Be sure to understand and articulate (in "notes" column) who the social beneficiaries would be.
	RESTORATION WILL GENERATE ENVIRONMENTAL BENEFITS	Restoring the candidate landscape is expected to yield environmental benefits.	■ Review Table 4 to identify possible environmental benefits. ■ In most conceivable situations, this key success factor will be met.
B. AWARENESS	BENEFITS OF RESTORATION ARE PUBLICLY COMMUNICATED	Benefits that would arise from the candidate landscape being restored have been clearly identified and communicated to land managers, the public, and other relevant stakeholders.	■ Review Table 4 to identify possible benefits. ■ Peer-to-peer (e.g., farmer-to-farmer) communication of the benefits of restoration can be an effective means of raising awareness and motivating action. People tend to trust those most like themselves. ■ Communication efforts that are targeted toward specific audiences may be more effective than those targeted at general audiences.
	OPPORTUNITIES FOR RESTORATION ARE IDENTIFIED	Candidate areas for restoration have been identified and quantified.	■ Maps generated via both remote sensing (e.g., aerial photos, satellite imagery) and ground-based observations can identify, record, and communicate candidate areas of restoration. ■ One common way to quantify candidate areas is in terms of hectares.

	DIAGNOSTIC QUESTION	RESPONSE			NOTES ON RESPONSE	FOLLOW UP QUESTION(S)	FOLLOW UP RESPONSE(S)	EXAMPLES OF STRATEGIES TO ADDRESS GAP IN KEY SUCCESS FACTOR
		YES	PARTLY	NO				
	Is restoring the candidate landscape expected to generate economic benefits that result in a net positive financial or economic impact relative to the status quo land use?					■ If "yes", then what are the expected economic benefits? ■ If "yes", then who benefits? ■ If "no", then how big is the expected financial or economic gap?		Conduct a benefit-cost analysis comparing (a) likely benefits generated from the restored landscape, (b) likely costs of restoring the candidate landscape, and (c) likely costs and benefits of the status quo use of the landscape.
	Is restoring the candidate landscape expected to generate social benefits?					If "yes", then what are the expected social benefits?		Engage communities living in and around the candidate landscape to identify which social benefits could be generated if the landscape were restored in a certain manner.
	Is restoring the candidate landscape expected to generate any environmental benefits?					If "yes", then what are the expected environmental benefits?		Engage scientists (e.g., biologists, ecologists, hydrologists, soil scientists) to identify which environmental benefits could be generated if the landscape were restored in a certain manner.
	Are the benefits that would arise from the candidate landscape being restored clearly identified and communicated to stakeholders and the public?					■ What benefits might arise? ■ Which stakeholders would benefit?		■ Conduct awareness-raising campaigns via newspapers, radio, television, internet, and/or site visits. ■ Introduce and/or leverage existing national tree-planting days as well as school tree-planting programs.
	Have candidate areas for restoration been identified and quantified?					■ If "yes", then where are the candidate areas? ■ If "yes", then how big is the restoration opportunity?		Conduct a "Restoration Opportunities Assessment Method" (see Box 2).

Table 6 | **Motivate: Decision Makers, Landowners, and/or Citizens are Inspired or Motivated to Catalyze Processes That Lead to Forest Landscape Restoration (continued)**

FEATURE	KEY SUCCESS FACTOR	DEFINITION	COMMENT
C. CRISIS EVENTS	CRISIS EVENTS ARE LEVERAGED	The government and/or civil society use the risk or occasion of crisis events to build political and public support for forest landscape restoration.	■ Crisis events can include floods, landslides, droughts, sandstorms, wood shortages, declining crop yields, and unemployment. They include humanitarian catastrophes where damage could have been avoided if forest landscapes had been healthy (e.g., landslide), where the act of restoration mitigates the crisis (e.g., unemployment), or where restoration prevents future crises (e.g., floods). ■ One does not desire these events to occur. But when they do, restoration supporters should act quickly to mobilize political and community support for restoration.
D. LEGAL REQUIREMENTS	LAW REQUIRING RESTORATION EXISTS	The government has legislation that requires land managers to allow tree recovery or to replant trees in forest areas that have been cleared in the candidate landscape.	■ Restoration requirements are more likely to be directed at entities involved with commercial logging, mining, or other extractive activities than for subsistence activities. ■ Although some stakeholders might perceive a "legal requirement" to restore trees as an enabling condition for forest landscape restoration, by definition a "requirement" is designed to motivate action. ■ Government mandates for restoration can trigger sensitivities about government incursion into land-use decisions that otherwise would be the purview of traditional communities or private landowners. Therefore, how legal requirements are communicated and complemented by other policies, incentives, and practices can be important to the success of the requirement.
	LAW REQUIRING RESTORATION IS BROADLY UNDERSTOOD AND ENFORCED	The law requiring tree recovery or replanting in the candidate landscape is understood by relevant actors and is enforced in a visible, credible, and fair manner.	It is not sufficient that a law requiring restoration merely exists; the law needs to be understood by affected entities and enforced by authorities if it is to motivate restoration.

	DIAGNOSTIC QUESTION	RESPONSE			NOTES ON RESPONSE	FOLLOW UP QUESTION(S)	FOLLOW UP RESPONSE(S)	EXAMPLES OF STRATEGIES TO ADDRESS GAP IN KEY SUCCESS FACTOR
		YES	PARTLY	NO				
	Is the region experiencing a crisis event, or the risk of one, that would motivate restoration in the candidate landscape?					■ What types of crises have occurred in the candidate landscape in the past? ■ What types of crises could occur in the future?		■ Conduct and communicate research that quantifies and visualizes the degree to which restored forest landscapes can prevent or mitigate natural humanitarian disasters. ■ When disasters occur, immediately publicly communicate the benefits of restoration.
	Does the government have a law requiring landowners or managers to replant or restore trees in forest areas that have been cleared?					If "yes", what specific terms and conditions does the law have (e.g., what to restore, by when, how)?		Establish government law (or industry policy) that requires land managers to allow tree recovery or to replant trees in areas that have been cleared due to their own commercial activity (e.g., logging).
	Is the law requiring tree or forest restoration broadly understood by relevant actors and enforced in a visible, credible, and fair manner?					If "no", then what is the nature of the shortcoming?		■ Conduct communication campaign to make relevant actors aware of restoration requirements. ■ Take enforcement action (e.g., fines, denial of credit access, jail) against violations of restoration requirements. ■ Ensure human and financial resources for enforcement are adequate.

Table 7 | **Enable: Enabling Conditions are in Place that Create a Favorable Context for Forest Landscape Restoration**

FEATURE	KEY SUCCESS FACTOR	DEFINITION	COMMENT
E. ECOLOGICAL CONDITIONS	SOIL, WATER, CLIMATE, AND FIRE CONDITIONS ARE SUITABLE FOR RESTORATION	The candidate landscape's soil, rainfall, and temperature conditions are suitable for forest regrowth, and the fire regime does not hinder forest regrowth.	This key success factor combines multiple physical conditions affecting forest regrowth. Each condition (soil, rainfall, temperature, fire) should be evaluated on its own, yet the response can reflect the aggregate of the four.
	PLANTS AND ANIMALS THAT CAN IMPEDE RESTORATION ARE ABSENT	The candidate landscape is free of unwanted plants (e.g., persistent invasive species) and unwanted animals (e.g., uncontrolled grazing livestock) that can hinder tree growth or recovery.	■ Examples include *Brachiaria spp.* in Brazil, *Imperata cylindrica* in Indonesia, kudzu in southern United States, and uncontrolled ruminants (cattle, sheep, goats) in multiple locations. ■ Landscapes can be free of unwanted plants and/or unwanted animals either because none ever existed naturally in the landscape or because they have been successfully removed through human intervention.
	NATIVE SEEDS, SEEDLINGS, OR SOURCE POPULATIONS ARE READILY AVAILABLE	The candidate landscape has source populations (e.g., sizable patches of remnant native trees), underground root systems, animal dispersal agents, or low-cost sources of native tree seeds and seedlings that can be the foundation for forest regrowth.	■ Viable source populations or underground root systems of native trees are critically important for passive restoration. ■ This key success factor applies to the entire supply chain for native seeds and seedlings, including seed production, seed collection, and seedling nurseries.
F. MARKET CONDITIONS	COMPETING DEMANDS (E.G., FOOD, FUEL) FOR DEGRADED OR LOST FOREST LANDS ARE DECLINING	Demand for crop, livestock, fuel wood, and/or biofuel production on degraded or former forestlands in the candidate landscape is declining (e.g., due to productivity improvements elsewhere), thereby "freeing up" land for forest restoration.	■ This key success factor is arguably one of the most important of them all in light of increasing global demand for land to generate crops, livestock, and biofuel (Searchinger et al. 2013). ■ This key success factor does not apply in cases where lands are restored into agroforestry or silvopastoral systems. In those systems, the restored lands also supply crops and livestock, respectively.
	VALUE CHAINS FOR PRODUCTS AND SERVICES FROM RESTORED FORESTS EXIST	To the degree that forest restoration in the candidate landscape generates marketable products and services, value chains are in place allowing these products to get from the restored forest to the end consumer.	■ This key success factor does not apply in cases where there is no intention to harvest or collect any marketable forest products. ■ This key success factor refers to both market access and market demand for products and services derived from restored forest landscapes. ■ "Value chain" includes steps such as harvesting, collecting, processing, transporting, and distributing forest products. ■ Markets include those for nonconsumptive forest benefits, too, such as recreation, tourism, and watershed protection.

	DIAGNOSTIC QUESTION	RESPONSE			NOTES ON RESPONSE	FOLLOW UP QUESTION(S)	FOLLOW UP RESPONSE(S)	EXAMPLES OF STRATEGIES TO ADDRESS GAP IN KEY SUCCESS FACTOR
		YES	PARTLY	NO				
	Are the candidate landscape's soil, rainfall, temperature, and fire conditions suitable for enabling trees to regrow?					If "no", then what are the gaps in physical suitability?		■ Adaptively manage or adjust restoration plan (e.g., species mix) to match water and climate regime of landscape. ■ Launch program to reduce unwanted fires. ■ Launch program to improve soil quality (e.g., plant nitrogen-fixing trees and bushes).
	Is the candidate landscape free of unwanted plants and unwanted animals that could hinder tree recovery?					If "no", then what are the problematic plant and/or animal species?		■ Implement program to remove invasive plants (e.g., using fast-growing native trees to create shade, using goats, appropriately applying herbicides). ■ Implement program to remove unwanted roaming livestock (e.g., incentives and training for fences).
	Does the candidate landscape have source populations, underground root systems, or low-cost sources of native tree seeds and seedlings that can be the foundation for forest regrowth?					If "no", then where is the gap (e.g., seeds, seed collectors, nurseries, source populations, underground root systems)?		■ Establish laws protecting remaining tracts of native trees in candidate landscape. ■ Create financial incentives and training programs aimed at increasing the number and quality of seedling nurseries.
	Is demand for crop, livestock, fuel wood, and/or biofuel production on degraded or former forestlands in the candidate landscape declining?					What are the main alternative competing land uses for the candidate areas to be restored?		■ Pursue technical and financial measures to increase the productivity (yields per hectare) of crops and livestock on existing nonmarginal agricultural land. ■ Pursue technical and financial measures to increase the supply of timber from sustainably managed plantations and of nonbiomass renewable energy. ■ Avoid establishing bioenergy targets that could lead to degraded or former forestlands being converted to biomass plantations.
	Are value chains in place allowing products from restored forests to reach end consumers?					If "no", then where is the value chain gap?		■ Encourage growth of markets (both supply and demand) for timber and nontimber forest products sustainably derived from restored forest landscapes. ■ Provide low-interest financing for businesses directly involved in the "restoration value chain."

Table 7 | **Enable: Enabling Conditions are in Place that Create a Favorable Context for Forest Landscape Restoration (continued)**

FEATURE	KEY SUCCESS FACTOR	DEFINITION	COMMENT
G. POLICY CONDITIONS	LAND AND NATURAL RESOURCE TENURE IS SECURE	Those who manage the candidate landscape have clear and secure rights (e.g., in the form of land ownership or natural resource management rights) to the benefits that would accrue from restoring trees.	■ Lack of (or insecure) land tenure and natural resource rights can discourage restoration that involves human intervention. People will not invest in planting trees or allow trees to return to lands they manage if it is not clear that they have secure rights to benefit from the restored trees. ■ Tenure and natural resource rights can be in the form of private land ownership, communal lands, user-right certificates, etc. ■ Be sure that the tenure that is in place does not infringe on customary rights.
	POLICIES AFFECTING RESTORATION ARE ALIGNED AND STREAMLINED	Relevant public policies are aligned, streamlined (e.g., not too bureaucratic), and mutually reinforcing to support forest restoration in the candidate landscape.	■ Policies to consider include those on agriculture, extractive industries, water, and natural resources. ■ In some cases nature conservation policies might inhibit restoration (e.g., laws forbidding extraction of native seeds from protected areas, laws forbidding harvesting native tree species). ■ In some cases regulations and paperwork might make implementation of restoration too cumbersome, time consuming, or difficult, especially for small land managers or owners.
	RESTRICTIONS ON CLEARING REMAINING NATURAL FORESTS EXIST	The candidate landscape has laws restricting clearing or cutting of remaining natural forests.	■ Restrictions on clearing remaining natural forests can prevent further expansion of degraded or cleared forest areas, thereby enabling net forest gain. These restrictions also create an incentive to restore the productivity of already cleared areas since access to the forest frontier is reduced. ■ These restrictions can take the form of a specific share of land that must remain under forest cover (e.g., Brazil's Forest Code), an extensive network of national parks and national forests, an extensive network of forested indigenous territories, communal lands having forest protection rules, "no net forest loss" rules, and more. ■ An important component of this key success factor is that "natural forests" have been clearly defined by the jurisdiction sponsoring the restriction (e.g., national government). This definition should include primary forests, secondary forests, and degraded forests with potential for restoration.
	FOREST CLEARING RESTRICTIONS ARE ENFORCED	Laws that restrict clearing of remaining natural forests are adequately enforced.	■ It is not sufficient that regulations restricting clearing of remaining natural forests merely exist; the restrictions need to be enforced by relevant authorities. ■ Particularly in remote areas, enforcement is in part a function of the capacity of law enforcement organizations and incentives for them to do their jobs.

	DIAGNOSTIC QUESTION	RESPONSE			NOTES ON RESPONSE	FOLLOW UP QUESTION(S)	FOLLOW UP RESPONSE(S)	EXAMPLES OF STRATEGIES TO ADDRESS GAP IN KEY SUCCESS FACTOR
		YES	PARTLY	NO				
	Do those who manage the candidate landscape have clear and secure rights to the benefits that would accrue from restoring trees?					If "no", then what rights are missing, and for whom?		Reform policies to ensure that land managers have clear and secure rights to land and the natural resources (e.g., trees) on their land.
	Are policies that may affect forest restoration in the candidate landscape aligned and streamlined?					If "no", then which policies are not aligned or streamlined?		Conduct an assessment to identify existing policies that might affect the efficacy and efficiency of forest landscape restoration, determine whether or not each is mutually supportive, and recommend policy reforms to achieve greater alignment.
	Does the candidate landscape have laws restricting the clearing or cutting of remaining natural forests?					If "yes", then what are those laws?		Establish laws that restrict cutting or clearing of remaining natural forests.
	Are these clearing or cutting restrictions adequately enforced?					If "no", then why not?		■ Conduct communication campaign to make relevant actors aware of law. ■ Establish a forest cover change monitoring system to identify illegal clearing. ■ Take enforcement action (e.g., fines, denial of credit access) against violations of law. ■ Ensure human and financial resources for enforcement are adequate.

Table 7 | **Enable: Enabling Conditions are in Place that Create a Favorable Context for Forest Landscape Restoration (continued)**

FEATURE	KEY SUCCESS FACTOR	DEFINITION	COMMENT
H. SOCIAL CONDITIONS	LOCAL PEOPLE ARE EMPOWERED TO MAKE DECISIONS ABOUT RESTORATION	People living in and around the candidate landscape are empowered to become involved in the design of the forest restoration program, help define restoration goals, and play a role in management.	■ Unless local people are empowered, the ones whose land management practices need to change will have little stake in the success of restoration. ■ Leveraging existing local institutions and processes (e.g., forestry cooperatives via villages with customary tenure) can facilitate local participation and uptake. ■ Empowerment requires effective participation, as well as accountability regarding decisions that are taken and grievance mechanisms when these processes break down.
	LOCAL PEOPLE ARE ABLE TO BENEFIT FROM RESTORATION	People who live in or around the candidate landscape can capture or enjoy the benefits from restoration (e.g., improved water quality, increased supply of forest products) or have alternative means of livelihood.	■ This key success factor is about who enjoys or captures the benefits—local people. The key success factors within the "benefits" in Table 2, on the other hand, are about the existence and types of benefits, regardless of who enjoys or captures them. ■ This key success factor is arguably one of the most important for any type of assisted regeneration. If local people do not benefit, then they will have little incentive to change behaviors to enable forest landscape restoration or sustain the restored landscape over the long term.
I. INSTITUTIONAL CONDITIONS	ROLES AND RESPONSIBILITIES FOR RESTORATION ARE CLEARLY DEFINED	Roles and responsibilities for forest restoration in the candidate landscape are clearly defined, understood among relevant actors (e.g., government, civil society, private sector), and coupled with authority.	■ In the absence of such clarity and coordination, inaction may occur due to important roles not being filled or due to institutions claiming overlapping responsibility. ■ To adequately answer this question, users may need to map out the roles and responsibilities of actors. Be sure to recognize both vertical and horizontal relationships between entities.
	EFFECTIVE INSTITUTIONAL COORDINATION IS IN PLACE	Relevant actors from government, civil society, and/or the private sector are sufficiently coordinated to design, implement, and monitor forest restoration in the candidate landscape.	Coordination might need to be between government agencies (e.g., ministries such as agriculture, environment, forestry, and development); between national, state, and municipal governments; or between government, nongovernmental organizations, and companies, to name a few.

	DIAGNOSTIC QUESTION	RESPONSE			NOTES ON RESPONSE	FOLLOW UP QUESTION(S)	FOLLOW UP RESPONSE(S)	EXAMPLES OF STRATEGIES TO ADDRESS GAP IN KEY SUCCESS FACTOR
		YES	PARTLY	NO				
	Are people living in and around the candidate landscape empowered to become involved in making decisions about restoration (e.g., program design, goal-setting, management)?					If "no", then what aspects are people not empowered to do?		■ Involve representatives from people living in and around the candidate landscape in the restoration process (goal-setting, design, implementation, progress updates). ■ Cultivate restoration champions from local communities.
	Are people living in and around the candidate landscape able to capture or enjoy the benefits generated by restoration?					If "no", then why not?		■ Allow local people to harvest some of the forest products from the restored landscape. ■ Ensure that financial flows for the goods and/or services generated by the restored landscape (e.g., payments for ecosystem services) go to people living in and around the restored landscape.
	Are the roles and responsibilities for forest restoration in the candidate landscape clearly defined, understood among relevant actors, and coupled with authority?					If "no", then what is missing in terms of clarity of roles and responsibilities?		Create a national, state, or watershed Forest Landscape Restoration Plan that articulates roles and responsibilities among government, civil society, academic, and private sector entities.
	Are relevant actors from government, civil society, and/or the private sector sufficiently coordinated to design, implement, and monitor forest restoration in the candidate landscape?					If "no", then what is missing in terms of coordination?		■ Within government, create an interministerial Forest Landscape Restoration Task Force charged with coordinating government (national, state, municipal) activities on restoration. ■ Create a multisector stakeholder restoration initiative that sets the vision and coordinates restoration activities across the landscape (e.g., the Brazilian Atlantic Forest PACT).

Table 8 | **Implement: Capacity and Resources Exist and are Effectively Mobilized to Implement On-the-Ground Forest Landscape Restoration**

FEATURE	KEY SUCCESS FACTOR	DEFINITION	COMMENT
J. LEADERSHIP	NATIONAL AND/OR LOCAL RESTORATION CHAMPIONS EXIST	Charismatic people (or powerful institutions) exist who can effectively inspire decision makers to pursue restoration, mobilize support, and maintain momentum over time in the candidate landscape.	■ Champions can be individuals or organizations. ■ Champions can play a role in both the "motivate" and "implement" theme. ■ Some landscapes may already have one or more champions. For others, champions may need to be cultivated and given a visible profile. ■ Most successful case examples (see case examples) had either a champion or strong government support. Few lacked both.
	SUSTAINED POLITICAL COMMITMENT EXISTS	Commitment from government (at multiple levels if relevant) and nongovernmental institutions to restoration in the candidate landscape exists and is sustained.	It may be difficult to assess the long-term commitment of an institution *a priori*. In such situations, consider factors such as whether or not the commitment transcends political parties and whether or not the benefits of restoration would be enjoyed by common citizens and powerful interests (if so, government commitment is likely to be more long term).
K. KNOWLEDGE	RESTORATION "KNOW-HOW" RELEVANT TO CANDIDATE LANDSCAPE EXISTS	Local experts know of or generate research into restoration techniques (e.g., natural and assisted regeneration, traditional knowledge) tailored to the candidate landscape.	■ Local expertise can come from traditional knowledge from communities living in or around the landscape, experts from universities and rural extension services, and nongovernmental organizations active in the field. ■ The know-how may be generated locally or might be imported from elsewhere but communicated or delivered by local practitioners.
	RESTORATION "KNOW-HOW" TRANSFERRED VIA PEERS OR EXTENSION SERVICES	Technical assistance and rural extension ("extension services"), farmer-to-farmer visits, and/or other means of awareness raising and capacity building for restoration are in place and adequately resourced in the candidate landscape.	■ Land managers may need training and other forms of capacity building on the "why" and "how" of restoration. ■ Training can occur via participatory workshops, person-to-person meetings, newsletters, videos, and other means. ■ "Farmer-to-farmer" or "land-manager-to-land-manager" communication can be one of the most effective means of education and training. People tend to trust those who are most like themselves.

	DIAGNOSTIC QUESTION	RESPONSE			NOTES ON RESPONSE	FOLLOW UP QUESTION(S)	FOLLOW UP RESPONSE(S)	EXAMPLES OF STRATEGIES TO ADDRESS GAP IN KEY SUCCESS FACTORS
		YES	PARTLY	NO				
	Is there a charismatic, committed champion(s) of restoration for the candidate landscape?					Who is (are) the champion(s)?		■ Cultivate, support, and give a voice to prospective restoration champions (individuals, organizations). ■ Convene meetings of champions and prospective champions from multiple locations (even outside the candidate landscape) so they inspire each other and share best practices.
	Is there expressed, long-term commitment from government and nongovernmental institutions to restoration in the candidate landscape?					If "yes", what is the proof of the expressed commitment, and from whom?		Create and mobilize a broad constituency (representing multiple sectors including agriculture) that keeps restoration on the national political agenda.
	Does local knowledge on how to implement restoration at scale in the candidate landscape exist?					If "no", then what are the most important knowledge gaps?		■ Create programs on forest landscape restoration in universities and agriculture schools. ■ Prioritize forest landscape restoration in public and private research grant-making programs. ■ Build bridges between researchers and restoration practitioners so the former generate actionable research that is applied in the landscape.
	Are extension services, farmer-to-farmer visits, and/or other means of awareness raising and capacity building for restoration in place and adequately resourced in the candidate landscape?					For the candidate landscape, which entities are best positioned to deliver extension services?		■ Facilitate farmer-to-farmer meetings and interaction regarding restoration. ■ Set key performance indicators related to forest landscape restoration for extension agents. ■ Increase funding for forest landscape restoration training within extension services. ■ Include restoration technical assistance as part of agriculture financing packages to farmers. ■ Utilize modern information and communication technologies to better connect extension agents and land managers, and to provide both with the most up-to-date research and information.

Table 8 | **Implement: Capacity and Resources Exist and are Effectively Mobilized to Implement On-the-Ground Forest Landscape Restoration (continued)**

FEATURE	KEY SUCCESS FACTOR	DEFINITION	COMMENT
L. TECHNICAL DESIGN	RESTORATION DESIGN IS TECHNICALLY GROUNDED AND CLIMATE RESILIENT	The forest landscape restoration plan for the candidate landscape is based on best practices, incorporating the best available science and climate-smart approaches.	■ "Best practices" in this context refers to the approaches for forest landscape restoration that are informed by scientific research and/or local experience and that have demonstrated success at facilitating restoration. In some regions, written "best practice" guidance may be available from universities, NGOs, or extension agencies, but in others it will not. ■ For active restoration, the technical design needs to address aspects such as site preparation, species selection, tree spacing, and maintenance factors. ■ For passive restoration, the technical design needs to address aspects such as how to remove pressures preventing trees from naturally regrowing (e.g., livestock, fire). ■ Restoration plans should factor in projected climate change in order to be climate resilient.
	RESTORATION LIMITS "LEAKAGE"	Forest landscape restoration in the candidate landscape avoids transferring forest clearing activities to other locations ("leakage"), resulting in net increase in forest landscape area.	■ There is a risk that forest landscape restoration in the candidate landscape could result in transferring, "exporting," or "outsourcing" to other areas or countries those activities that were causing deforestation, forest degradation, or otherwise keeping trees off the candidate landscape. ■ While such "leakage" might result in an increase in the amount of forest area in the candidate landscape, it would result in a loss of forest area elsewhere. From a global perspective, this loss could negate in part or in whole the gross forest gain from the candidate landscape. For example, Meyfroidt and Lambin (2011) recount an analysis of land use displacement triggered by forest restoration in seven countries experiencing a forest transition in recent decades (i.e., Bhutan, Chile, China, Costa Rica, El Salvador, India, and Vietnam). Since the advent of net forest regrowth in these seven nations, an area equivalent to 22 percent of their restored forest area underwent land use displacement in other countries. This displaced area increased to 52 percent between 2003 and 2007. A portion (not specified) of this displacement triggered deforestation. ■ The historic forest landscape restoration case examples assessed during the development of this Diagnostic did not have in place measures to limit leakage. Going forward, however, limiting leakage will be an important key success factor if forest landscape restoration is to lead to a net global increase in forest area and quality.

	DIAGNOSTIC QUESTION	RESPONSE			NOTES ON RESPONSE	FOLLOW UP QUESTION(S)	FOLLOW UP RESPONSE(S)	EXAMPLES OF STRATEGIES TO ADDRESS GAP IN KEY SUCCESS FACTORS
		YES	PARTLY	NO				
	Is the forest restoration plan for the candidate landscape based on best practices, incorporating the best available science and climate-smart approaches?					If "no", then what is missing from the plan?		■ Develop a forest landscape restoration plan informed by the best science and factoring in climate change. ■ Review restoration plans of successful restoration experiences elsewhere to gain insights on best practice.
	Does the forest landscape restoration process have in place measures (e.g., policies, practices, incentives, yield improvements) that limit leakage or is unfolding in a manner that leakage is limited?					If "no", then what measures are missing from the restoration process?		■ Introduce measures that increase the productivity per hectare of crops, livestock, or timber from existing agricultural and forestry lands. ■ Introduce measures that decrease demand for crops, livestock, or timber.

Table 8 | **Implement: Capacity and Resources Exist and are Effectively Mobilized to Implement On-the-Ground Forest Landscape Restoration (continued)**

FEATURE	KEY SUCCESS FACTOR	DEFINITION	COMMENT
M. FINANCE AND INCENTIVES	"POSITIVE" INCENTIVES AND FUNDS FOR RESTORATION OUTWEIGH "NEGATIVE" INCENTIVES FOR STATUS QUO	From the perspective of the land manager, financial incentives and funds for restoration of the candidate landscape exist and are sufficient to outweigh the financial incentives for activities that prevent trees from regrowing.	■ "Positive" incentives are those that can encourage forest landscape restoration. They can include (but are not limited to): grants, loans, tax breaks (on the inputs, outputs, or financing of restoration), direct government expenditures (e.g., subsidies, procurement policies), payments for ecosystem services, or private markets for goods and services. ■ "Negative" incentives are those that prevent forests or trees from regrowing on a landscape. They can include (but are not limited to): grants, loans, tax breaks, and direct government expenditures supporting livestock, agriculture, and extractive industries. ■ In some circumstances, both positive and negative financial incentives may exist but if the latter outweigh the former, restoration will not likely occur at scale. ■ Consider not only the amount but also the timing of the finance and incentives. ■ Incentives and finance fall under the "implementation" theme (and not the "enable" theme) because they refer to cash flows going to land managers in a manner that influences whether or not they implement measures to restore trees.
	INCENTIVES AND FUNDS ARE READILY ACCESSIBLE	Financial incentives and funds for restoration in the candidate landscape are available without excessive hurdles or bureaucracy for the relevant land managers or communities.	In some situations, financial incentives and funds for restoration may be available but accessing them can be difficult. For instance, funding availability may not be sufficiently advertised, the application process may be too technical for small landowners, the amount of paperwork may be too bureaucratic, and the eligibility criteria may preclude a large share of land managers most needed for large-scale restoration.
N. FEEDBACK	EFFECTIVE PERFORMANCE MONITORING AND EVALUATION SYSTEM IS IN PLACE	A system for monitoring progress and evaluating impact of restoration in the candidate landscape exists.	■ Performance monitoring systems were absent from most historic case examples. Nonetheless, since decision makers today are increasingly attuned to performance monitoring, having such systems in the future is an important key success factor. ■ Aspects to monitor could include (but are not limited to) hectares undergoing restoration, tree survival rates, and quantified benefits to people and wildlife. ■ Monitoring and evaluation systems can use remote sensing, crowd-sourced ground-level monitoring (using community and NGO volunteers and modern information communication technologies), and surveys of inhabitants of the candidate landscape.
	EARLY WINS ARE COMMUNICATED	Early restoration successes in the candidate landscape are communicated to stakeholders.	■ Achieving and publicly communicating early success or "early wins" can help maintain momentum, recruit more engagement, trigger replication elsewhere in the landscape, shore up political support, and sustain external financing. ■ Visits between farmers or land managers are one approach that seems to work for communicating successes. If one's neighbor has a positive experience with restoration, then one is more likely to adopt the same practices. ■ Showing "before" and "after" images and leveraging demonstration sites can be effective ways to showcase progress.

	DIAGNOSTIC QUESTION	RESPONSE			NOTES ON RESPONSE	FOLLOW UP QUESTION(S)	FOLLOW UP RESPONSE(S)	EXAMPLES OF STRATEGIES TO ADDRESS GAP IN KEY SUCCESS FACTORS
		YES	PARTLY	NO				
	Do the incentives and funds that promote restoration outweigh those that prevent forest or tree regrowth from the land manager's perspective in the candidate landscape?					What are the relevant positive and negative incentives? What is the scale of these incentives from a land manager's perspective (e.g., $/hectare)?		■ Introduce forest landscape restoration-dedicated financing mechanisms, such as: ■ Grants ■ Low-interest loans ■ Tax breaks (on the inputs, outputs, or financing of restoration) ■ Direct government expenditures ■ Government procurement policies ■ Payments for ecosystem services (e.g., water, carbon) ■ Remove or reduce incentives that discourage forest or tree regrowth
	Are the financial incentives and funds designed to promote restoration in the candidate landscape readily accessible to the relevant land managers or communities?					If "no", then what are the barriers to access?		■ Advertise the availability of incentives and funds. ■ Provide administrative support to land managers to apply for incentives and funds. ■ Reduce amount of paperwork for applying for incentives.
	Does the candidate landscape have a performance monitoring system in place for tracking and evaluating restoration progress?					If "yes", is baseline data already being gathered? If "no", what aspects of a performance monitoring system are missing?		■ Whenever possible, establish a baseline (e.g., photos, satellite imagery, data on hectares and other measurements from the landscape as it is) to enable comparisons over time. ■ Develop and implement a performance monitoring system (including remote sensing monitoring and ground-level participatory monitoring).
	Are early restoration successes being communicated in the candidate landscape?					If "yes", how are the successes communicated (e.g., through what media)? If "no", what media are available that could be utilized?		Publicly communicate restoration progress, success stories, and lessons learned. Ensure the stories connect with the target audiences (e.g., images of progress, stories of benefits to people).

Step 3: Identify Strategies to Address Missing Factors

The third step addresses the missing key success factors—those deemed "not in place" or only "partly in place." During this step, users brainstorm, propose, and record policies, incentives, practices, and other interventions that could address the missing key success factors in the candidate landscape. The purpose is to identify strategies that maximize the likelihood that restoration will be successful.

Users can brainstorm and deliberate possible strategies and actions based on their knowledge and on input from others (see section V). During this step, we recommend that users:

- Recognize that some strategies may address more than one key success factor.
- Consider strategies aimed at sectors outside of the forest, such as agriculture.
- Ensure that each strategy or action, once fully articulated, includes best practice components of *who* is to do *what*, *why*, by *when*, and *how* it will be done.
- Consider applying criteria to distinguish between higher and lower priority strategies. Such criteria could include, but are not limited to, urgency, ease of implementation, cost, sequencing (e.g., resource tenure may need to be secured first before local benefits to restoration can be achieved), and geographic considerations (e.g., a desire to spread efforts across an entire nation as opposed to a smaller region).
- Consider what ongoing policy processes present strategic and feasible windows of opportunity for near-term influence; some of the proposed strategies might require law and policy reforms.

To stimulate ideas, users can refer to the column "Examples of strategies" in Tables 6, 7, and 8. Although not comprehensive, this column high-

lights a number of strategies from historic case examples and elsewhere. The Excel-based tool also provides this information, along with space to record ideas.

WRI plans to amend and improve the Excel-based tool over time. With that in mind, we invite users to share additional strategies they identify, develop, or implement so we can add them to the online *Restoration Diagnostic* Excel tool. In this manner, future users benefit from the experiences of a growing global restoration community. The website www.wri.org/restorationdiagnostic includes an e-mail address where users can submit their ideas.

Once strategies have been identified, users likely will find it necessary to prioritize them in terms of which to pursue and when to pursue them. Some strategies may be more impactful than others, some may take more time to realize, and users may have limited human, financial, and political resources to expend.

Depending on their aspirations and constraints, users may want to consider one or more of the following criteria when prioritizing strategies:

- Urgency of addressing the gap.
- Sequential need for addressing the gap (e.g., a certain gap such as unclear tenure needs to be addressed in order for other gaps to be successfully closed).
- Operational ease of implementing the strategy.
- Political ease of pursuing the strategy.
- Cost of implementing the strategy.
- Timing needed for strategy to be implemented (e.g., users may want to prioritize implementing strategies that have long ramp-up or lead times).

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SECTION V

PRACTICAL GUIDANCE

The three steps of the diagnostic are designed to help decision makers and stakeholders rapidly embark on the process of getting the right key success factors in place for forest landscape restoration. In this section, we provide practical guidance for conducting a diagnostic, highlight some important caveats, and share results from pilot applications.

Information Sources

Information, data, and perspectives needed to complete a diagnostic can come from a variety of sources, including:

- **Government agencies.** Relevant agencies can include those responsible for forestry, agriculture, environment, planning, rural development, and tourism.
- **Experts and practitioners from nongovernmental organizations.** Nongovernmental organizations active in the fields of restoration, conservation, and rural development are likely to have in-house experts, data, and field experiences to share.
- **Experts from universities and research institutions.** Academics renowned for their knowledge of restoration, forest ecosystems, agriculture, land-use policy, finance, and other disciplines related to forest landscape restoration are often willing to share their expertise.
- **Land managers, landowners, and local communities.** These stakeholders are important to engage as they are the ones whose land management practices will likely have to change in order for restoration to occur.
- **Managers from private sector companies.** Managers from forest product and agriculture businesses in the candidate landscape may have insights on the status of key success factors.
- **Published research.** Papers and studies, preferably peer-reviewed, can provide data on the current status of various key success factors and restoration strategies.
- **Landscape monitoring systems.** Systems that monitor change in landscapes—such as Global Forest Watch[11]—can reveal where and when land-use change has occurred. Such systems can help identify candidate landscapes, provide information on the biophysical characteristics of those landscapes, and generate insights on the socioeconomic pressures on those landscapes.
- **GPFLR Learning Network.** Available at www.forestlandscaperestoration.org, this online network provides free access to research reports and forest landscape restoration practitioners from around the world.

Input and perspectives from these sources can be obtained through a variety of approaches, including reading, structured or semi-structured interviews, focus groups, and workshops. One effective and efficient way to engage others is to convene interactive, participatory workshops where representatives of the types of organizations listed above share perspectives and data in a structured process. Another is to share the key success factor status assessment worksheet (Step 2) with representatives of the above organizations, provide a brief context, and ask them to complete it.[12]

Relying solely on the perspectives of people internal to the organization conducting the diagnostic poses the risk of perpetuating misperceptions and of not fully leveraging the breadth of available expertise. Therefore, we highly recommend complementing internal information sources with those external to the organization.

Some participants may hesitate to share their perspectives in a group setting. Likewise, social or gender dynamics might create barriers to the full participation of groups that are often marginalized, such as indigenous peoples or women. Therefore, those conducting a diagnostic should be cognizant of the social context and gender dynamics in which data gathering occurs and adapt input-gathering methods accordingly.

Furthermore, during pilot applications, we found that having one person responsible for driving a diagnostic process for the candidate landscape is essential. This person should be empowered to gather the requisite data, interview the appropriate experts, engage the relevant stakeholders, and consolidate the results into a completed assessment.

Timing and Periodicity

The Restoration Diagnostic is designed to be conducted quickly and over a short time period. The more time the user spends conducting a diagnostic, the more detailed the analysis and assessment can be. But via a quick literature review and consultations with people with the appropriate knowledge, it is possible to complete a diagnostic in a matter of a few dedicated weeks.

Forest landscape restoration is a long-term, dynamic process. Based on the case example experiences, we recommend revisiting the diagnostic once every five years to help restoration stakeholders identify remaining (or new) gaps in key success factors and address them in a timely manner.

Caveats

To set appropriate expectations and to maximize the value of conducting a diagnostic, it is important to note what the method is not. In particular:

- **It is not strictly quantitative.** The diagnostic poses a series of questions that can be answered in the form of "this key success factor is in place," "it is partly in place," or "it is not in place." In other words, the responses are qualitative, not quantitative. Such qualitative responses are by design and are sufficient for identifying gaps in key success factors for a landscape. Trying to make each response quantitative would take too much time and resources and, in many cases, is unnecessary. For instance, one diagnostic question—"Does the government have a law requiring land owners or managers to replant or restore trees in forest areas that have been cleared?"—requires a simple affirmative or negative response. It does not require any quantification. Nonetheless, quantitative information can helpfully inform responses to some of the questions and provide context that later can help users develop strategies. For example, quantifying the economic benefits of restoration vis-à-vis the status quo land use can help answer the diagnostic question, "Does restoring the candidate landscape generate economic benefits that result in a net positive financial or economic impact relative to the status quo land use?"

- **It does not tell users specifically which interventions to implement.** The diagnostic helps users identify gaps in key success factors and gives examples of interventions that could address each type of gap. But an intervention for addressing a particular gap in one location may not work in another since each candidate landscape will have a unique set of social, economic, and environmental circumstances. Therefore, the diagnostic should not be used to mechanically determine interventions; selecting the appropriate interventions requires judgment on the part of users.

- **It does not tell users how to implement on-the-ground forest landscape restoration.** The diagnostic is a method that can help inform restoration planning, but it is not designed to dictate precisely how to implement on-the-ground forest landscape restoration. For instance, it does not tell users how to map locations for restoration, how to engage local stakeholders when rolling out a restoration strategy, and how to prepare lands for restoration. Users can consult the broader ROAM publication (Box 2) and www.forestlandscaperestoration.org for advice on these activities.

Pilot Applications

During development of *The Restoration Diagnostic*, we conducted pilot applications in Rwanda, Brazil, and Ecuador. Box 6 summarizes the results of the pilot in Rwanda, Box 7 for a region in Brazil, and Box 8 for Ecuador. These pilot applications provide insights into how a diagnostic can be conducted and some results.

BOX 6 | APPLYING THE DIAGNOSTIC: RWANDA

WRI and IUCN conducted a restoration diagnostic in Rwanda in 2013. Those involved included representatives from universities, local civil society, and the government—particularly the agriculture, forests, and economic development agencies. The diagnostic occurred via a series of five workshops, one per province, with research and interviews conducted in between workshops.

Step 1: Selecting the scope was straightforward. In 2011, the president of Rwanda made a Bonn Challenge pledge to restore 2 million hectares—80 percent of the country's total land area. Given the country's population density and acute food needs, the vast majority of the proposed restoration will be into agroforestry systems. In light of this pledge, Rwanda's entire rural area became the scope of the diagnostic.

Step 2: During the workshops, participant breakout groups assessed the status of the key success factors for forest landscape restoration in Rwanda. Table 9 summarizes the results, which highlighted gaps in seed availability, government coordination, and extension services, among other factors.

Step 3: Participant breakout groups then identified a range of strategies that could address the key success factors that were not in place or were only partly in place. Participants identified more strategies than the government believed it could implement in the early years of the restoration process. To prioritize strategies, participants subjectively evaluated the "urgency" of addressing the gap and the "ease" of implementing the associated strategy. Participants ranked the strategies by priority; those with a combination of "high urgency" and "high ease of implementation" ranked highest, and those with the opposite combination ranked lowest. Table 9 lists the prioritized strategies matched with the key success factor gap they are designed to address.

Table 9 | **Diagnostic results for Rwanda**

● In place ● Partly in place ● Not in place

THEME	FEATURE	KEY SUCCESS FACTOR	RESPONSE	STRATEGIES
MOTIVATE	BENEFITS	Restoration generates economic benefits	●	
		Restoration generates social benefits	●	
		Restoration generates environmental benefits	●	Launch a public awareness campaign to highlight the benefits of a diverse range of trees, especially native species.
	AWARENESS	Benefits of restoration are publicly communicated	●	
		Opportunities for restoration are identified	●	
	CRISIS EVENTS	Crisis events are leveraged	●	
	LEGAL REQUIREMENTS	Law requiring restoration exists	●	
		Law requiring restoration is broadly understood and enforced	●	
ENABLE	ECOLOGICAL CONDITIONS	Soil, water, climate, and fire conditions are suitable for restoration	●	Introduce target to plant at least 20% with native species.
		Plants and animals that can impede restoration are absent	●	
		Native seeds, seedlings, or source populations are readily available	●	Build Tree Seed Center capacity to supply the quantity, quality, and diversity of seeds, especially native species.
	MARKET CONDITIONS	Competing demands (e.g., food, fuel) for degraded forestlands are declining	●	
		Value chains for products from restored area exist	●	
	POLICY CONDITIONS	Land and natural resource tenure are secure	●	
		Policies affecting restoration are aligned and streamlined	●	
		Restrictions on clearing remaining natural forests exist	●	Mandate one agency to promote and provide technical guidance on agroforestry.
		Forest clearing restrictions are enforced	●	
	SOCIAL CONDITIONS	Local people are empowered to make decisions about restoration	●	
		Local people are able to benefit from restoration	●	Use Joint Sector Working Group to coordinate government agencies and help prioritize/promote restoration activities.
	INSTITUTIONAL CONDITIONS	Roles and responsibilities for restoration are clearly defined	●	
		Effective institutional coordination is in place	●	
IMPLEMENT	LEADERSHIP	National and/or local restoration champions exist	●	
		Sustained political commitment exists	●	Improve understanding among ministerial and district staff of how small-scale landowners manage their woodlots to identify acceptable measures for improving production.
	KNOWLEDGE	Restoration "know-how" relevant to candidate landscapes exists	●	
		Restoration "know how" transferred via peers or extension services	●	
	TECHNICAL DESIGN	Restoration design is technically grounded and climate resilient	●	Improve existing district- and sector-level extension services by aligning performance targets of agriculture and forest staff with restoration goals.
		Restoration limits "leakage"	●	
	FINANCE AND INCENTIVES	Positive incentives and funds for restoration outweigh negative incentives	●	
		Incentives and funds are readily accessible	●	
	FEEDBACK	Effective performance monitoring and evaluation system is in place	●	
		Early wins are communicated	●	

BOX 7 | APPLYING THE DIAGNOSTIC: BRAZIL'S ATLANTIC FOREST

In 2012, WRI and researchers from Johns Hopkins University School of Advanced International Studies conducted a restoration diagnostic on the Atlantic forest biome in Brazil. This tropical forest biome runs along the Atlantic coast of Brazil from Rio Grande do Norte state in the north to Rio Grande do Sul state in the south, and inland as far as Paraguay and the Misiones Province of Argentina.

Step 1: WRI and Johns Hopkins University selected the Atlantic forest biome for several reasons. First, the biome is distinct geographically and ecologically from other regions of Brazil, making it a manageable scope. Second, the biome is in significant need of restoration; less than 12 percent of its pre-European settlement extent remains. Third, there was a budding interest in restoration. A year earlier, the Atlantic Forest Restoration Pact—a partnership among nongovernmental organizations, universities, companies, and other stakeholders—had committed 1 million hectares to the Bonn Challenge.

Step 2: Through interviews, field visits, and an extensive literature review, researchers assessed the status of the key success factors for forest landscape restoration in the biome. Those interviewed included local scientists, regional policymakers, landowners, and nongovernmental organizations active in land conservation and restoration within the region.

Step 3: Researchers then identified strategies that could address the key success factors deemed not in place or only partly in place.

In collaboration with the Brazilian federal Ministry of the Environment, WRI, IUCN, and the International Institute for Sustainability revisited and refined the step 2 and step 3 analyses in 2013 as part of the ministry's process to develop a national strategy for the recovery of native vegetation. The process involved gathering stakeholder and expert input via workshops on the presence or absence of key success factors and then fielding input on what strategies may be needed to address the gaps. Each workshop involved at least 20 people representing federal and state government agencies, nongovernmental organizations, forest product companies, landowner groups, and universities. One-on-one interviews with stakeholders and experts who could not participate in the workshops complemented the analysis.

This process unfolded for the Atlantic forest as well as for five other biomes in Brazil. Table 10 illustrates the refined results for the Atlantic forest. The identified strategies included following through on implementing three existing policies and introducing eight new strategies:

- **Forest Law:** Follow through on implementing the Law for the Protection of Native Vegetation (Forest Law 12.651/2012).
- **Sustainable agricultural intensification:** Follow through on sustainably intensifying existing croplands and pastures outside areas to be recovered (e.g., ABC Program).
- **Land tenure:** Follow through on improving clarity of land title (e.g., via the land regularization process).
- **Awareness:** Launch a multiyear communications movement targeting farmers, agribusiness, urban citizens, and opinion leaders to build awareness of native vegetation recovery, its benefits, and how to get involved.
- **Seeds and seedlings:** Create a value chain for native vegetation recovery by doubling nursery capacity and streamlining policies to improve the quantity, quality, and affordability of native seeds and seedlings.
- **Markets:** Build robust markets from which landowners can earn revenue and improve livelihoods by means of the goods (e.g., wood, nontimber forest products) and services (e.g., watershed protection, carbon sequestration) generated by recovered native vegetation.
- **Institutions:** Clarify the roles and responsibilities among government agencies, companies, and civil society and align existing public policies to ensure they mutually support recovery of native vegetation.
- **Finance:** Introduce innovative financial mechanisms designed to encourage the recovery of native vegetation.
- **Rural extension:** Expand rural extension services and capacity building (both public and private) to equip landowners with the most advanced knowledge and low-cost methods for native vegetation recovery.
- **Spatial planning and monitoring:** Implement a pioneering national spatial planning and monitoring decision-support system to support the recovery of native vegetation.
- **Research and development:** Increase the scale and focus of investment in cutting-edge research and development to reduce the cost and ramp up the pace of native vegetation recovery.

Table 10 | **Diagnostic results for the Atlantic forest (Brazil)**

● In place ● Partly in place ● Not in place

THEME	FEATURE	KEY SUCCESS FACTOR	RESPONSE	STRATEGIES
MOTIVATE	BENEFITS	Restoration generates economic benefits	●	Awareness; Markets; Finance
		Restoration generates social benefits	●	
		Restoration generates environmental benefits	●	
	AWARENESS	Benefits of restoration are publicly communicated	●	Awareness
		Opportunities for restoration are identified	●	
	CRISIS EVENTS	Crisis events are leveraged	●	Awareness
	LEGAL REQUIREMENTS	Law requiring restoration exists	●	
		Law requiring restoration is broadly understood and enforced	●	Forest Law
ENABLE	ECOLOGICAL CONDITIONS	Soil, water, climate, and fire conditions are suitable for restoration	●	Rural extension; Research and development
		Plants and animals that can impede restoration are absent	●	Rural extension; Research and development
		Native seeds, seedlings, or source populations are readily available	●	Seeds and seedlings
	MARKET CONDITIONS	Competing demands (e.g., food, fuel) for degraded forestlands are declining	●	Sustainable agricultural intensification
		Value chains for products from restored area exist	●	Markets
	POLICY CONDITIONS	Land and natural resource tenure are secure	●	Land tenure
		Policies affecting restoration are aligned and streamlined	●	Institutions
		Restrictions on clearing remaining natural forests exist	●	
		Forest clearing restrictions are enforced	●	
	SOCIAL CONDITIONS	Local people are empowered to make decisions about restoration	●	
		Local people are able to benefit from restoration	●	Land tenure; markets
	INSTITUTIONAL CONDITIONS	Roles and responsibilities for restoration are clearly defined	●	Institutions
		Effective institutional coordination is in place	●	Institutions
IMPLEMENT	LEADERSHIP	National and/or local restoration champions exist	●	
		Sustained political commitment exists	●	Awareness
	KNOWLEDGE	Restoration "know-how" relevant to candidate landscapes exists	●	Research and development
		Restoration "know-how" transferred via peers or extension services	●	Rural extension
	TECHNICAL DESIGN	Restoration design is technically grounded and climate resilient	●	Research and development
		Restoration limits "leakage"	●	Forest Law; Sustainable agricultural intensification
	FINANCE AND INCENTIVES	Positive incentives and funds for restoration outweigh negative incentives	●	Finance
		Incentives and funds are readily accessible	●	Finance
	FEEDBACK	Effective performance monitoring and evaluation system is in place	●	Spatial planning and monitoring
		Early wins are communicated	●	Spatial planning and monitoring

BOX 8 | APPLYING THE DIAGNOSTIC: ECUADOR

In 2014-15, WRI and a team of researchers from the Johns Hopkins University School of Advanced International Studies applied the restoration diagnostic in Ecuador, including the country's coastal (La Costa), Andean (La Sierra), and Amazon (El Oriente) regions.

Step 1: In 2014, the team selected these regions of Ecuador in expectation that the country would announce a commitment to forest landscape restoration as part of Initiative 20x20—a country-led effort to get 20 million hectares (Mha) of land in Latin America and the Caribbean into the process of restoration by 2020. In December of that year, Ecuador followed through by committing to restoring 500,000 ha of degraded land by 2020 as part of the initiative.

Step 2: Via interviews, literature reviews, and consultation with experts, the team assessed the status of the key success factors for forest landscape restoration in all three regions. Table 11 summarizes the results. Those engaged included officials from government ministries responsible for land-use decisions, local and international nongovernmental organizations, and local academics.

Step 3: Engaging stakeholders via interviews, the team identified possible strategies that would close existing gaps in key success factors and thereby help Ecuador meet its Initiative 20x20 commitment.

The diagnostic resulted in several important findings. In terms of the motivating key success factors, Ecuador has been largely successful in incentivizing land restoration, particularly through its national restoration program, Socio Bosque. The incentive program, however, could be complemented by strengthening the legal environment to support restoration efforts on the ground. Although the new constitution in Ecuador has established a basic framework for restoration, it is not well-understood and leaves room for poor enforcement at the local level.

In terms of the enabling key success factors, Ecuador does not currently have a sufficient number of ecological, market, policy, legal, social, or institutional conditions in place to create a favorable context for forest landscape restoration. The team recommended several strategies to address these gaps. For instance, the country will need to improve clarity of land tenure, update databases on land markets, and simplify land registration processes. The country needs to facilitate agency coordination between the Ministry of the Environment and the Ministry of Agriculture, Livestock, Aquaculture and Fisheries in order to align policies and more clearly define institutional roles and responsibilities. Improved coordination among ministries and between national and local government agencies could boost the ability to enforce the law as well as assist in improving rural extension services, seed distribution, and land tenure clarification.

The team identified four primary recommendations to improve key success factors on implementation. First, the country will need to incorporate climate resilience considerations into restoration strategies. This should be part of a broader effort to strengthen research and development into effective restoration practices to improve "know-how." Second, financial resources to support forest landscape restoration will need to be diversified, including by growing funds from bilateral government donors and private foundations. Third, restoration efforts will need to more actively engage local governments and a diverse group of stakeholders to enhance leadership and transfer knowledge on restoration strategies. Fourth, Ecuador should support strategic communication efforts to empower emerging champions, ensure sustained political commitment, and provide a positive feedback loop that sustains the motivation for restoration.

Table 11 | **Diagnostic results for Ecuador**

● In place ● Partly in place ● Not in place

THEME	FEATURE	KEY SUCCESS FACTOR	RESPONSE	STRATEGIES
MOTIVATE	BENEFITS	Restoration generates economic benefits	●	
		Restoration generates social benefits	●	
		Restoration generates environmental benefits	●	
	AWARENESS	Benefits of restoration are publicly communicated	●	
		Opportunities for restoration are identified	●	
	CRISIS EVENTS	Crisis events are leveraged	●	
	LEGAL REQUIREMENTS	Law requiring restoration exists	●	
		Law requiring restoration is broadly understood and enforced	●	Provide clarity and enforce forest law
ENABLE	ECOLOGICAL CONDITIONS	Soil, water, climate, and fire conditions are suitable for restoration	●	Enhance rural extension services
		Plants and animals that can impede restoration are absent	●	Enhance rural extension services
		Native seeds, seedlings, or source populations are readily available	●	Increase distribution of seeds
	MARKET CONDITIONS	Competing demands (e.g., food, fuel) for degraded forestlands are declining	●	Balance economic development with restoration by closing policy loopholes
		Value chains for products from restored area exist	●	
	POLICY CONDITIONS	Land and natural resource tenure are secure	●	Update databases; simplify registration
		Policies affecting restoration are aligned and streamlined	●	Improve agency coordination
		Restrictions on clearing remaining natural forests exist	●	
		Forest clearing restrictions are enforced	●	Improve agency coordination
	SOCIAL CONDITIONS	Local people are empowered to make decisions about restoration	●	Strengthen land tenure
		Local people are able to benefit from restoration	●	Strengthen land tenure
	INSTITUTIONAL CONDITIONS	Roles and responsibilities for restoration are clearly defined	●	Improve agency coordination
		Effective institutional coordination is in place	●	Improve agency coordination
IMPLEMENT	LEADERSHIP	National and/or local restoration champions exist	●	Improve strategic communication
		Sustained political commitment exists	●	Improve strategic communication
	KNOWLEDGE	Restoration "know-how" relevant to candidate landscapes exists	●	Incorporate resilience into technical design; R&D
		Restoration "know-how" transferred via peers or extension services	●	Enhance rural extension services
	TECHNICAL DESIGN	Restoration design is technically grounded and climate resilient	●	
		Restoration limits "leakage"	●	
	FINANCE AND INCENTIVES	Positive incentives and funds for restoration outweigh negative incentives	●	Diversify financial resources
		Incentives and funds are readily accessible	●	Diversify financial resources
	FEEDBACK	Effective performance monitoring and evaluation system is in place	●	
		Early wins are communicated	●	

SECTION V

CONCLUDING THOUGHTS

History indicates that forest landscape restoration on a large scale is possible. Restoration has occurred before; it can occur again.

Restoring forest landscapes, however, is not a simple matter. Without sufficient motivation, public and private sector decision makers and the people living within a landscape will not change their land uses or land management practices in a manner that fosters restoration. Without the right enabling conditions, land use and land management practices will not change either—even if decision makers are sufficiently motivated. Without adequate implementation capacity and resources, successful restoration over the long term will not occur—even if motivation and enabling conditions are present. All three are needed.

The Restoration Diagnostic is designed to help decision makers and other restoration stakeholders navigate around these potential barriers. By leveraging insights and lessons from history, the diagnostic articulates key success factors for forest landscape restoration. It guides users in determining the degree to which these factors are already in place within a landscape being considered for restoration, and helps identify strategies for filling gaps.

The diagnostic can assist users in prioritizing and focusing restoration policies or interventions before large amounts of human, financial, or political capital have been invested. Doing so can increase the likelihood that restoration processes will be successful and sustainable. Likewise, when reapplied periodically during a long-term restoration process, the diagnostic can be a tool for adaptive management.

The world has a significant forest landscape restoration opportunity. Our aspiration is that over the coming two decades the world will make progress toward realizing much of this opportunity. Generations are often remembered for one or two defining, transformative achievements. May people look back 50 years from now and say that *this was the restoration generation*.

APPENDIX 1. GUIDING PRINCIPLES OF FOREST LANDSCAPE RESTORATION

Successful forest landscape restoration integrates a number of guiding principles, including:[13]

- **Focus on landscapes.** It restores entire landscapes, not individual sites. Restoration typically entails balancing across the landscape a mosaic of interdependent land uses—such as protected forest areas, ecological corridors, regenerating forests, other natural ecosystems, agroforestry systems, agriculture, improved fallow systems, well-managed plantations, and riparian strips—to meet a variety of human needs.
- **Restore ecological functionality.** It restores the ecological functionality of the landscape, such as its richness as a habitat, its ability to contain erosion and floods, and its resilience to climate change and various disturbances. This can be done in many ways, one of which is to restore the landscape toward the pre-human disturbance or "original" vegetation, but other strategies may also be used.
- **Allow for multiple benefits.** It generates a suite of ecosystem goods and services by intelligently and appropriately increasing tree cover across the landscape. In some places, trees are added to agricultural lands without forming a forest canopy in order to enhance food production, reduce erosion, provide shade, and produce firewood. In other places, trees are added to create a closed canopy forest capable of sequestering large amounts of carbon, protecting downstream water supplies, and providing rich wildlife habitat.
- **Recognize that a suite of interventions are possible.** It embraces a wide range of strategies for restoring trees on the landscape. For instance, some strategies make way for "nature to take its course" (e.g., curtailing livestock grazing to allow trees to spontaneously regrow), while others involve very active human intervention (e.g., tree planting).
- **Involve stakeholders.** It actively engages local stakeholders—including landowners, land managers, communities, civil society, governments, and the private sector—in decisions regarding restoration goals, implementation methods, and trade-offs. It is important that the restoration process respects local stakeholders' rights, aligns with their land management needs, and provides them with benefits. Active, voluntary involvement of local stakeholders can lead to better buy-in, greater access to local knowledge, motivated land managers, and less need for external resources.
- **Tailor to local conditions.** It adapts to fit local social, economic, and ecological contexts; there is no "one size fits all."
- **Manage adaptively.** It adjusts restoration strategies over time as environmental conditions, human knowledge, and societal values change. It leverages continuous monitoring and learning to make adjustments as the restoration process progresses.
- **Avoid conversion of natural ecosystems.** It does not call for increasing tree cover beyond what would be ecologically appropriate for a particular location, and should not cause any loss or conversion of natural forests, grasslands, or other ecosystems (e.g., into tree or crop plantations). Restoration should complement, not undermine, ecosystem conservation efforts.

APPENDIX 2. FOREST RESTORATION OPPORTUNITY MAPPING METHOD AND CAVEATS

To identify the opportunities for restoration shown in Figure 3, researchers at WRI, IUCN, and the University of Maryland used preexisting, globally consistent, geospatial datasets at a 1-kilometer resolution. They first developed a map of areas with climate and soil conditions capable of supporting a tree canopy cover of at least 10 percent. This is a broad definition of a forest landscape, and includes savannas with trees. They proceeded to map the composition and density of the tree cover most likely to be growing there, absent human influence, using a global map of ecoregions. Having created a hypothetical map of today's potential forest area as it might be without human influence, researchers contrasted it with a map of today's forest as it actually was in the early 2000s. The result of this comparison was a global map of cleared—that is, converted—and degraded forest lands.[14]

Researchers analyzed which of these cleared and degraded forest landscapes hold potential for restoration. Areas taken up by open croplands[15] and settlements were eliminated from consideration. The remaining landscapes shown in Figure 3 were considered likely to contain opportunities for restoration.[16]

It is important to note a number of caveats to avoid misapplying the forest landscape restoration opportunity analysis, setting unfounded expectations, or underappreciating the challenges:

- **A global map is not suited for planning.** Figure 3 is designed to indicate the scale of the global restoration opportunity. It shows landscapes where restoration opportunities are more likely to be found, and where closer examination is warranted. It does not identify individual sites for action or suggest specific restoration interventions. The resolution of the map is 1 square kilometer—too coarse even for national-level planning purposes—and the generalized global datasets that were used to make the map omit many considerations that are critical at the local level. More refined, higher resolution research is required when evaluating the potential of a particular tract of land and what interventions to employ. Such an approach should combine higher resolution imagery and ground-based land-use information, incorporate local knowledge, and include local stakeholders in deciding on preferred land uses and restoration methods. The *Restoration Opportunities Assessment Method* (Box 2) provides more information on how to conduct such a refined analysis, and may increase or decrease the estimate for any given jurisdiction or country.
- **Cleared or degraded forest lands are usually not "unused" or devoid of people.** "Cleared" and "degraded" forest land might conjure up images of vast tracts of uninhabited and unutilized land. This is often not the case in reality, however. A reasonable hypothesis is that most tracts of land that have been degraded or cleared of their native vegetation are owned, claimed, or used—at least periodically—by somebody. People accessed these lands before; they are likely still doing so or will do so again. Likewise, some of these lands may support economic activity, even if the returns are low. For example, tracts of cattle pastureland in cut-over regions of the Atlantic forest in Brazil are

yielding economic returns to ranchers, albeit just an estimated R$500 per hectare per year in some cases (Brancalion et al. 2012). Consequently, any strategy designed to change practices on these lands will need to respect the interests and rights of the people living in and around the area.

- **Not all cleared or degraded forest lands should be restored into forest landscapes.** Competing demands for land use are growing in some areas, including for needs such as food production (Searchinger et al. 2013). Decision makers will need to determine how best to integrate forest landscape restoration into wider land use decisions and planning to meet various needs.
- **It is not easy.** Restoring cleared or degraded forest lands can face any number of economic, social, political, or legal barriers. For instance, the benefit-cost ratio for restoring forests on a tract of land might be negative or its net present value might fail to out-compete that of the status quo land use. Moreover, unclear or insecure land tenure can discourage those managing a tract of land from making the upfront investments or land management practice changes needed to restore trees.

APPENDIX 3. CASE EXAMPLES

This Appendix summarizes the historical case examples and data sources underpinning each example.

Brazil—Tijuca National Park

Since the mid-1800s, 3,200 hectares of dense forest were restored near Rio de Janeiro to create one of the largest urban parks in the world: Tijuca National Park.

Data sources

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China—Loess Plateau Watershed Rehabilitation Project**

Since the late 1970s, trees and other vegetative cover have been restored on 1.6 million hectares in an effort to slow erosion, increase crop production, and boost incomes.

Data sources

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Costa Rica—National Forest Recovery

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Denmark—Heath Restoration in Jutland

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Data sources

Ethiopia—Humbo Project

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India—Watershed Restoration

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Puerto Rico—National Restoration

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South Korea—National Restoration

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Sweden—Reforestation in the Southwest

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Tanzania—Woodland regeneration in the Shinyanga district

Since the mid-1980s, local villages have restored 500,000 hectares of woodlands within a 5 million hectare landscape in the Shinyanga District, protecting the land and providing valuable nontimber forest products to local communities.

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United States—Forest recovery in New England

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United States—Restoration in the South

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Vietnam—National Mangrove Restoration

Since 1978, a series of programs triggered restoration of more than 18,000 hectares of mangroves across an area of 152,000 hectares, improving the livelihoods of nearly 8,000 families.

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ENDNOTES

1. To view the map, visit http://www.wri.org/resources/maps/atlas-forest-and-landscape-restoration-opportunities or see pages 22-23 (Figure 3) in this publication.

2. Readers who are already familiar with the concept and benefits of forest landscape restoration may want to skip to section III.

3. Intact forest landscapes are large, unbroken expanses of natural ecosystems within areas of current forest extent, without signs of significant human activity, and having an area of at least 50,000 hectares (Potapov et al. 2008).

4. If a landscape such as a wooded savanna would naturally have 25 percent tree canopy cover but currently has 10 percent, then forest landscape restoration would call for restoring trees up to 25 percent canopy cover, not more.

5. See http://www.un.org/climatechange/summit/wp-content/uploads/sites/2/2014/07/FORESTS-Action-Statement_revised.pdf.

6. Lugo, A. 2014. pers. comm., 18 August.

7. Visit www.wri.org/restorationdiagnostic for profiles of each case example.

8. Our assessment is based on the status of the case example at the time of writing this publication, not projections of their future performance. For those case examples that we concluded have some characteristics that may negatively affect their long-term success, we articulate those concerns in their respective case example profiles. These profiles can be found at www.wri.org/restorationdiagnostic.

9. This theme only applied when decision-makers (e.g., governments, land managers) consciously decided to catalyze processes that result in forest landscape restoration (either through active or passive restoration or a combination of both). This theme did not apply in situations where forest landscapes recovered without human intention, such as when forest landscapes recover as farmers abandon land in favor of urban jobs.

10. For example, see Meyfroidt and Lambin (2011); Gregersen et al. (2011).

11. See www.globalforestwatch.org

12. For additional guidance on possible data and sources, visit part I of the *Governance of Forests Initiative Guidance Manual* (available at http://www.wri.org/sites/default/files/gfi_guidance_manual.pdf).

13. Based on Maginnis et al. (2005).

14. In this context, "degraded" refers to a reduction in the volume and canopy cover of trees across a landscape. Degradation results in a reduction of biomass, biodiversity, and ecosystem services provided by forests. Degraded, however, does not necessarily entail poor soil quality.

15. The analysis used a global cropland dataset (Pittman et al., 2010). http://www.mdpi.com/2072-4292/2/7/1844 that shows croplands as detectable from space in Modis 250m imagery, per pixel classification. Detection sensitivity differs between crops. It can identify intensive broadleaf crop production (e.g., maize, soybeans), but has more difficulty identifying narrow-leaved crops such as rice and areas of low agricultural intensification.

16. The analysis did not exclude former forest land that is now livestock pastures from being considered for restoration. Many of these lands therefore show up as having potential for forest landscape restoration. However, given growing demand for meat from livestock, many of these pastures will need to undergo sustainable pastureland intensification so that demand can be met without conversion of natural forests and savannas. See Laestadius et al. 2012 for more about the methods used.

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