IUCN

Second Bonn Challenge progress report

Application of the Barometer in 2018

Radhika Dave, Carole Saint-Laurent, Lara Murray, Gabriel Antunes Daldegan, Rens Brouwer, Carlos Alberto de Mattos Scaramuzza, Leander Raes, Silvio Simonit, Marisete Catapan, Gerardo García Contreras, Alain Ndoli, Charles Karangwa, Naalin Perera, Swati Hingorani, Tim Pearson

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

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Foreword – El Salvador

In 2012, a year after the Bonn Challenge was launched, El Salvador pledged to bring 1 million hectares – half of its land area – under restoration. At the time, many people asked if my government was being too ambitious. But 90% of El Salvador's population is vulnerable to the impacts of climate change and land degradation. So we are not being overly ambitious, we are doing what needs to be done for our survival. Restoring our forest landscapes is crucial if we want to enhance our resilience, stabilise our food and water supplies and protect the biodiverse landscapes that are our carbon sinks.

In March 2019, I had the distinct honour of announcing the UN Decade on Ecosystem Restoration 2021–2030. It was a proposal my government first floated to the international community at a Bonn Challenge High-Level Roundtable in 2018. Watching 70+ countries endorse the Decade reminded me of how far we have come in our restoration journey and how far we have yet to go. Restoration is slowly being mainstreamed as a vehicle for the Sustainable Development Goals, Aichi/post-Aichi Targets and the Paris Agreement but the need of the hour is to take stock of the progress of our current restoration targets and to use this information to increase our ambition. This is one of the reasons why I am delighted to launch the second report of the Bonn Challenge Barometer as it is a tool that will be vital in helping to assess the progress of the UN Decade as it moves towards implementation. El Salvador is featured in this report and I am proud of our efforts to develop a national forest and landscape restoration plan that extends from 2018 to 2022 and harnesses the potential of nature-based solutions, such as restoring mangroves to mitigate the impact of hurricanes.

My message to the global restoration community is that the Decade offers us a unique opportunity to accelerate our efforts to achieve the Bonn Challenge and to capture quantifiable progress through the Barometer. Let us come together with this common vision.

Hon. Lina Pohl
Minister of Environment and Natural Resources
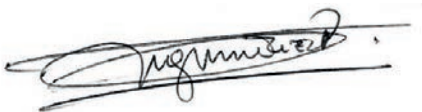Government of El Salvador

Foreword – Rwanda

The first milestone of the Bonn Challenge, 2020, is quickly approaching. Rwanda was one of the early adopters of the Bonn Challenge and my government feels a special sense of pride in seeing how global support for forest landscape restoration has grown – the United Nations General Assembly has announced the UN Decade on Ecosystem Restoration, countries in the Caucasus and Central Asia region have joined the Bonn Challenge, Scotland became the first European region to announce a restoration pledge and, in my region, the AFR100 initiative, which contributes to the Bonn Challenge, surpassed its 100-million hectare (Mha) target. At the time of publishing this report, 170.43 Mha have been pledged to the global goal of bringing 150 Mha under restoration by 2020 and 350 Mha by 2030.

The *Second Bonn Challenge progress report. Application of the Barometer in 2018*, showcases progress in six restoration pilot countries, including Rwanda, in addition to a snapshot of progress from 13 other jurisdictions. It is the most comprehensive assessment of restoration progress to date and is an invaluable source of data for governments, technical partners and donors. The report tells us exactly where we are making progress, the factors that contributed to it and the hurdles we need to resolve to scale up our efforts. Recognising the immense potential of the Barometer, the Commission of Central African Forests (COMIFAC) committed to participating in the development of this progress-tracking protocol for restoration commitments. Similarly, the Caucasus and Central Asia region endorsed the Barometer in the 2018 Astana Resolution.

A development that I am particularly excited about is the online platform of the Barometer, which went live in December 2018. It allows my ministry to upload our data on restoration – maps of the landscapes we work in, details of the policies and funding mechanisms we have put in place for restoration, information from other non-governmental organisations (NGOs) working with us – into a portal housed at www.infoflr.org. The IUCN team then supports us in interpreting this data and generating a detailed picture of our restoration efforts. In the coming months, this portal will be further enhanced and made widely available to all pledgers.

I urge the cohort of Bonn Challenge pledgers to join Rwanda in supporting the Barometer. Forest landscape restoration and the Bonn Challenge have the potential to help our governments deliver on the promises we have made to our constituencies – jobs, clean water, food security and resilience to climate change. Together, we can achieve the Bonn Challenge.

Prime Ngabonziza
Director General
Rwanda Water and Forestry Authority

Executive summary

In 2011, the government of Germany and IUCN (International Union for Conservation of Nature) together launched the Bonn Challenge as a global commitment to bring under restoration 150 million hectares (Mha) of land by 2020. The New York Declaration on Forests endorsed and built upon this goal in 2014, committing to a global target of 350 Mha by 2030. At the time of publishing, 58 pledgers had signalled their commitment through ambitious pledges to the Bonn Challenge and its regional platforms, such as Initiative 20x20 and the African Forest Landscape Restoration Initiative (AFR100). The recently declared UN Decade on Ecosystem Restoration brings added momentum and attention to these global commitments as vehicles for environmental sustainability. IUCN has developed the Bonn Challenge Barometer – a progress-tracking framework and tool to support pledgers in meeting the critical need to assess and report on the implementation of national and subnational forest landscape restoration (FLR) pledges made under the Bonn Challenge.

Applying the Barometer allows pledgers to report on actions taken, and also to identify obstacles to achieving their pledges. It is structured as a systematic yet flexible protocol, with two overarching sets of indicators. The "Success factors" are policies and institutional frameworks, financial flows and technical planning that create the enabling conditions needed for FLR implementation. The "Results and benefits" include the results of FLR actions in terms of the land area brought into restoration, and the climate mitigation, biodiversity conservation and job creation benefits associated with them.

The Barometer protocol was launched in 2017 and further refined with in-depth application in five countries – Brazil, El Salvador, Mexico, Rwanda and the United States – in 2018. Additionally, in-depth application has begun in Sri Lanka. A rapid application of the protocol was undertaken in 13 additional countries to provide a broad snapshot of progress. Altogether, these 19 countries have collectively pledged a total of 97 Mha, representing 57 % of current commitments. The Barometer is now available as an online tool for data visualisation and reporting by pledgers, accessible at https://infoflr.org/bonn-challenge-barometer.

Key messages from the results of the 2018 application include:

- The development of the Bonn Challenge Barometer of progress allows us to track substantive implementation progress more accurately, in terms of hectares brought into restoration and delivery of associated ecosystem benefits (including carbon sequestered and biodiversity conservation), as well as jobs created.
- Implementation of FLR is clearly happening at scale. From the 13 countries reporting on area under restoration, which represent only a subset of all Bonn Challenge countries, we now know that 43.7 Mha are under restoration transition. While this equates to 29% of the total Bonn Challenge target, this represents approximately 56% of these countries' Bonn Challenge commitments.
- FLR is being implemented using a range of restoration approaches. For the five countries with in-depth Barometer application, the management of degraded forest lands through silviculture and natural regeneration, and the improvement of agricultural lands through agroforestry, are the predominating FLR strategies (87%). Commercial plantations only account for 2.2% of current FLR activities.
- The Barometer also indicates that the benefits accruing from these documented activities include an additional 354,000 jobs, an average investment per hectare of at least US$ 235 and 1.379 billion tonnes CO_2e sequestered.

- This report also shows how FLR contributes to biodiversity conservation. For example, El Salvador (Chapter 4) reports that approximately 17% of national restoration initiatives are underway in protected areas.
- The pilot application process and data collection for the Barometer were instrumental in catalysing national discussions on forest restoration indicators and the development of an FLR monitoring database (e.g. Brazil, Chapter 3).
- There are strong policies, plans and institutional arrangements in place that support implementation of FLR interventions (e.g. Rwanda, Chapter 6). However, challenges remain with weak coordination between different institutions and across scales. This is identified as a bottleneck to progress in the case of Quintana Roo, Mexico (Chapter 5), and is relevant across a broader set of countries.
- There is a demonstrated willingness for countries to raise domestic investment for landscape restoration, but such investment falls short of needed resources.
- Adequate focus on identifying jurisdictional programmes across different sectors that include FLR approaches is necessary to bring the ministries responsible together to align policies, plans and strategies and improve inter-sectoral coordination.

The year 2018 marked the end of the Barometer development phase. Several lessons and challenges were identified and IUCN will continue to work closely with countries to address the need for:

- An acknowledgement that restoration takes place at multiple scales (national, subnational, site level) and through multiple actors (state, non-state, non-profit, private sector).
- Clarification of terminology. FLR terminology is broad and subject to broad interpretation. The Barometer relies on a diverse set of intervention types and there is an inherent assumption that all Bonn Challenge countries are adhering to generally accepted FLR principles. However, there may be instances where FLR terminology needs to be refined or better explained.
- Specific efforts to systematise and align reporting on CO_2 sequestration from restoration with United Nations Framework Convention on Climate Change (UNFCCC) reporting.
- Improvement of spatial data. Spatial data on restoration initiatives on the ground are often lacking or not shared by pledgers.
- Specific efforts to support pledgers to assess and document the socio-economic impacts of FLR across scales.
- Urgent integration of restoration monitoring with efforts to reduce deforestation.

The Barometer will be available to all countries to record progress this year. However, it is anticipated that this will need to be accompanied by capacity building, support and analysis, so that by 2020 there is an accurate and reliable reflection of progress from all participating pledgers.

Acknowledgements

Any opinions, findings, conclusions or recommendations expressed in this publication are those of the authors.

Acronyms

AFR100	African Forest Landscape Restoration Initiative	FSSP	Forest Sector Strategic Plan
ANA	National Water Agency, Brazil	FTE	full-time equivalent
APP	area of permanent protection	GGCRS	Green Growth and Climate Resilience Strategy, Rwanda
ASPY 2030	Yucatán Peninsula Framework Agreement on Sustainability for 2030	GHG	greenhouse gas
BEST	Biomass Energy Strategy	GIS	geographic information system
BNDES	Brazilian Development Bank	IBAMA	Brazilian Institute of Environment and Renewable Natural Resources
CBD	Convention on Biological Diversity		
CENTA	Centro Nacional de Tecnología Agropecuaria y Forestal	IBAT	Integrated Biodiversity Assessment Tool
		ICCN	Congolese Institute for Nature Conservation
CI	Confidence Interval	IISD	International Institute for Sustainable Development
COMIFAC	Central African Forests Commission	IMAFLORA	Forest and Agriculture Certification and Management Institute, Brazil
CONABIO	Commission for the Knowledge and Use of Biodiversity, Mexico		
		INAB	National Forestry Institute, Guatemala
CONAFOR	National Forestry Commission, Mexico	INECC	National Institute of Ecology and Climate Change, Mexico
CONAP	National Council for Protected Areas, Guatemala		
CONASAV	National Council for Environmental Sustainability and Vulnerability, El Salvador	INEGI	National Institute of Statistics and Geography, Mexico
		INFyS	National Forest and Soil Inventory, Mexico
CONAVEG	National Commission for Native Vegetation Recovery, Brazil	IPC	Indice de Precios al Consumidor
		IPCC	Intergovernmental Panel on Climate Change
COP	Conference of the Parties	IUCN	International Union for Conservation of Nature
CSC	Consejo Salvadoreño del Café		
DIGESTYC	Dirección General de Estadísticas y Censos	KBA	key biodiversity areas
DRC	Democratic Republic of Congo	LDN	Land Degradation Neutrality
EDPRS	Economic Development and Poverty Reduction Strategy, Rwanda	LPVN	Native Vegetation Protection Law, Brazil
		LRTWG	landscape restoration technical working group
ESALQ	Escola Superior de Agricultura Luiz de Queiroz	LULC	land use and land cover
EX-ACT	Ex-Ante Carbon Balance Tool	MAD-Mex	Monitoring Activity Data for the Mexican REDD+ program
FAO	Food and Agriculture Organization of the United Nations		
		MADS	Ministry of Environment and Sustainable Development, Colombia
FIAES	Fondo Iniciativa para las Americas El Salvador		
FLEGT	Forest Law Enforcement, Governance and Trade	MAG	Ministry of Agriculture and Livestock, El Salvador
FLR	forest landscape restoration	MAGA	Ministry of Agriculture, Livestock and Food, Guatemala
FMES	Forestry Sector Monitoring and Evaluation System		
FRL	forest reference level	MapBiomas	Brazilian Annual Land Use and Land Cover Mapping Project
FSI	Forest Survey of India		

MARN	Ministry of Environment and Natural Resources	PMABB	Brazilian Biomes Environmental Monitoring Program
MCTIC	Ministério da Ciência, Tecnología, Inovações e Comunicações	PND	National Development Plan, Mexico
MEEATU	Ministry of Water, Environment, Land Management and Urban Planning, Burundi	PPCDAm	Action Plan for the Prevention and Control of Deforestation in the Legal Amazon
MINAE	Ministério de Ambiente y Energía	PRA	State Environmental Compliance Programme
MINAGRI	Ministry of Agriculture and Animal Resources, Rwanda	PREP	National Ecosystem and Landscape Restoration Program, El Salvador
MINEDD	Ministry of Environment and Sustainable Development, Côte d'Ivoire	PROCODES	Conservation Programme for Sustainable Development
MINFOF	Ministry of Forests and Wildlife, Cameroon	PROMARNAT	Programa Sectorial de Medio Ambiente y Recursos Naturales (Environment and Natural Resources Sectoral Programme, Mexico)
MINILAF	Ministry of Lands and Forestry, Rwanda		
MIS	monitoring information system		
MITADER	Government of Mozambique Ministry of Land, Environment and Rural Development	PRONAFOR	Programa Nacional Forestal (National Forestry Programme, Mexico)
MMA	Ministry of the Environment, Brazil	PROVEG	National Policy for the Recovery of Native Vegetation, Brazil
MoE	Ministry of Environment, Rwanda		
MRV	monitoring, reporting and verification	PSTA	Strategic Plan for the Transformation of Agriculture, Rwanda
NAMA	Nationally Appropriate Mitigation Action		
NBSAP	National Biodiversity Strategy and Action Plan	REDD+	Reducing Emissions from Deforestation and Forest Degradation plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks
NDC	nationally determined contribution		
NEMA	National Environment Management Authority, Kenya		
NFS	National Forest System, USA	REMA	Rwanda Environment Management Authority
NGO	non-governmental organisation	RNRA	Rwanda Natural Resources Authority
OBPE	Office for the Protection of the Environment, Burundi	RL	legal reserves in Brazil
		ROAM	Restoration Opportunity Assessment Methodology
PACTO	Atlantic Forest Restoration Pact, Brazil		
PEC	Special Concurrent Programme for Sustainable Rural Development	ROOT	Restoration Opportunities Optimization Tool
		RWFA	Rwanda Water and Forestry Authority
PECC	Special Climate Change Programme	SAGARPA	Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food, Mexico
PEF	Forestry Strategy Programme		
PES	payment for ecosystem services	SDG	Sustainable Development Goal
PLANAVEG	National Plan for the Recovery of Native Vegetation, Brazil	SEMA	Secretary of Ecology and the Environment, Mexico

SEMARNAT	Secretariat of Environment and Natural Resources, Mexico
SICAR	National Environmental Registry of Rural Properties, Brazil
SNMB	National Biodiversity Monitoring System, Mexico
TOF	trees outside forests
TPP	20-Point Programme, India
UFMG	Federal University of Minas Gerais
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP-WCMC	United Nations Environment World Conservation Monitoring Centre
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Project Services
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USFS	United States Forest Service
WRI	World Resources Institute
WWF	World Wide Fund for Nature

1 Introduction

1.1 Background

The Bonn Challenge is a global effort to place 150 million hectares (Mha) of the world's deforested and degraded land under restoration by 2020, increasing to 350 Mha by 2030.[1] At the time of publishing, 58 contributors had pledged more than 170 Mha to the Bonn Challenge.[2] Underlying the Bonn Challenge is the forest landscape restoration (FLR) approach.[3] This aims to reduce and reverse land degradation in order to restore ecological integrity and enhance human well-being. IUCN and the World Wide Fund for Nature (WWF) first proposed FLR at the start of the 21st century as a systematic framework for managing landscapes, to complement forest conservation and sustainable management efforts (IISD, 2002). Despite natural regeneration and human-assisted restoration of ecosystems, the scale and extent of recent land degradation has far outpaced efforts to conserve or restore ecosystems. Thus, land degradation now affects over 3 billion people globally and, by conservative estimates, close to 30% of arable land (Nkonya et al., 2016; Gellie et al., 2018). Since the launch of the Bonn Challenge in 2011, multiple countries have made voluntary commitments. The Bonn Challenge also provides a framework for regional restoration initiatives and platforms, such as the African Forest Landscape Restoration Initiative (AFR100) in Africa, Initiative 20x20 in Latin American and Caribbean countries, and the Agadir Commitment for the Mediterranean. The Bonn Challenge is advanced by a suite of high-level regional roundtables in East, Central, Southern and West Africa, Asia, Latin America and the Caribbean, and the Caucasus and Central Asia region. Additional regional platforms are currently under development.

Responding to this global threat, several multilateral agreements and international policy arenas have recognised the urgent need for increased efforts to restore degraded landscapes. Ambitious restoration goals are found under the Convention on Biological Diversity (CBD), the UN Framework Convention on Climate Change (UNFCCC) and the UN Convention to Combat Desertification (UNCCD), as well as in the Sustainable Development Goals (SDGs), the Rio+20 Land Degradation Neutrality (LDN) Goal and the UN Global Objectives on Forests. The Bonn Challenge, while being a voluntary commitment, is well aligned with these multilateral environmental agreements and other global goals. For example, the role of enhancing forest carbon stocks through restoration has been recognised under Reducing Emissions from Deforestation and Forest Degradation+ (REDD+) and Article 5 of the Paris Agreement. Furthermore, under the nationally determined contributions (NDCs) to the UNFCCC, Parties to the Paris Agreement acknowledge the urgent need to scale up and accelerate restoration efforts in degraded and undermanaged land so as to avoid a global average temperature increase of more than 1.5 °C. The measures incorporated into countries' NDCs largely include land-use and land-cover change actions, such as those encompassed in the FLR approach. As of September 2018, 41 of the 46 countries that had then committed to the Bonn Challenge had included targets for restoration in their NDCs.

Globally, 2018 saw incredible movement on FLR and the Bonn Challenge. Eight additional countries (between January and November 2018) pledged to restore 8.1 Mha. This includes a new pledge from the Khyber Pakhtunkhwa Province in Pakistan, the first subnational jurisdiction to achieve, and extend, its pledge to the Bonn Challenge. The Caucasus and Central Asia region has joined the Bonn Challenge, with six countries signing the Astana Resolution, which calls for the restoration of 2.5 Mha and increased intercountry partnerships to share knowledge and experiences on FLR. It strongly endorses the Bonn Challenge Barometer as a monitoring framework. In March 2018, two critical ministerial roundtables took place in the Democratic Republic of Congo, at which ministers from 10 Central African Forests Commission (COMIFAC) countries met to discuss how to accelerate and finance FLR implementation. This culminated in the adoption of the Common Strategy for

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[1]   The Bonn Challenge goal of 150 Mha was extended to 350 Mha under the New York Declaration on Forests.

[2]   www.bonnchallenge.org; at the time of publication more than 170 Mha had been pledged by 58 jurisdictions and other entities. Pledges made under regional initiatives, such as the AFR100, are included within the global commitments set under the Bonn Challenge where applicable.

[3]   www.infoflr.org.

the Mobilisation of Financial and Technical Resources for the Implementation of Bonn Challenge Commitments.

In Brazil, high-level representatives from Peru, Bangladesh, El Salvador, Ethiopia, Malawi, Uruguay, Brazil, Ecuador and the Dominican Republic participated in the third International High Level Roundtable on the Bonn Challenge in March 2018. The Roundtable uncovered inspiring stories of FLR implementation and progress. The Minister of Environment and Forests of Bangladesh spoke about the country's Social Forestry Programme, which has distributed US$ 34.8 million to date and benefited 652,955 individuals, 121,507 of whom were women. The Minister of Environment and Natural Resources of Guatemala highlighted that the country has already restored 547,000 ha and reaffirmed its intention to exceed its Bonn Challenge commitment.

These snippets are a testament to the commitment of governments to restore degraded and deforested landscapes, and to use their own resources to do so. They provide insights into how FLR is being integrated in domestic programmes on livelihoods generation, food security and gender equity. They also underscore the importance of having a flexible protocol, such as the Bonn Challenge Barometer, that can capture this information, which can then be used to pinpoint investment opportunities for donors, potential synergies between ministries (e.g. agriculture and environment), and entry points for non-governmental organisations (NGOs) and international governmental organisations to provide technical capacity to governments and other contributors to the Bonn Challenge.

1.2 Bonn Challenge Barometer of progress

Global target-setting on land restoration underscores the role of FLR approaches in meeting national and international commitments. The need to measure progress towards these ambitious targets is now the focus. In 2016, IUCN began to develop the Bonn Challenge Barometer (henceforth referred to as the "Barometer") as a flexible and systematic progress-tracking protocol. This was in response to the growing demand from governments, donors and partners for a means to collect and share information on action taken towards the Bonn Challenge targets. Six countries are collaborating with IUCN to develop, pilot and implement the Barometer, with support from the government of

Germany. These are Brazil, El Salvador, Mexico (i.e. Quintana Roo), Rwanda, Sri Lanka and the USA.

To capture a broader view of the progress being made beyond the six pilots already underway, rapid assessments using the Barometer framework were conducted in 13 additional countries (Burundi, Cameroon, Colombia, Costa Rica, Democratic Republic of Congo, Ghana, Guatemala, India, Côte d'Ivoire, Kenya, Malawi, Mozambique and Uganda). Snapshots of their progress are included in this report (see Appendix 2). An additional three countries in Africa – Ethiopia, Madagascar and Togo – will apply the Barometer framework to assess their actions and progress as part of an initiative starting in 2019.

The Barometer, and the protocol that underpins it, is designed to enhance global understanding of how close the world is to achieving ambitious restoration pledges and tracking the associated benefits of FLR implementation. This includes the contribution of a broad range of activities encompassed in the FLR approach to global climate mitigation. Pledgers can do this by measuring and reporting on efforts using process indicators, achievements on the ground (results in hectares of land brought under restoration) and associated biodiversity, jobs and carbon sequestration benefits. Since late 2017, government officials and implementing agencies in pilot countries have worked with IUCN staff to define parameters of success, identify appropriate progress indicators and develop reporting structures that allow an array of data to be gathered from varied sources. In its development phase, 2017–2018, IUCN staff and consultants worked with government agencies and partners to apply the Barometer in a process of continuous learning. This process is described in more detail in the next chapter of the report.

The 2017 Spotlight Report[4] presented the conceptual framework for the Barometer with its two overarching dimensions (*Success factors* and *Results and benefits*). It also provided a snapshot of progress in the countries piloting this tool. The *Second Bonn Challenge progress report* provides an in-depth look at the process of finalising the Barometer protocol through consultations and iterative steps. It shares results until December 2018 from the full application of the Barometer in five of the six pilot countries (El Salvador, Mexico, Brazil, Rwanda and the USA) and early data from its initiation in the sixth pilot country, Sri Lanka. The report also shares the results of a rapid application of the protocol in 13 other Bonn Challenge pledge countries (see Figure 1.1).

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[4]   The 2017 Bonn Challenge Barometer Spotlight Report can be accessed at https://portals.iucn.org/library/node/47111.

Figure 1.1 Map showing Bonn Challenge pledgers covered in the Second Bonn Challenge progress report

Piloting Countries
Rapid Assessment Countries
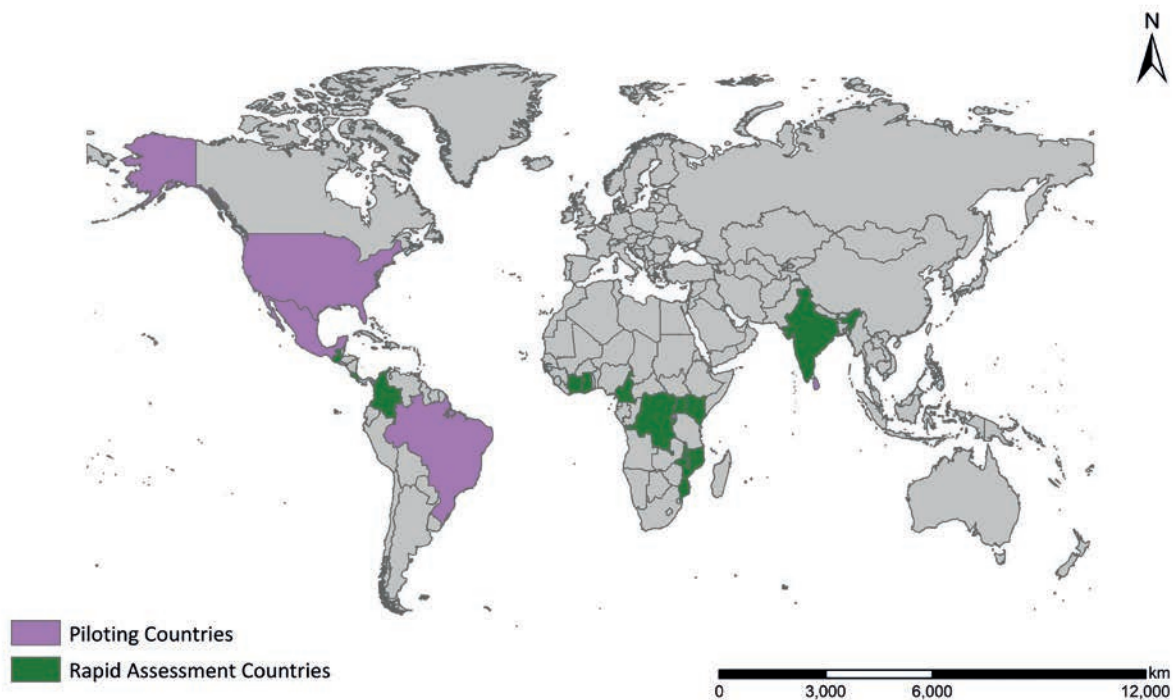
The *Second Bonn Challenge progress report* marks the end of the development phase of the Barometer.

IUCN launched an online platform for the Barometer in early 2019. The goal was to make data collection an automated process, albeit with some oversight, so that the Barometer was accessible to a wider set of pledgers.[5] During 2018 it became apparent that an additional approach and tool was needed to respond to the interest expressed by so many Bonn Challenge contributors. The interactive platform will allow users affiliated with government institutions and other pledger focal points to upload information on their efforts to achieve the Bonn Challenge goals, following the Barometer's framework. The Barometer does not operate in isolation. Acknowledging the relationship that the Bonn Challenge has with existing international commitments, the Barometer and protocol were designed to leverage existing accounting efforts and data sources. For example, to assess the contribution of FLR to biodiversity, input data are drawn from existing data sources and knowledge products, such as the World Database on Protected Areas, the Database of Key Biodiversity Areas and national conservation priority areas, identified by pledgers. These data are used to estimate restoration action in areas of high biodiversity importance. Similarly, calculations for national greenhouse gas (GHG) accounting for the forest and land sector can be used as a basis for climate mitigation estimates, using the Barometer. This enables

reflection on the potential mitigation contribution of FLR interventions being implemented by pledgers. Barometer reporting also draws upon existing systems, where they exist, in Bonn Challenge jurisdictions, as seen in the case of El Salvador (Chapter 4).

The objectives of the *Second Bonn Challenge progress report* are to share detailed information on progress achieved and obstacles encountered till December 2018. It also discusses opportunities to accelerate action on the ground to maximise the environmental, social and development objectives of the restoration of degraded landscapes. Accordingly, the report has the following four sections:

The development of the Barometer protocol and its constituent elements, and challenges and gaps that remain (**Chapter 2**).

Data on the indicators within the two overarching dimensions of the Barometer for the five pilot countries and an initial account of ongoing efforts in Sri Lanka (**Chapters 3-8**).

Information gathered from a rapid application of the Barometer protocol in 13 additional countries (**Chapter 9**).

Synthesis of results and conclusion (**Chapter 10**).

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5   The platform can be accessed at: https://infoflr.org/bonn-challenge-barometer.

2 Barometer protocol development and application in 2018

This chapter discusses the development of the Barometer protocol and its application to detailed data collection to December 2018.

2.1 Barometer protocol development

The Barometer protocol (henceforth referred to as the "protocol") is the underlying conceptual framework guiding data collection through the application of the Barometer. That is, the protocol presents the indicators, selected through a collaborative and iterative process with pilot countries, to measure and report on progress under each of the two overarching dimensions of the Barometer. In addition to the framework, the protocol provides guidance and resources on data input for each indicator. The initial framing phase established foundational principles and implementation practicalities. Following this, extensive research was undertaken to evaluate existing initiatives and synergistic efforts, and how they might relate to the Barometer. The protocol was drafted in late 2017 and progressively refined through piloting, which began in early 2018. IUCN in-country staff and consultants worked with relevant government counterparts to collect, review and submit data.

2.2 Framing

Before the development of the protocol started in mid-2017, IUCN and consultants Winrock International, identified the core principles of the Barometer:

1. Develop a highly accessible and practical mechanism that *empowers* and *enables* pledgers to more effectively achieve their Bonn Challenge commitments. Rather than functioning as a compliance mechanism, the intention was to design a protocol that *supports* pledgers by helping to objectively evaluate progress and provide guidance on best practices and resources for doing so.
2. Minimise the reporting burden by acknowledging and ensuring *synergy between reporting on FLR efforts under other distinct, but related, reporting commitments*. Many jurisdictions are already undertaking prescribed measurement and reporting actions to comply with commitments under international conventions, such as the UNFCCC and CBD, and this can burden already overstretched institutions. Therefore, aligning efforts and enhancing the utility of the Barometer by supporting other reporting efforts was a central focus for the development team. As such, the Barometer can ultimately support countries' efforts to ensure complementarity and coherence between relevant national priorities and international commitments on restoration.
3. Ensure flexibility. The 58 jurisdictions that have made pledges under the Bonn Challenge reflect a vast range of geographies, political and socio-economic contexts, biophysical conditions, resources, capacities and motivations, including achieving their international environmental and climate commitments. Therefore, an important foundational principle was to have a *flexible* protocol underpinning the Barometer. It was critical that the protocol issue guidance on collecting and reporting reliable, consistent and comparable data. However, it was also important to appreciate the challenges many jurisdictions face in implementing and monitoring FLR over large or diverse geographies, with gaps in capacity and resources, and poor coordination between actors.

Ultimately, the Barometer is envisioned as tool that can be accessed through an online platform. It provides the following functions:

■ A submission platform on which jurisdictions submit data through their respective online profiles. The

Barometer protocol can be accessed on this platform and guides data collection and entry.

- A means for the public, donors and other stakeholders to access and explore verifiable data submitted by jurisdictions.
- Support in decision making through the ability to compare planned and realised actions, evaluate whether priority areas brought under restoration meet objectives, assess whether financial flows to FLR meet needs, etc.

2.3 Drafting the protocol

During the initial phases of development, protocol developers reviewed existing initiatives and resources relating to FLR implementation and monitoring, and considered which tools and resources would be useful. This process allowed the developers to: (i) understand the gaps in available guidance and information for evaluating FLR progress and impacts, and (ii) inform the guidance and resources provided in the protocol to support pledgers in data collection.

In addition, existing international commitments and initiatives relevant to FLR were reviewed to explore synergies with the Barometer. This included a review of the UN Food and Agriculture Organization Global Forest Resources Assessment (FRA) 2020 Guidelines and Specifications, the UNCCD's LDN framework, the CBD Aichi Biodiversity Targets, the UN SDGs and others.

Draft protocol indicators were organised into the three overarching categories identified during initial discussions: (i) *Enabling conditions*, (ii) *FLR planning* and (iii) *Results and benefits*. During protocol refinement, the first two categories were consolidated into *Success factors*, comprising the subcategories *Policies* and *Financial flows* and *Technical underpinning*. The *Results and benefits* category remained the same (see Figure 2.1).

Under the *Success factors, Technical underpinning* category, first drafts included indicators influenced by IUCN's experience in the Restoration Opportunity Assessment Methodology (ROAM) process. This provides guidance on FLR implementation across landscapes. Planning efforts include mapping and prioritising areas suitable for FLR, and quantifying anticipated biophysical, economic and social impacts. After piloting and further consideration, however, several of these FLR planning indicators were discarded due to concerns over applicability in many country contexts and the burden involved in collecting and reporting these data, particularly for jurisdictions that have not undertaken ROAM assessments. Instead, a broader *restoration planning* indicator now includes a description of formal restoration planning exercises and approaches, including ROAM, if undertaken. As such, the protocol provides information on resources for restoration planning, but does not require data providers to give detailed reports on specific analyses performed. The online Barometer tool is expected to host spatial outputs for priority areas for restoration from future assessments.

Figure 2.1 The two dimensions of the Barometer and their constituent indicators

SUCCESS FACTORS

RESULTS AND BENEFITS

FLR-supportive policies, plans, strategies, and institutional arrangements

Financial flows towards FLR

Technical underpinning

Area under restoration

Climate impacts

Biodiversity impacts

Socio-economic impacts
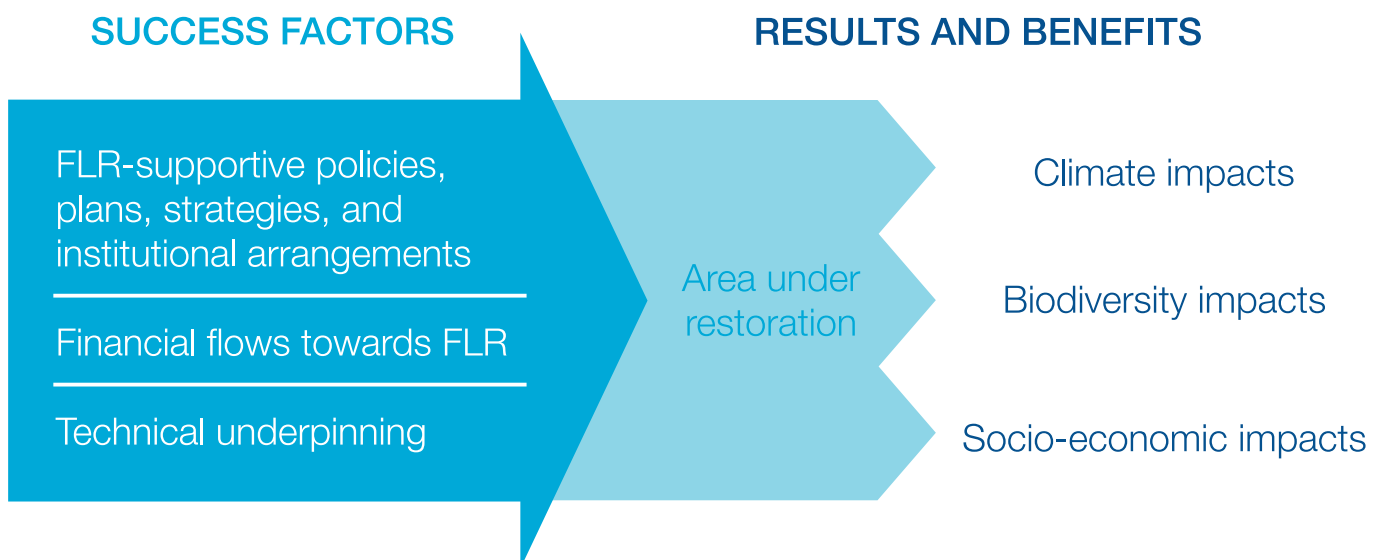
Overall, the *Results and benefits* category also remained consistent throughout the drafting and piloting processes. In the context of FLR, "under restoration" was defined as a set of measures that are put in place, and operate within or influence the landscape, that slow and then reverse the degradation status of key ecological, social and economic indicators. In addition to the central indicator, *area under restoration*, other indicators in this category are *climate impacts, biodiversity impacts* and *socio-economic impacts*. Given that data collection and reporting on many of these indicators is potentially congruent with reporting under other international commitments and frameworks (e.g. climate change and UNFCCC reporting on mitigation outcomes from the land and forest sector, biodiversity impacts and the CBD Aichi Biodiversity Targets), the protocol includes explicit reference to relevant commitments in the guidance section for each indicator. For climate adaptation, jobs created and biodiversity can act as proxies for environmental and socio-economic resilience under climate change scenarios. Furthermore, a comprehensive description of each relevant international commitment, framework or reporting effort is offered, including a description of their relevant reporting indicators and synergies with Barometer protocol indicators.

The protocol considered the broad range of circumstances of users. While data collecting and reporting is important, flexibility and transparency needed to be incorporated into the use of data sources and approaches, representing varying degrees of accuracy and credibility. Therefore, the Barometer team requested that pledgers place the accuracy and credibility of responses on select indicators (financial flows, area under restoration, climate impacts and socio-economic impacts) into three categories. Modelled on Intergovernmental Panel on Climate Change (IPCC) terminology, this categorisation represents a continuum of confidence in accuracy of responses, and is summarised in Box 2.1.

Another significant development during the later months of protocol refinement was the inclusion of Barometer self-assessments. Discussions between developers and pilot country actors revealed a desire to add context to reported data to support interpretation. Thus, this option was introduced as an opportunity to reflect on progress and evaluate major barriers and shortfalls. For example, while a policy to support FLR activities might exist, to be impactful it should be implemented and enforced. Therefore, developers decided to invite pledgers to assess and report on the perceived adequacy or efficacy of selected FLR-supportive measures, including policies, plans and strategies; financial flows; and

> **Box 2.1** Bonn Challenge tracking protocol tiers
>
> **Tier 1:** responses representing estimates or broad generalisations with no or little supporting empirical data, presented with low confidence in their accuracy.
>
> **Tier 2:** responses that are more grounded in data, ground assessments or evaluations, but are still considered generalisations and are presented with a moderate level of confidence.
>
> **Tier 3:** responses grounded in data, ground measurements, peer-reviewed studies and evaluations, presented with a high level of confidence.

technical capacity. However, the team did not provide specific guidance on these self-assessments, resulting in a diversity of methods ranging from workshop deliberations, interviews with expert and government officials, and IUCN staff and partners providing assessments based upon professional experience.

After Barometer piloting was completed, it was determined that these self-assessments offered value to jurisdictions seeking to identify significant gaps in their efforts. However, due to concerns about perceived sensitivities and risks related to reporting on the effectiveness or value of policies, plans and strategies, the Barometer self-assessment for the *FLR-supportive policies, plans and strategies and institutional arrangements* indicator was eliminated in the final version of the protocol.

2.4 Data collection and analysis

The Barometer protocol development phase included extensive consultations with national FLR coordination committees and officials responsible for the Bonn Challenge. A wider group of partners, government agencies, researchers and practitioners working on land use and restoration efforts was also consulted.

For initial piloting within the target countries, data collection was structured with specific instructions for each data entry field. These allowed pilot jurisdictions to enter data in a consistent manner using dropdown

menus and text fields. The same form was used to facilitate data collection during the rapid application in the 13 additional countries. This data input form will be replaced with a data submission process through the online platform, but will remain in reserve for future data collection.

The five pilot countries adopted a wide range of approaches to respond to the protocol indicators, providing the information outlined in this report. As such, no attempt is made to draw comparisons between countries; this is not an objective of the Barometer. Rather, it is a consistent and transparent evaluation of progress towards meeting Bonn Challenge commitments and the outcomes associated with FLR implementation.

2.5 Lessons learnt, challenges and remaining concerns

FLR is practised worldwide by groups and individuals operating at global, national, regional and local scales. Furthermore, implementation and monitoring of activities encompassed in the FLR approach is a multidisciplinary field, involving actors from natural resource management, agriculture, finance and policy, among others. It was, therefore, challenging to comprehensively capture all complementary efforts and guidance available on FLR-relevant planning, implementation and monitoring, and incorporate it into the protocol. The protocol will, necessarily, be a flexible product, subject to periodic refinement and adjustment.

The Barometer self-assessments were an opportunity to collect information that significantly added value to the submission and analysis of data. Responses could help jurisdictions reflect on their progress in a more substantive manner. They could further identify opportunities for national actors and international donors to support global restoration targets through a diverse range of restoration interventions included in FLR. Nevertheless, these self-assessments are inherently subjective and risk repercussions for representing sensitive subject matter in a manner inconsistent with the desires of institutions or political powers. It will be important to keep these concerns in mind as data are collected.

Requesting jurisdictions to categorise some of the indicator responses into the tiered structure provides flexibility, allowing a range of data types to be used. This also allows responses to be transparently and consistently

represented in the Barometer, and provides a user-friendly way to communicate the type of data used to produce the response, thus providing users with context for interpreting the information. However, while broad guidance on tier selection and categorisation was issued in the first iterations of the protocol, it was determined that more was needed. Thus, a series of decision trees were developed to help users navigate tier selection by distinguishing the relative level of confidence and accuracy data sources offered. These decision trees are now included in the annex to the protocol. Pilot countries did not have this additional guidance during data collection and reporting. As such, tier categorisation was, in some cases, inconsistent and was therefore revised.

There were also challenges in defining several of the protocol's indicators. Each of the jurisdictions that have made Bonn Challenge pledges represents a unique profile of socio-political and biophysical contexts. This required ample flexibility to be built into the proposed definitions. Nevertheless, piloting revealed several instances where the proposed categories were incongruent with national definitions or there were concerns about how the data would be represented.

The distinction between different FLR types was one area of concern. For the *area under restoration* indicator in the protocol, jurisdictions list the types of FLR that have been implemented and, if data are available, specify how many hectares have been brought under restoration for each. The seven proposed FLR types in the Barometer reflect those delineated in the ROAM guidance,[6] encompassing a broad range of actively and passively managed systems. While there may be hundreds of unique types of FLR, the types presented in ROAM are broad aggregations. The definitions applied by jurisdictions may not always align with the FLR types proposed, and national forest definitions play an important role in how jurisdictions consider FLR activity. At the same time, the Barometer reports progress made in implementing FLR, and thus implicitly assumes that these efforts respect FLR principles.

For example, in some cases, national governments maintain official distinctions between forestry and agricultural activities and FLR activity. In El Salvador, where much of the FLR has involved establishing silvopastoral systems, this presented a problem. The ROAM FLR types include agroforestry as a catch-all term for trees integrated with active agricultural land. This includes a vast range of practices, such as intercropping,

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[6]   https://infoflr.org/what-flr/types-flr.

home gardens, silviculture and silvopastoral systems. Yet, during in-country consultations undertaken during protocol piloting in El Salvador, concerns were expressed about a mismatch between the national definitions of agroforestry and silvopastoral systems.

Issues also emerged around the *socio-economic impacts* indicator. Given the difficulty many jurisdictions face in quantifying the social and economic impacts of FLR activities, and the lack of easily accessible guidance and tools to do so, the *number of jobs created* was selected as this indicator. Recognising FLR activities can produce short-term/seasonal employment as well as long-term jobs (generally considered more valuable to the economy), and that these data are already collected by some jurisdictions, the option to report jobs created in these two separate categories was provided in the protocol. However, this distinction does not match all of the existing models and methods for quantifying this FLR impact. For example, the model applied by Mexico and El Salvador to determine employment from FLR activities distinguished between direct and indirect employment rather than the length of employment. Responses were provided accordingly. Nevertheless, it was determined that where countries could distinguish between short- and long-term employment impacts, this should be represented in the Barometer. Any other distinctions made in reporting as a result of the quantification/data collection approach are treated as a single value of total jobs created.

2.6 Next steps

The development of the Barometer online platform, launched fully in February 2019,[7] begins the next stage of the application of the Barometer to a wider set of Bonn Challenge pledgers. It will provide a user-friendly means for decision makers, donors, NGOs and others to explore the contributions of each pilot country, and eventually other jurisdictions. The reporting frequency has yet to be determined, but it is likely that those countries that have made commitments with 2030 deadlines will seek to submit data every two years. A Barometer progress report was published in 2017, and more will be published regularly to 2030.

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[7]   The online Barometer platform was pre-launched on 30 November 2018, allowing users to visualise data for the five in-depth pilot countries.

3 Brazil

In 2017, Brazil made a Bonn Challenge pledge to bring 12 Mha of degraded land under restoration by 2030, with 2005 as the start year.[8] While Brazil's pledge was made recently, considerable progress in terms of supportive policy frameworks and active associations for the restoration of different biomes were already present. The Bonn Challenge pledge made by the Atlantic Forest Restoration Pact (PACTO) in 2009 precedes the national pledge. The 2017 Spotlight Report focused on progress made by PACTO in restoring the Atlantic forest biome.

The *Second Bonn Challenge progress report* shares progress at the national scale. For 2018, the government of Brazil reports an area of 9,424,802 ha under natural regeneration in the Amazon as progress towards achieving its Bonn Challenge target. Restoration interventions are mainly natural regeneration, but also planted forest and woodlots, watershed protection and agroforestry. The benefits associated with restoration efforts across the country include on average 151,000 jobs generated per year and total carbon sequestration of 1.2 billion tonnes of CO_2 (tCO_2). A new development in 2018 was the establishment of two working groups within the National Commission for Native Vegetation Recovery (CONAVEG) to focus attention on mobilising financial resources in support of the National Plan for Native Vegetation Recovery (PLANAVEG), one of the main instruments supporting FLR implementation in Brazil, and a second working group on monitoring implementation actions. There is now a preliminary database to track progress nationally. This progress has been possible thanks to specific policies at the state and federal levels, and investments, predominantly through

domestic public expenditure from the federal and state governments. At the same time, constraints remain in fully implementing key policy tools to achieve the 12 Mha target, including financial limitations.

3.1 Piloting process

Brazil's Ministry of the Environment (MMA) was an active and enthusiastic partner, both in the development of the Barometer, providing invaluable feedback, and as a pilot country. It has compiled a robust and comprehensive set of data for its Bonn Challenge commitment progress. In January 2018, a technical consultative workshop was held with MMA personnel and representatives of multiple government, research and practitioner communities to formally introduce the protocol and solicit feedback on indicators and guidance. The constructive suggestions reflecting the national context and Brazilian perspectives that emerged were incorporated into an updated version of the protocol.[9]

3.2 Results and benefits

3.2.1 Area under restoration

In 2018, for the first time, it was possible to produce regional estimates for forest restoration for the Amazon. A permanency analysis was performed to identify areas covered by secondary vegetation in the Amazon, which covers 61% of the country's geographical area, for at least six continuous years (2008–2014). It found that 9,424,802 ha were under natural regeneration. This analysis was based on the TerraClass database (Embrapa, 2011), which provides official information on land use and land cover (LULC) in deforested areas in the Amazon biannually for 2004 to 2014, and is described in detail in sub-section 3.3.5.

In addition to the data from TerraClass for the Amazon, PACTO is preparing a similar analysis for the Atlantic Forest biogeographical region. A restored and recovered forest persistency analysis was performed based on land-use classification time series from 2009 to 2017 and forest age data, and is currently under peer review (Crouzeilles et al., in press). Through this it has been possible to identify an additional 673,000–741,000 ha of degraded forests and converted land under forest

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[8] The baseline year for reporting on the Bonn Challenge is January 2011 for the enabling conditions, while 2010 is the baseline year for reporting progress against land area brought under restoration. Brazil decided to begin with 2005 in order to align with its baseline year for NDC reporting. This difference in the baseline years needs to be reconciled.

[9] Data were collected through nine interviews with initiative and project leaders in NGOs, researchers and governmental officers; participation in three related events; and more than 20 data request emails with associated follow-up. This was complemented with data from 25 official websites, publications and other sources for approximately 56 different projects, actions and initiatives. These data were reconciled, validated and compiled in the Barometer database.

recovery from 2011 to 2015, of which 300,000 ha are planted (see Chapter 3.3.5). This *Second Bonn Challenge progress report* establishes the baseline for subsequent reports. It has also triggered new analyses, such as those to evaluate the permanency of natural succession in forest areas, and impacts in protected areas, indigenous territories and priority areas for biodiversity conservation in the Amazon.

3.2.2 Climate impacts

Official UNFCCC reports (MCTIC, 2017) were used to estimate national CO_2 sequestration and related climate change impacts. A sink of 1.364 billion tCO_2 was identified in secondary vegetation from 2005 to 2017 across the whole country, based on the IPCC methodology for calculating CO_2 removal.

3.2.3 Biodiversity impacts

The area under natural regeneration in the Amazon was analysed. This identified 4,338,964.84 ha (46%) from the total located in priority areas, according to Brazil's Official Priority Areas for Biodiversity Conservation.[10] An additional 509,900.61 ha (5%) of secondary forest vegetation are inside indigenous territories and 984,400.88 ha (10%) are in different categories of protected areas. These biodiversity benefit analyses do not capture the conservation importance of the restoration efforts in the Atlantic Forest biome.

3.2.4 Socio-economic impacts

The estimate for socio-economic impacts achieved through the creation of jobs was calculated using a model to estimate the number of jobs generated through achieving the target of the National Policy for the Recovery of Native Vegetation (PROVEG).[11] The creation of a total of 112,000–191,000 jobs per year is projected. This data considers the number of people directly involved in the implementation and maintenance of the restored areas in the adopted scenarios for each model considered (natural succession, enrichment and total planting). It also includes indirect jobs in the related production chains of timber and non-timber products from restored areas.

3.3 Success factors

This sub-section describes the important enabling conditions captured under *Success factors* that have led to the results seen so far.

3.3.1 Policy and institutional framework

Brazil's contributions to the Bonn Challenge are part of national efforts to restore and reforest native vegetation and to reduce GHG emissions through land-use and cover commitments. Brazil has two important native vegetation recovery-related targets. One is the NDC, which includes the restoration and reforestation of 12 Mha of degraded and deforested land for multiple purposes, as one of the possible measures to be adopted in order to achieve Brazil's commitment to reduce GHG emissions by 37% below 2005 levels by 2025. The second is PROVEG, which also has a target of 12 Mha specifically to restore or induce natural recovery in native vegetation. Brazil's Bonn Challenge actions thus include measures that form part of the nation's NDC under the Paris Agreement of the UNFCCC, ratified by the government of Brazil in September 2016. As stated at the time of ratification, the intention is not legally binding and will not compromise Brazil's sustainable economic development. All policies, measures and actions to implement the NDC contribute to the National Policy on Climate Change (N° 12187/2009), the Native Vegetation Protection Law (N° 12,651/2012, the Forest Code), the National Conservation Areas System (Lei 9.985/2000) and the National Biodiversity Strategy and Action Plan (NBSAP; CBD Aichi Biodiversity Targets 5 and 6), and their instruments and planning processes. These policies and their implementation instruments form the core set of enabling conditions to catalyse and sustain FLR approaches.

Natural forest regeneration for the Amazon is linked to the outputs and outcomes of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm). The PPCDAm has been a crucial policy framework for the implementation of the National Policy on Climate Change, the Bonn Challenge and other Brazilian land-use and forestry commitments. It was established in 2004, and aims to continually and consistently reduce deforestation rates and establish a sustainable development model for the Amazon. The implementation of the PPCDAm coordinates the actions of more than a dozen ministries. Their activities

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[10]   www.mma.gov.br/biodiversidade/biodiversidade-brasileira/%C3%A1reas-priorit%C3%A1rias/item/489.

[11]   www.mma.gov.br/images/arquivos/florestas/planaveg_plano_nacional_recuperacao_vegetacao_nativa.pdf.

are articulated around four thematic components: land and territorial planning; environmental monitoring and control; promotion of sustainable productive activities; and economic and regulatory instruments. Its main achievement was to transform the Brazilian forestry sector from the largest CO_2 emitter in 2004, with 75% of Brazil's overall emissions annually, to a sink absorbing 538 million tCO_2 from the atmosphere in 2018 (Ministério do Meio Ambiente, 2018). Its improvements in terms of land governance (law enforcement improvement, long-term and consistent deforestation data, land allocation, etc.) are key factors behind the observed forest regeneration in the Amazon.

Another important political process is the implementation of the Native Vegetation Protection Law (LPVN) and its main tool, the National Environmental Registry of Rural Properties (SICAR). This is the main legislation regulating land use and native vegetation management on private property. It prescribes that landowners must conserve, recover or compensate for changes in the native vegetation located in two kinds of set-aside area: areas of permanent protection (APPs) and legal reserves (RLs). Each landholding has to protect 20% of its area as an RL, except in the Amazon, where the protected area is 80% for forests and 35% for savannahs. The limits of APPs, located on slopes and around rivers, are defined according to the steepness and sizes of farms and rivers. Landholders have to recover or restore land either in situ or elsewhere to legally comply with these thresholds. By October 2018, SICAR had reached 5.4 million farms, corresponding to 466.4 Mha. This tool is the basis for the implementation of the LPVN and is under continual development. Currently, it is being used by states to validate landowner registrations. Following this, another module of SICAR will help farmers to develop their owns plans to recover vegetation deficits in APPs and eventually in RLs, as part of a range of available compensation options. Two analyses of the SICAR database by the Forest and Agriculture Certification and Management Institute (IMAFLORA) and the Federal University of Minas Gerais (UFMG) indicate that the native vegetation deficit complies with the LPVN. It is between 19 Mha (11 Mha in RLs and 8 Mha in APPs) (Guidotti et al., 2017) and 21 Mha (±6–11 Mha in RLs and 9 Mha in APPs) (Soares-Filho et al., 2014).

These estimates indicate that 8–9 Mha in APPs will come under restoration in future years. As restoration is a possible solution for RL deficits in LPVN implementation, part of the estimated 11 Mha could also eventually be added to the appraisal of potential restored areas. As some of the forested areas under natural regeneration in the Amazon, detected by the TerraClass programme and reported here, could be designated as APPs and RLs by landowners, there is a potential overlap and these set-aside deficit estimates cannot be added to those of natural regeneration. A precise evaluation of natural forest succession areas in Amazon needed to achieve legal compliance with the LPVN will result from the validation of properties on the rural environmental registries. This will be done by the state's official environmental organisations. A possible next step is to generate a preliminary analysis on the potential use of natural regeneration areas in the Amazon and Atlantic Forest in the LPVN implementation process, using the same databases generated by IMAFLORA, the UFMG and PACTO.

The SICAR database provides spatial information to support vegetation recovery decisions and to establish ecological connectivity among vegetation remnants and protected areas. The validation of SICAR registries and the implementation of the State Environmental Compliance Programmes (PRAs) will allow landowners to participate in the Project for Recovery Degraded and Altered Land (PRADA). These projects will be an official source of landscape-level data on key components of native vegetation recovery across the country. The data will be aggregated with remote-sensing data for natural regeneration areas not covered by SICAR (protected areas, other public land, forest restoration projects funded by private investment) to provide national information about native vegetation recovery and restoration.

The main tool for the implementation of PROVEG is PLANAVEG. This aims to coordinate and strengthen public policies, financial incentives, markets and good agricultural practices to promote native vegetation recovery in set-aside and degraded areas with low productivity. CONAVEG is responsible for putting the plan into effect, and was officially convened in 2017 with one representative from each of the following ministries: Agriculture, Environment, Finance, Planning, and Science and Technology, and representatives from the Secretary of Agrarian Development and the National Association of Municipal Environmental Agencies. There are also two members from the National Association of State Environmental Agencies and four from civil society. CONAVEG publishes the information bulletin *Infoveg* for stakeholders and the general public (PLANAVEG, 2018).

In regular meetings, CONAVEG bylaws were approved and two thematic advisory working groups were created. The first, on finance tools, supports financial resources mobilisation, especially the development of innovative

models, instruments and tools, focused on income generation and sustainability. The second, on monitoring, will define monitoring indicators for each one of the eight strategic initiatives of PLANAVEG. It will also structure an online monitoring platform for ongoing restoration and recovery projects and draft the first PLANAVEG monitoring report.

The Finance Tools Working Group defined a set of 11 key strategic issues. These covered the analysis of available financing options for forest restoration and sustainable business (commercial and concessional loans, grants, guarantees, premium payments, tax exemptions, forest bonds, fine conversion programmes, etc.); financial products with specific characteristics (long-term maturity, insurances, guarantees, etc.) focused on small farmers, APP and RL recovery; and climate-smart agriculture.

A set of improvements were made in the Ministry of Agriculture's Annual Agriculture and Husbandry Financing Plan (Plano Safra) to better adapt financial products to restoration activities. The plan now includes payment for physical inputs (seeds, seedlings, fences, etc.) used for the recovery of set-aside areas. It increases finance for the low-carbon agriculture programme and climate-smart agriculture. The financing limits were also increased to US$ 1.5 million per project, covering the project requirements for medium and large rural properties.

All policy developments have a clear connection with the strong Brazilian social and environmental movement. This movement includes several important leaders, as well as diverse and mature institutions, with their respective constituencies. This strong community engagement around FLR reflects some global examples of institutional arrangement and networks.

The Brazilian Coalition on Climate, Forests and Agriculture brings together over 180 organisations representing agribusiness, environmental protection entities and academia. Dialogue and planning among these organisations resulted in two important recent publications: *Climate Change: Risks and Opportunities for the Development of Brazil: Brazilian Coalition On Climate, Forests and Agriculture's Proposals for 2018 Election Candidates* and *2030–2050 Vision: The Future of Forests and Agriculture in Brazil* (Brazilian Coalition on Climate, Forests and Agriculture, 2018a, 2018b). The second report is the result of a year of debates among more than 200 experts about long-term land-use objectives. Both

documents address forest restoration and reforestation as central to promoting sustainable land use.

PACTO is a coalition of 280 NGOs – local to federal government bodies, companies, research and development institutions and associations. As part of its effort to restore 1 Mha, PACTO established the Brazilian Annual Land Use and Land Cover Mapping Project (MapBiomas)[12] to create an improved remote-sensing approach to monitor forest restoration process. After a two-year process, the PACTO Working Groups on Public Policy, Restoration Economy and Technical-Science Communication published *A Reserva Legal que queremos – The Legal Reserve We Want* (PACTO, 2018). This contributed to the debate about limits and opportunities related to land use in this kind of set-aside area, including general analysis, a question-and-answer section, and recommendations for the ongoing efforts to regulate and implement the PRAs. Recent highlights from PACTO include its work on gender perspectives in restoration initiatives; the continuing support for CONAVEG, especially the Working Groups (Financial Tools and Monitoring); updating of the processes of Brazil's Official Priority Areas for Biodiversity Conservation for Atlantic Forest; and the expansion of Fundo Amazônia support for restoration projects across the whole country (up to a maximum 20% of available funding for areas outside the Amazon).

The more recently formed Alliance for the Restoration of the Amazon brings together NGOs, private companies and governments to reconcile perspectives and scale up action on FLR implementation. The initiative will work as a knowledge hub integrating a community of practice and fostering a forest economy. The Alliance will help to better coordinate efforts at the landscape level and to raise awareness on the importance of nature-based solutions for regional development. Its first position paper, launched in 2019, frames FLR as a strategic development agenda for the Amazon, guaranteeing biodiversity conservation while contributing to the long-term resilience of forest livelihoods.

3.3.2 Financial flows

By 2017, around US$ 353 million had been invested in native vegetation recovery and restoration in the whole country. This was distributed among four source-related categories: domestic public expenditure, US$ 155 million; private sources, US$ 81 million; international

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[12] MapBiomas is a multi-institutional initiative to generate annual land cover and use maps using automatic classification processes applied to satellite images. The complete description of the project can be found at http://mapbiomas.org.

donor support, US$ 12 million; and domestic philanthropic and non-profit, US$ 105 million (see Figure 3.1). To our knowledge, this is the first time these data have been collected. Data were obtained through interviews, official websites and consultations, among other sources, for 22 different projects, actions and initiatives in different regions. Although not yet complete, this could form a basis for a more permanent and comprehensive expenditure indicator.

Fundo Amazônia has provided key funding (Fundo Amazônia, 2019). The first Public Call for Native Vegetation Recovery projects in Amazônia received 30 proposals for a total available amount of US$ 61 million. The projects selected will restore a minimum of 15,000 ha of forest. Fundo Amazônia has also provided US$ 103 million for SICAR implementation, together with another US$ 38 million from the federal budget.

Espírito Santo State invested around US$ 22 million, mostly from oil royalties, in its well-implemented regional Reflorestar programme (Governo ES, 2019). This aims to conserve the hydrological cycle by means of forest conservation and restoration, sustainable soil management and agriculture. At the same time, it will improve the socio-economic status of farmers.

There are two well-funded ongoing initiatives that could have great potential impact. The first is the programme

Forest+, led by the Secretary of Climate and Forest of the MMA. This was approved in March 2019 by the Green Climate Fund, which has provided US$ 150 million to pay smallholder farmers, indigenous people and local communities for good conservation and/or restoration practices in priority environmental areas.

The second is the improved environmental fine conversion mechanism. Environmental fines are usually subject to endless legal disputes and only 5% of all fines are collected at the federal level. Under a new legal framework, in addition to damage restoration, the fines issued by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) could be converted into green investments with debt relief. Interested parties can choose between providing either direct or indirect funding support to strategic environmental projects, which have a strong emphasis on native vegetation restoration. This policy allows major initiatives to be subject to tenders, with different organisations being selected based on the quality of the proposals submitted. Under the direct conversion option, infringing companies and defaulters swap a fine for an investment of 65% of the fine in environmental services recovery actions. With indirect conversion, violators invest 40% of the total debt into priority recovery projects selected by the government. The choices have to be aligned with the priorities of other public policies, such as PROVEG.

Figure 3.1 Financial flows by funding stream
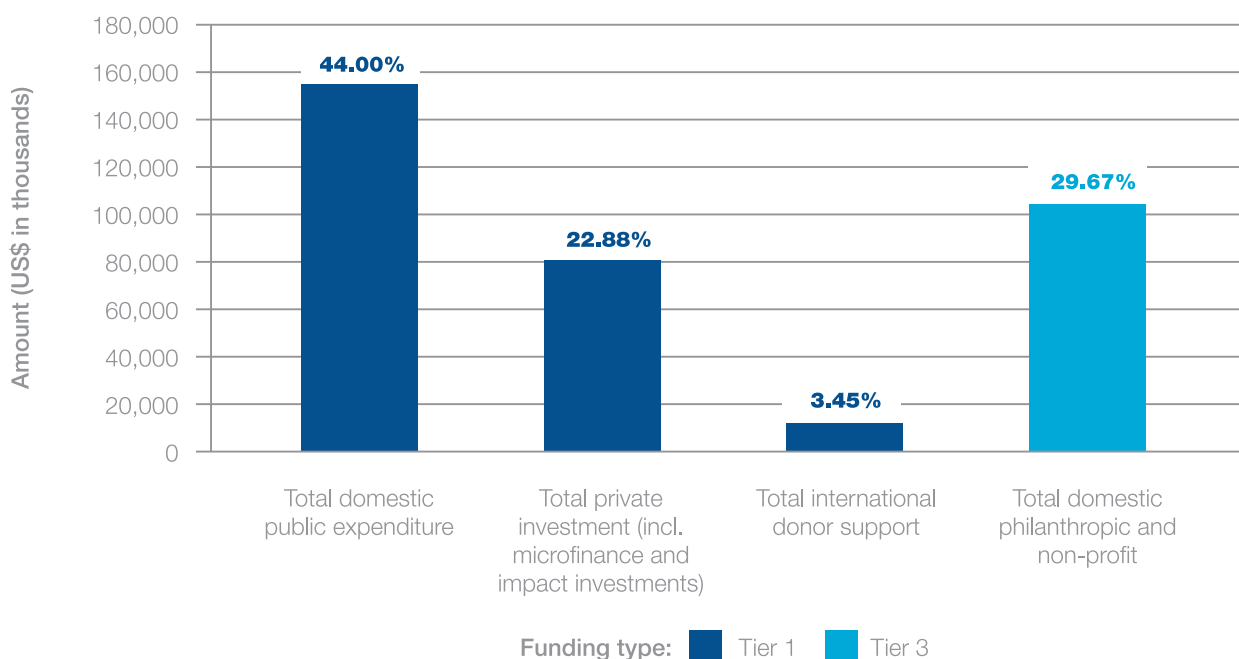
A national advisory committee is being organised with representatives from civil society and the government. Its primary goals are improving the debate around programme implementation and suggesting themes for proposals. From the approximately US$ 1.4 billion available in fines not paid, US$ 303 million are currently available.

The first three official calls for proposals have already been made. All relate to native vegetation recovery: Atlantic Forest areas in Santa Catarina state, APPs along the rivers of the São Francisco basin in Minas Gerais state, and the Taquari River basin in Mato Grosso do Sul state. In the last two, river sedimentation due to deforestation along the watercourses is a critical problem for agriculture and water supply management. Environmental degradation issues such as these have become more complex in recent years.

At the same time, the national and state budget financial deficit for restoring these degraded areas is increasing due to prolonged low economic growth and fiscal crisis. These two factors make the fine conversion mechanism key to restoring natural resources and ecosystem services, such as water supply, in several Brazilian regions.

3.3.3 Technical underpinning: restoration planning

Brazil is a large country, with many different initiatives on FLR planning and monitoring. Eight approaches focused on better planning are listed on the Brazilian datasheet under the Barometer web tool. Of these, two were commissioned by the government. The first is a novel linear programming approach to identifying optimal priority areas for restoration. It was applied to the Atlantic Forest biogeographical region using multiple criteria, such as biodiversity conservation, climate change mitigation and the reduction of costs (Strassburg et al., 2019). The tool increases restoration cost-effectiveness by up to eight times in this case. It offers flexible solutions for different forest restoration targets across scales from local to global. This study is part of the MMA's effort to implement systematic conservation planning methods to improve PLANAVEG implementation. The tool can generate scenarios and support decision making on priority areas for restoration related to different land-use policies in the Atlantic Forest. Funds were secured to explore the inclusion of a fifth additional criterion, water supply, in the Atlantic Forest modelling. The aim is to develop a user-friendly interface and extend the approach to all other Brazilian regions except Cerrado.

The goal of the second approach was to estimate the natural regeneration potential of native vegetation in Brazilian biogeographical regions (Ministério do Meio Ambiente, 2017). Developed in partnership with the World Resources Institute (WRI Brasil), it is based on remote-sensing data and spatial analysis. Specialists interpreted the structure and characteristics of the landscapes for each region. The results can support planning actions and the implementation of federal and state public policies aimed at optimising the natural recovery of native vegetation on a large scale, while minimising costs.

In addition, ROAM has been applied in five contexts, some with direct IUCN involvement (Vale do Paraíba, São Paulo state; Brasilia, Federal District; Pernambuco, Pará and Santa Catarina states), offering a strong basis for decision-making processes at the regional scale (Cepan, 2018; Padovezi et al., 2018; Akarui, 2017; Imazon, 2017; Oliveira, 2017; SEMA-DF, 2017; Governo do Estado do Espírito Santo, n.d.).

At least seven different approaches, both national and regional, related to FLR monitoring methodologies have also been identified. Four use remote-sensing approaches to map land use, including native vegetation recovery. The other three cover the sources and removal of GHGs, public forest concessions and farmers' set-aside areas under the LPVN.

Analysis of remote-sensing data at 5 m resolution estimates the remaining vegetation cover to be 28%, that is, 32 Mha (Rezende et al., 2018). The approach, adopted by SICAR as a ground truth layer, involves the highest resolution ever used to map forest cover in the Atlantic Forest. From the 7.2 Mha classified as degraded riparian areas, 5.2 Mha must be restored by landowners to comply with the LPVN. This potentially represents an increase of native vegetation cover of up to 35% in this biogeographical region.

3.3.4 Technical underpinning: monitoring FLR

To determine the area under natural regeneration in the Amazon reported here, a 30 m pixel remote-sensing classification from the TerraClass database was used. TerraClass is an initiative to monitor land use and cover across the Amazon with layers for 2004, 2008, 2010, 2012 and 2014. The following criteria were applied to designate a pixel as forest under recovery: (i) previously classified as converted in the *Programa Despoluição de Bacias Hidrográficas* (Basin Restoration Program;

PRODES) clear-cut deforestation database; (ii) classified as forest succession since 2008; and (iii) classified as forest succession for at least six consecutive years. All pixels that fit these criteria were added up to estimate the total amount of forest under recovery between 2008 and 2014.

For the hectares under restoration in the Atlantic Forest biome, the criteria adopted to classify an area as under recovery in restored and recovered persistence analysis were: (i) previously mapped as agriculture or pasture for at least five consecutive years; (ii) connected to at least five other mapped areas classified as forest under recovery; (iii) mapped as forest in 2017; and (iv) classified as forest for at least three consecutive years. In addition, a database of 60,000 ha of forest restoration projects was consolidated by PACTO.

Furthermore, in 2018, the Bonn Challenge Barometer process and preparation for the *Second Bonn Challenge progress report* brought about two important improvements in the implementation of an adaptive management approach for PROVEG implementation in Brazil. First was a preliminary discussion about the set of forest restoration indicators. Second, a structured FLR monitoring database was created. Table 3.1 presents the structure of this FLR project monitoring database and the

information received from a set of key forest restoration programmes in different Brazilian regions. As next steps, data collection should be expanded to include other initiatives; other variables should be added (e.g. total cost and cost per hectare); and double counting in the total of 388,294 ha under FLR should be eliminated.

The challenge in generating a spatial and long-term analysis of native vegetation restoration and recovery in a country of continental dimensions is significant; it requires funding, an organisational framework and technical solutions. The development of these databases for the Amazon, Cerrado and the Atlantic Forest is one of the main goals of the Brazilian Biomes Environmental Monitoring Program (PMABB) (Ministério do Meio Ambiente, 2019). The implementation of this programme will not only generate better data, but also support the transformation of these data into robust information, including uncertainty evaluation. This can then be used to support decision-making processes at different scales. Analytical methods applied to long-time-series data cubes, integrating different satellite data and other spatial and census data can help in understanding the variables affecting and explaining the regional patterns of forest recovery and the relationships with general land-use change dynamics.

Table 3.1 Illustrative/subset/synoptic data for some key forest restoration projects in implementation in Brazil

Programmes/ initiatives	FLR types/ activities	Area under restoration (ha)	Sources
Fundo Amazônia/Brazilian Development Bank (BNDES)	Planted forests and woodlots	13,276	Accumulated reforested area for environmental compliance – Table 17 from the annual report (Relatório de Atividades do Fundo Amazônia de 2017). www.fundoamazonia.gov.br/export/sites/default/ pt/.galleries/documentos/rafa/Book_RAFA2017_ PORT_27jun18_WEB.pdf
Iniciativa Mata Atlântica/BNDES	Planted forests and woodlots	2,700	www.bndes.gov.br/wps/portal/site/home/onde-atuamos/meio-ambiente/iniciativa-bndes-mata-atlantica/iniciativa-bndes-mata-atlantica
Pacto pela Restauração da Mata Atlântica	Planted forests and woodlots	35,000	Validated from the total of 60,000 ha registered in the PACTO database. www.pactomataatlantica.org.br
Produtor de Água – National Water Agency of Brazil (ANA)	Watershed protection and erosion control	19,000	www3.ana.gov.br/portal/ANA/programas-e-projetos/ programa-produtor-de-agua
Produtor de Água – ANA	Planted forests and woodlots	14,000	www3.ana.gov.br/portal/ANA/programas-e-projetos/ programa-produtor-de-agua

Table 3.1 Continued...

Programmes/ initiatives	FLR types/ activities	Area under restoration (ha)	Sources
Reflorestar – Estado do Espírito Santo	Agroforestry	1,901	www.es.gov.br/programa-reflorestar
Reflorestar – Estado do Espírito Santo	Natural regeneration	286,171	www.es.gov.br/programa-reflorestar
Reflorestar – Estado do Espírito Santo	Planted forests and woodlots	2,292	www.es.gov.br/programa-reflorestar
Projeto Conservador das Águas	Planted forests and woodlots	600	www.extrema.mg.gov.br/conservadordasaguas
Project Xingu (ISA)	Watershed protection and erosion control	5,801	www.socioambiental.org/pt-br/tags/muvuca
Parceria para o Bom Desenvolvimento (UNDP/Global Environment Facility)	Planted forests and woodlots	25	http://goodgrowthpartnership.com www.thegef.org/project/taking-deforestation-out-soy-supply-chain
Aliança pela restauração na Amazônia: CI e ITPA	Planted forests and woodlots	40	www.conservation.org/global/brasil/Pages/alianca-restauracao-amazonia.aspx
Aliança pela restauração na Amazônia: CI e ISA	Planted forests and woodlots	105	www.conservation.org/global/brasil/Pages/alianca-restauracao-amazonia.aspx
Aliança pela restauração na Amazônia: CI e Institute of Conservation and Sustainable Development of the Amazon (IDESAM)	Planted forests and woodlots	10	www.conservation.org/global/brasil/Pages/alianca-restauracao-amazonia.aspx
Programa Nascentes: Secretaria de Meio Ambiente do Estado de São Paulo	Natural regeneration	2,021	www.ambiente.sp.gov.br/programanascentes
Programa Nascentes: Secretaria de Meio Ambiente do Estado de São Paulo	Planted forests and woodlots	4,843	www.ambiente.sp.gov.br/programanascentes
Programa Nascentes: Secretaria de Meio Ambiente do Estado de São Paulo	Agroforestry	510	www.ambiente.sp.gov.br/programanascentes

3.4 Conclusion

The Bonn Challenge Barometer of progress process and the preparation of the *Second Bonn Challenge progress report* brought about two important improvements to the adaptive management approach for PROVEG implementation in Brazil. The first was a preliminary discussion about the set of forest restoration indicators and the second was an initial version of a structured FLR monitoring database.

These inputs come at a time when the recently created Monitoring Thematic Consulting Working Group is starting to debate monitoring issues. These inputs will help to address challenges, such as defining official indicators, building an organised correspondent database, establishing permanent web-based data collection, updating processes with accredited users, and creating a national native vegetation recovery and restoration project register. Questions about the number of projects; investments and restored areas in different modalities; the socio-economic and biodiversity impacts; the carbon sinks and other ecological services; and the use of project data as ground truth for remote-sensing classifications, etc. will be dealt with in the longer term to enable a national FLR effort.

A well-implemented monitoring process will bring other benefits to the PLANAVEG and LPVN implementation process. These include improving communication; coordination and collaboration among potentially synergistic initiatives, avoiding duplication of effort; and assuring the adoption of adaptive management and learning-based approaches. The accumulated lessons of different projects and integrated landscape management, from different regions and scales, are the basis for scaling up efforts to restore areas to achieve Brazilian targets. This process will create a blueprint for the national communication on native vegetation recovery and restoration to the UNFCCC and CDB.

4 El Salvador

In 2012, El Salvador pledged to restore 1 Mha by 2030 as part of its Bonn Challenge commitment. As of December 2018, a reported 122,093 ha have been brought under restoration[13] through 227 restoration-focused projects undertaken since 2014. A diversity of restoration interventions have been used in El Salvador, dominated by agroforestry in multiple crop systems and silviculture. Implementation efforts by smallholder farmers and landowners underpin these results on the ground. The associated benefits for a subset of projects indicate both direct and indirect job creation, gross climate benefits of 3,647,060 tCO_2e, and approximately 32,812 ha restored in protected areas or key biodiversity areas (KBAs). These results are due to investments primarily driven by large contributions from domestic public funds, but also by international donor support.

El Salvador's National Ecosystem and Landscape Restoration Program (PREP), established by the Ministry of Environment and Natural Resources (MARN), provides a vision for implementing a set of restoration activities with private, public and civil society actors (Barry, 2012). This programme has now evolved into an operational action plan (MARN, 2017a), in which the roles of private, public, national and international donors are defined in order to strengthen FLR implementation capacities.

4.1 Piloting process

Piloting the Barometer tool in El Salvador included multiple stakeholder consultations with governmental and non-governmental agencies and organisations. To introduce and apply the Barometer protocol to the El Salvador context, two workshops were organised in June and September 2018. Participants were from a number of different government agencies, agroforestry and community associations, donor groups and non-profit organisations. The first workshop specifically helped to identify the information sources, the most relevant policy instruments and processes for collecting survey responses to questions related specifically to assessing the effectiveness and adequacy of policies, plans and strategies, financial flows, and technical capacity. After the workshop, three online surveys were developed to enable workshop participants to contribute information about the indicators.

During the first stage, the survey was set to allow experts from public institutions and international cooperation to express their views anonymously. The second workshop allowed the Barometer pilot project team to collect survey responses from a wider panel of experts, including representatives of NGOs and the agricultural sector, and then present and validate the estimate of FLR impacts obtained. In addition to these sources of data, the Barometer team drew on an existing FLR database, carbon removal tools and analyses conducted under the 2016–2017 ROAM process to assess and report data on financial flows, carbon removal through FLR, and estimates of jobs created (Raes et al., 2017; MARN, 2018).

4.2 Results and benefits

4.2.1 Area under restoration

The MARN monitoring system includes the main FLR activity database. This database is MARN's landscape and ecosystem restoration monitoring platform,[14] where most of the FLR activities implemented from 2014 to 2018 are reported. It shows that 122,093 ha had been brought under restoration by the end of 2018. However, detailed data, needed for the estimation of financial flows and the environmental and social benefits, were available for only about 75,000 ha under restoration.

A review of FLR projects (MARN, 2018) shows that in the 227 FLR activities implemented by the end of 2017, 20 FLR techniques or actions had been used to restore 75,722 ha (see Figure 4.1). All of these FLR techniques are then grouped under FLR categories (Dave et al., 2017): agroforestry (6), silviculture (4), natural regeneration (2), plantations and woodlots (2), good agricultural practices (2), mangrove restoration (2), and watershed protection and erosion control (2) (see Table 4.1).

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[13] MARN restoration monitoring platform: http://apps3.marn.gob.sv/geocumplimiento/restauracion/mapa.php.

[14] http://apps3.marn.gob.sv/geocumplimiento/restauracion/mapa.php.

Figure 4.1 Share of FLR techniques within the area under restoration
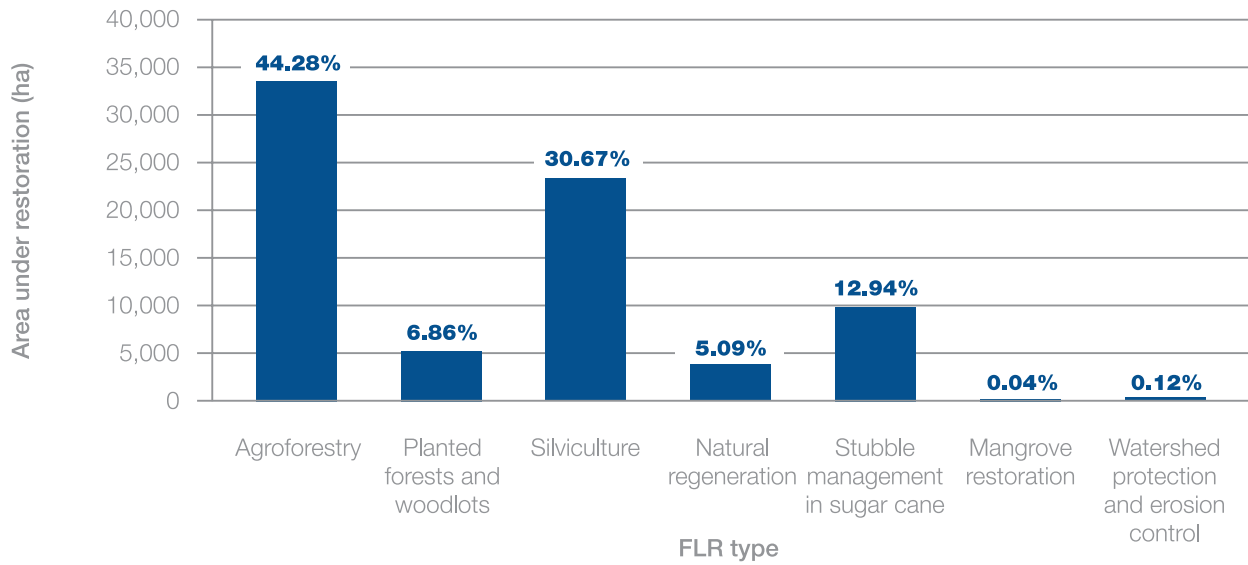
Figure 4.2 Gross climate impact of FLR activities, 2014–2018
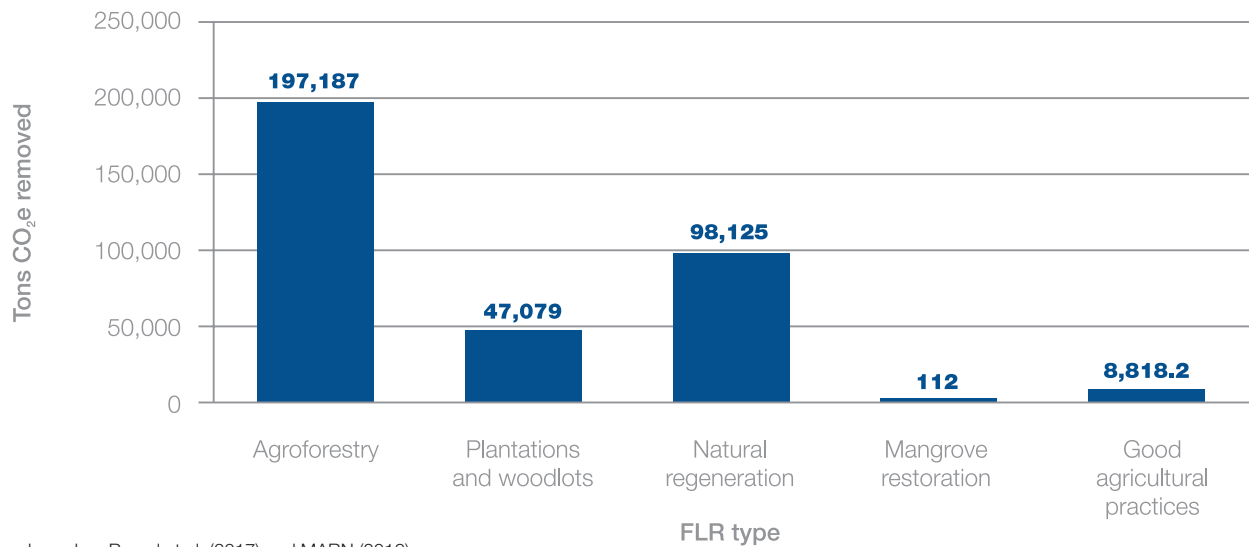
Sources: based on Bernal et al. (2017) and MARN (2018).

Due to the lack of technical and financial data, some FLR techniques were not accounted for through this first application of the Barometer, despite being reported in MARN's list of FLR projects/actions. These were natural forest thinning, mangrove restoration through sustainable management, and improved pasture and environmental guidelines. In addition, invasive species management in water bodies was not considered part of this study since it does not qualify as terrestrial restoration.

4.2.2 Climate impacts

The potential total gross climate impacts associated with restored forest landscapes from 2014 to 2017 amounted to 3,647,060 tCO_2e. In other words, climate benefits generated by the forest landscapes under restoration in El Salvador up to 2017 total 130,252 tCO_2e per year. Assuming the area restored by the end of 2017 remains unchanged, the shares of forest natural regeneration and plantations and woodlots in the total climate change benefits achieved by 2030 will increase to 32% and 15% respectively (see Figure 4.2).

Table 4.1 Description of FLR techniques used in El Salvador

FLR categories	Land use	Restoration techniques	Description
Agroforestry	Coffee	Coffee agroforestry system	Enrichment of coffee plantations with timber and native tree species, and including coffee management practices
		Diversified coffee plantation	Enrichment of coffee plantations with timber, fruit or ornamental plant species, and including coffee management practices
	Staple grains	Conservation agriculture	Implementing soil and water conservation practices that aim to protect the soil from water, sun and wind erosion
		Staple grains agroforestry system	Production systems where crops are combined with trees and fruit species
	Cacao, staple grains, pasture	Cacao agroforestry system	Cacao plantation combined with timber and fruit trees
	Pasture	Silvopastoral system	Grazing system where natural and improved pasture are combined with forest, fruit and forage plant species
Good agricultural practices	Staple grains	Organic agriculture	Food production systems that do not use synthetic agro-chemicals
	Sugar cane	Green harvest	Use of sugar cane residues, which can be incorporated into the soil through natural degradation or mechanical processes, instead of burning the crop residues
Watershed protection and erosion control	Riparian forest	Reforestation	Planting trees and scrub on riverbanks with no forest cover
		River channel dredging and clean up	Removing sediment, waste and run-off materials to rehabilitate obstructed river streams
Plantations and woodlots	Bare soil, cities	Reforestation	Planting trees and shrubs in areas without forest cover
	Natural forests	Reforestation	Planting trees and shrubs in areas with degraded forest cover
Silviculture	Natural forests	Forest protection	Establishing governance models to encourage inclusive conservation and sustainable use of forest resources
		Forest enhancement	Planting timber and multi-purpose trees, especially in cleared areas or along secondary forest and scrublands
Natural regeneration	Natural forests	Natural regeneration	Natural restoration of the ecosystem without human intervention
Mangrove restoration	Mangrove ecosystem	Ecological restoration of mangroves	Rehabilitation of water balance based on the ecology of each mangrove species to facilitate natural regeneration

As a component of the technical planning undertaken using ROAM in El Salvador, Raes et al. (2017) quantified the GHG balance of 11 FLR actions through the Ex-Ante Carbon Balance Tool (EX-ACT).[15] EX-ACT allows users to assess the climate impacts of land-use projects by comparing the GHG balance of land uses with and without improved management practices (FAO, 2014). In addition, the IUCN FLR CO_2 removals database provides an estimate of climate impacts achieved by specific FLR activities (Bernal et al., 2017). Considering the respective scopes of both tools, IUCN FLR CO_2 removal was used to estimate the mitigation potential of agroforestry, plantations and woodlots, and natural regeneration activities, while EX-ACT was employed for good agricultural practices.[16]

4.2.3 Biodiversity impacts

The proximity of restored forest landscapes and KBAs leads to a high level of alignment with NBSAPs (Beatty et al., 2018a). Accordingly, a spatial analysis of the overlap between areas under restoration, KBAs and their corresponding buffer zones was carried out, permitting the capture of FLR projects' contribution to enhancing biological connectivity and the ecological integrity of a given KBA (Fischer et al., 2006). It identified 71 landscape restoration activities located within KBAs (21,454 ha) and 30 activities in KBA buffer zones (8,421 ha). This means that around 39% of the FLR actions countrywide took place within or near KBAs.

A similar analysis for overlap between restoration and protected areas was also carried out. Out of 227 FLR projects, 54 landscape restoration actions, corresponding to 12,909 ha, are located in 39 protected areas. At country level, 17% of the restored forest landscapes are within protected areas. The findings of the biodiversity impact estimate are shown in Figure 4.3, indicating the overlapping areas between KBAs, protected areas and forest landscape activities. In total, 115 of a total 227 FLR projects are located in either KBAs or protected areas. These projects represent 32,812 ha.[17]

FLR approaches are recognised as a means of meeting CBD Aichi Biodiversity Targets 5, 7, 11, 13 and 15. Progress towards achieving the Aichi targets is assessed according to public information, such as the national reports presented to the CBD. According to the last

national progress report for the CBD pledges (MARN, 2014), the levels of achievement of Target 13 (genetic diversity) and Target 15 (ecosystem restored and resilience enhanced) were high. Other targets related to the FLR are Target 11 (protected areas) with a medium/high level of progress, while the level of achievement of Target 5 (habitat losses halved or reduced) was low/medium and Target 7 (sustainable agriculture, aquaculture and forestry) was low. Considering that all Aichi Biodiversity Targets relevant to FLR are equally important, global progress towards these goals can therefore be ranked as medium/high.

4.2.4 Socio-economic impacts

The social impact of the FLR actions considered was based on Raes et al. (2017). For each FLR project, the estimates for the creation of short- and long-term jobs was based on the specific FLR labour needs (in terms of a person-day) for implementation and management, project implementation year and the area restored (ha). To express the number of jobs generated in a more tangible way, labour needs were converted to full-time equivalent (FTE) employment, which represents five days worked per week for 50 weeks per year (CSC, 2017).

Approximately 12,235 FTE short-term jobs were provided by FLR implementation, while the management of the restored landscape created 2,715 FTE long-term jobs. The main findings can be summarised as follows:

- Sustainable forest management practices, specifically fire prevention, have been implemented the most (29% of the total area), creating the majority of FTE short-term jobs (see Table 4.2).
- Long-term jobs were mostly supplied through conservation agriculture and the agroforestry system with staple grains. This is due to the high labour needs for land management associated with these two techniques, while forest fire management is typically less labour intensive (see Table 4.2).
- Since numerous projects[18] were implemented during 2017, the supply of the FTE long-term jobs derived from these landscapes under restoration could not be accounted for at this stage, although they are expected to sustain significant levels of employment in the coming years.[19]

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[15] EX-ACT is a GHG assessment tool developed by FAO for agriculture and forestry projects. Guidelines and EX-ACT tools are available online: www.fao.org/tc/exact/ ex-act-home/en.

[16] IUCN FLR CO_2 removals do not cover GHG emissions derived from crop-residue management, therefore EX-ACT was used for this type of FLR activity.

[17] To avoid double-counting of the areas located in both KBAs and protected areas, some projects were not counted.

[18] Especially for diversified coffee plantations, coffee agroforestry systems and cacao agroforestry systems.

[19] Nevertheless, the contribution of these projects to enhancing the local job supply will be reflected as part of the next update of the Bonn Barometer.

Figure 4.3 Map of biodiversity impacts achieved through FLR
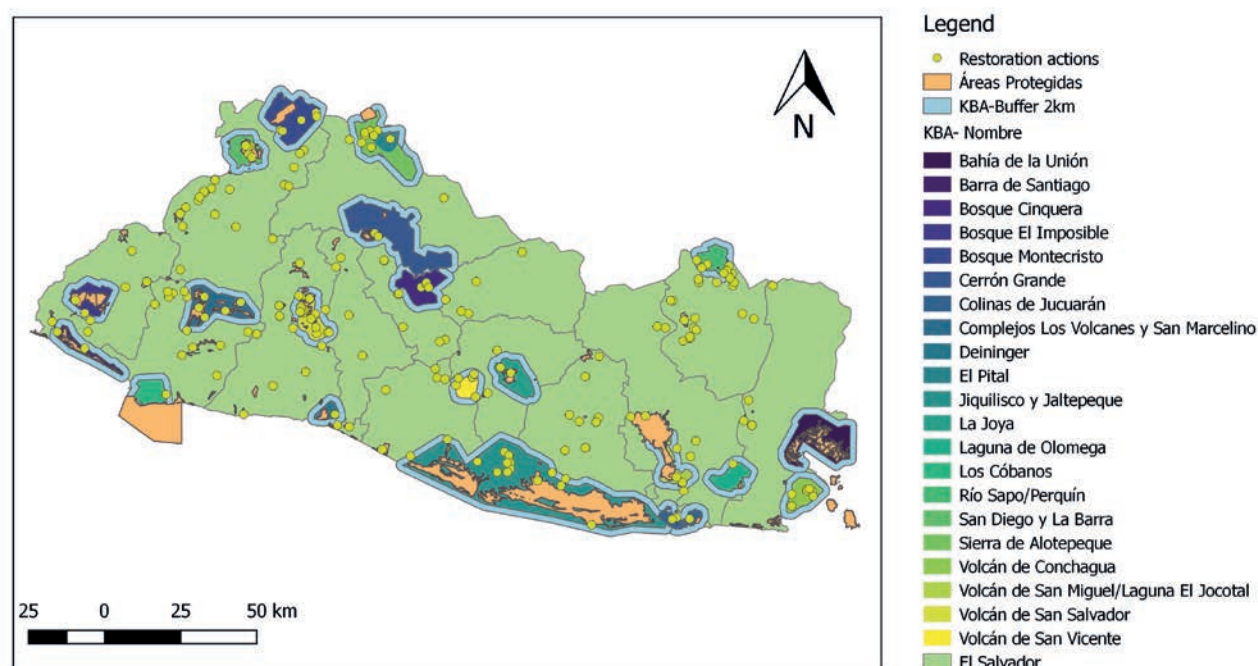
Table 4.2 Labour needs by FLR techniques

FLR technique	Labour needs for implementation (FTE employment per ha)	Labour needs management (FTE employment per ha per year)
Diversified coffee plantation	0.148	0.700
Coffee agroforestry system	0.148	0.084
Conservation agriculture	0.272	0.138
Agroforestry system with staple grains	0.176	0.294
Cocoa agroforestry system	1.120	0.452
Silvopastoral system	0.608	0.128
Green harvest in sugar cane	0.056	0.056
Organic agriculture	0.064	0
Natural forest regeneration	0.204	0.064
Enhancement of natural forest	0.140	0.064
Reforestation of natural forest	0.188	0.064
Reforestation of riparian forest	0.400	0.068
River channel dredging and clean up	0.176	
Fire prevention	0.144	0.048
Enrichment planting of secondary forest and scrub	0.144	0.064
Secondary succession in scrubland	0.112	0.048
Enhancement of scrubland	0.144	0.064
Reforestation in bare soil, cities	0.192	0.084
Mangrove ecological restoration	5.200	1.212

Independently of whether jobs supplied by FLR were short or long term, the labour intensity of FLR is an estimated 0.17 FTE jobs per ha restored. Most of the jobs derived from FLR landscapes originate from agroforestry systems (67%) and are considered agricultural employment, whereas 31% of the FTE employment generated by FLR is in the forestry sector.

4.3 Success factors

4.3.1 Policy and institutional framework

El Salvador has reported on the 10 most relevant policies, plans and strategy instruments for enhancing progress in FLR implementation (see Appendix 1, Table A1.2). MARN is primarily responsible for four of these, with five being the responsibility of the Ministry of Agriculture and Livestock (MAG). Significant among these is PREP, which is the foundation for El Salvador's national FLR effort, led by MARN. Within PREP, FLR is described as a means to adapt to climate change, foster rural development and ultimately achieve climate change mitigation. The Action Plan for the Restoration of Ecosystems and Landscapes describes the techniques and areas prioritised through the application of ROAM in 2016 and 2017.

ROAM, a spatial multi-criteria analysis based on 15 indicators, including financial, environmental and social indicators, was used to identify the areas and FLR techniques with the highest priority. The priority areas thus defined will guide the gradual restoration of the first 400,000 ha over the next five years. MARN's Institutional Strategic Plan is a five-year plan, which sets the goal of restoring 300,000 ha by the end of 2019. The NBSAP includes two focal areas supporting FLR implementation: the first focuses on the integration of biodiversity within the economy through improved agricultural practices, such as agroforestry, silvopastoral systems and green harvest of sugar cane. The second outlines the restoration and conservation of critical natural ecosystems (riparian forest, mangrove, coastal ecosystem).

The policies and strategies under MAG include (1) the Institutional Strategic Plan, aimed at promoting the restoration of priority ecosystems, riparian areas and forests and enhancing sustainable agriculture to create integrated biological corridors, and (2) the National Forestry Policy, which has as its primary objective the sustainable management of water and soil resources. FLR activities linked to good agricultural practices and afforestation/reforestation activities are supported by

MAG to improve the resilience of farming systems and achieve climate change mitigation under the National Forestry Policy. The National Strategy for Watershed Management addresses the need to foster agriculture that is both sustainable and resilient to climate change through FLR activities, such as reforestation, improved irrigation and soil management practices in aquifer recharge zones and dry regions. There is also the National Forestry Strategy, which enumerates a series of actions to restore ecosystems and increase forest cover. The strategy includes five activities that directly relate to FLR: (i) managing financial resources to implement forest restoration projects; (ii) establishing forestry incentives; (iii) promoting forest conservation; (iv) fostering agroforestry and commercial plantations; and (v) providing support to set up forest communities and non-profit associations that will implement reforestation and forest conservation. Finally, MAG is responsible for the National Policy on Climate Change for Agriculture, Forestry, Fisheries, and Aquaculture. The primary objective of this policy is to promote the sustainable management of natural resources through soil and water conservation practices that both improve local adaptive capacities and unlock the climate change mitigation potential of the land-use sector, giving priority to the most vulnerable populations. Fostering FLR activities, such as conservation agriculture and the management, instead of burning, of crop residues is part of what is proposed to achieve this objective.

The final policy instrument, considered to be among the 10 most important FLR policies in El Salvador, is the Sustainable El Salvador Plan, the outcome of a two-year national consultation process undertaken by the National Council for Environmental Sustainability and Vulnerability (CONASAV). The plan creates a platform that brings together actors from the private sector, public institutions, the academic sector and civil society. In relation to FLR, this plan set two targets: restoring 10,000 ha of mangrove forest by 2019 and 250,000 ha of degraded land by 2020.

4.3.2 Financial flows

All costs incurred by the implementation of FLR actions have been accounted for, as far as possible, to estimate total financial flows. This includes all expenses involved in restoring a given area, such as inputs (fertilisers and seedlings), equipment, labour and transaction fees (e.g. certification of timber). This means that even labour provided by the community or families – and not necessarily paid through wages – is considered to be private investment, based on minimum-wage

regulations (Raes et al., 2017). Given the importance of the smallholder share in landownership and total gross product (Verdone, 2018), this approach helps to capture the contribution of smallholders to FLR.

The total financial contribution for FLR is estimated to be US$ 190 million (see Table 4.3), where:

- A total of 12% of funding was allocated to the FLR planning and monitoring processes.
- Domestic public expenditure and international donor support were the two main sources of funding for FLR.
- Private investment and the domestic philanthropic and non-profit sector represented 23% and 8% of the total financial flows, respectively.

The financial flow assessment was carried out in two steps. First, implementation expenditure associated with each FLR technique was estimated based on cost structures developed by the Initiative for the Americas Fund (FIAES, 2016; FIAES 2018) in order to quantify the financial resources mobilised for the FLR projects listed by MARN. Off-farm costs related to technicians, workshops and community leaders promoting FLR were derived from Raes et al. (2017). The assessment of the financial resources allocated to each FLR project was adjusted for inflation to 2018 values, according to inflation developments from 2014 to 2017 (DIGESTYC).

According to activity data compiled on the MARN monitoring platform (MARN, 2018), of the 80 actors that have participated in FLR activities from 2014 to 2017, 27 belong to the domestic philanthropic and non-profit sectors, while 26 organisations provided private investment.[20] Domestic public expenditure

was channelled through 30 public institutions, ranging from ministries (MARN and MAG) to local government administrations (municipalities, municipal associations, water committees). Sixteen international donor organisations supported FLR implementation (see Table 4.3). The FLR technique with the highest total implementation cost is the ecological restoration of mangroves (US$ 12,602 per ha), followed by cacao agroforestry systems (US$ 7,885 per ha). The implementation cost of natural forest restoration ranges from US$ 540 per ha (forest protection) to US$ 3,725 per ha (reforestation on bare soil).

4.3.3 Technical underpinning: restoration planning

IUCN, together with MARN and several other national partners, implemented El Salvador's ROAM between 2015 and 2016. Participation and consultation mechanisms were used to hold workshops convened by MARN, with representatives of key sectors, specialists and technicians from various institutions, the private sector and cooperatives, among others. The ROAM process was based on PREP and through participatory generation and validation generated a series of technical inputs, including a map identifying areas with restoration opportunities; the definition of a series of restoration actions based on potential areas for restoration; a socio-economic and environmental analysis of the restoration actions selected; an assessment of possible financing mechanisms; and the identification of priority areas for restoration. As a result of these efforts, a national restoration action plan and strategy were consolidated (MARN, 2017a; Raes et al., 2017). As part of this 2018–2022 action plan, MARN established a restoration goal of 400,000 ha, prioritised

Table 4.3 Sources and amounts of financial flows allocated to FLR

	Domestic public expenditure (US$)	Private investment (US$)	International donor support (US$)	Domestic philanthropic and non-profit (US$)
FLR implementation on the ground	78,103,712	19,496,617	20,127,883	5,949,048
FLR planning, monitoring, and other projects	7,460,000	15,285,714	33,491,576	10,000,000
Sub-total	85,563,712	34,782,331	53,619,459	15,949,048
Total		**189,914,550**		

Sources: based on UNOPS & MAG (2013); USAID (2014); FIAES (2016, 2018); MARN (2016, 2017a, 2018); Smukler et al. (2016); CENTA (2017); Ruta (2017).

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[20] Total private investment includes investment by these organisations, as well as investments made by households through farm labour.

according to the findings drawn from the application of ROAM (MARN, 2017a).

4.3.4 Technical underpinning: monitoring FLR

The FLR reporting mechanism developed by MARN has been key in reporting progress for the Barometer. MARN developed a list of 46 FLR practices to outline their respective technical specifications, addressing a vast set of ecosystems, landscapes and degradation levels (MARN, 2017b). It started as a relatively simple mechanism, where actions are reported and verified on the ground by MARN technicians. As it evolves, it will be possible to add additional indicators that facilitate reporting progress on all of the Barometer's indicators.

4.4. Conclusion

El Salvador is putting a great deal of effort into FLR implementation and trying to achieve its commitment to the Bonn Challenge. This is evident in the strong enabling conditions created through supportive policies, appropriate technical planning and the establishment of a national restoration monitoring system. The MARN reporting mechanism is not a complex system, and could easily be adopted by other countries. MARN will continue to use it to report progress towards the Bonn Challenge. However, reporting by El Salvador was facilitated by the previous implementation of ROAM, which generated a lot of information that facilitated the estimation of carbon sequestration, biodiversity and job creation. More work will be needed to generate the capacity and tools necessary for continuous reporting on the different aspects of FLR in El Salvador.[21]

On a broader level, related to the different national submissions to the Barometer, it will be important to clarify within the Barometer what actions can be considered to be FLR approaches under the Bonn Challenge, and which actions – such as restoration of aquatic areas – are not considered to be restoration, or at least not terrestrial restoration. For instance, much of FLR has involved establishing silvopastoral systems in El Salvador. ROAM FLR types include agroforestry as a catch-all term for trees integrated into active agricultural land, which can represent a vast range of practices, including intercropping, home gardens, silviculture and silvopastoral systems. Yet, duringin-country consultations undertaken during protocol piloting in El Salvador, concerns were expressed about a mismatch between the national definitions of agroforestry and silvopastoral systems.

There is also a need to develop unified methodological tools, such as the FLR CO_2 removals tool,[22] and streamline the process for integrating spatial data on protected areas, KBAs and other conservation sites into the Barometer.

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[21]   See for example the work undertaken to develop a sustainability index for FLR: www.marn.gob.sv/indice-de-sustentabilidad-para-la-restauracion.

[22] CO_2 Removals tool produced by Winrock International under contract to IUCN. It can be accessed here: https://infoflr.org/what-flr/global-emissions-and-removals-databases.

5 Quintana Roo, Mexico

In 2014, at the UNFCCC Conference of the Parties 21 (COP21) in Paris, the government of Quintana Roo State, Mexico, pledged under the Bonn Challenge to bring under restoration 700,000 ha of degraded or deforested land by 2030. Since 2011, the baseline for assessing restoration targets, Quintana Roo has successfully brought more than 170,000 ha under restoration, which represents 24% of the 2030 target. FLR intervention types include sustainable intensification of agricultural production and sustainable livestock production, as well as reforestation and restoration of degraded forest landscapes. This achievement has been possible because of the efforts of local communities, supported by financial investment – predominantly through domestic public expenditure in terms of subsidies from the federal government. These results demonstrate the engagement and commitment of both the Quintana Roo and Mexican governments to meeting their Bonn Challenge pledge. However, some policy and budget constraints limit the scaling up of restoration.

5.1 Piloting process

During 2018, IUCN's Regional Office for Mexico, Central America and the Caribbean organised several meetings with representatives of the Quintana Roo state government and the National Forestry Commission (CONAFOR), which is actively working on restoring forest landscapes in Mexico. This highlighted stakeholders'

efforts and achievements and also reconciled discrepancies identified in the reporting process.

5.2 Results and benefits

5.2.1 Area under restoration

Estimations of area brought under restoration were based mostly on CONAFOR official reports on subsidies.[23] CONAFOR provides shapefiles of the polygons receiving subsidies for restoration programmes. However, polygons for only a few subsidy programmes were provided. Therefore, estimates are based only on numerical data, rather than spatial or remote-sensing analysis.

Based on the data sources, in 2011–2018 a total of 170,944 ha of forests were brought under restoration within Quintana Roo's territory. There are two phases of Quintana Roo's pledge: 300,000 ha by 2020, and an additional 400,000 ha by 2030. Therefore, the reported figure represents 57% and 24% of its commitments for 2020 and 2030 respectively. Silviculture accounts for the vast majority of FLR activities: 73% (124,386 ha) of the total area brought under restoration so far. This is followed by forest and woodland plantations, covering 35,345 ha, which corresponds to 21% of the total. The remaining 16% is mainly natural regeneration and agroforestry activities. Restoration of soils, mangrove restoration and silvopastoral activities were also reported, although at smaller scales (see Figure 5.1).

5.2.2 Climate impacts

Carbon balance models using the IPCC methodology[24] applied to sustainable production models (planted forest, agroforestry, silvopastoral systems, etc.) were used to calculate the amount of CO_2 sequestered. This could then be related to the restoration categories defined in the Barometer. Carbon balance models consider CO_2 absorption (wood biomass growth) and emissions from management activities (fertilisers, livestock, crop residuals, etc.). The average balance of CO_2 per ha for each restoration model is then multiplied by the number of hectares related to each restoration activity and summed up.

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[23]   Taking into account CONAFOR's Compensation Program for Change in Forest Land Use and the components of Forest Restoration & Productive Reconversion, Silviculture, and Commercial Forest Plantations of the National Forestry Programme (PRONAFOR), and the previous programmes ProÁrbol and the Special Program for the Conservation, Restoration and Sustainable Management of Natural Resources in the Yucatán Peninsula (PEPY) (www.gob.mx/conafor/acciones-y-programas/apoyos-conafor).

[24]   https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html.

Figure 5.1 Area under restoration by FLR intervention types
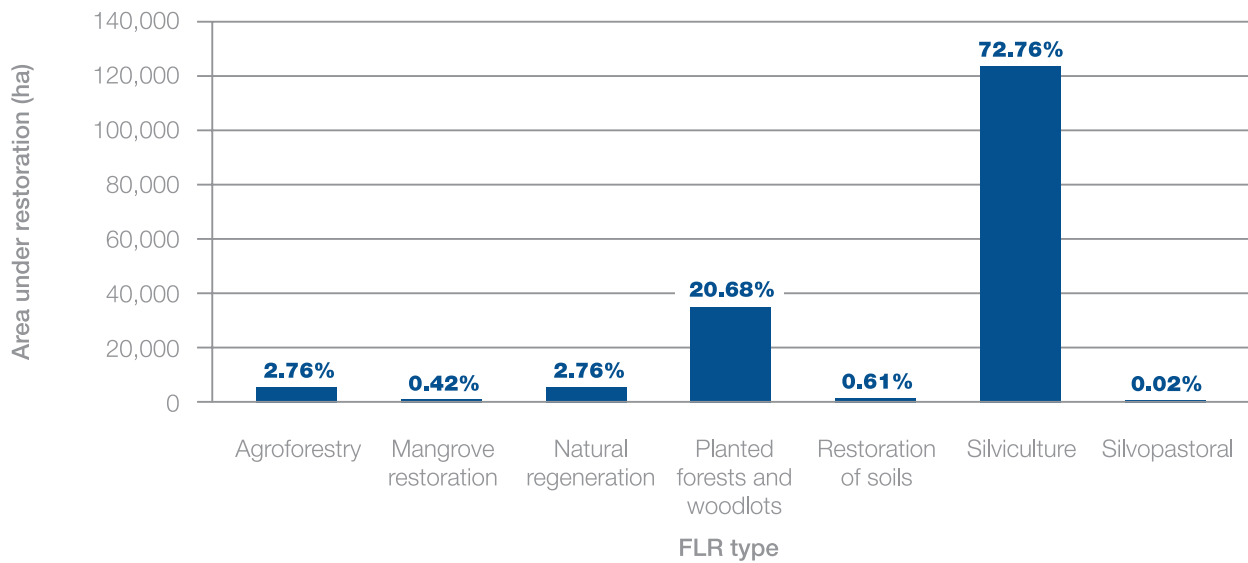
Note: all reported figures are categorised as Tier 3.

Estimates based on IUCN's ROAM assessment in Quintana Roo suggest that 9,380 million tCO_2e could have been sequestered by aerial wood biomass generated by FLR over the period 2011–2017. This figure was derived from mean carbon sequestration estimates per hectare, from carbon balance models, applied to each restoration category following the national emission factors from the National Institute of Ecology and Climate Change (INECC), plant-specific allometric functions and IPCC methodology. However, there is a need for more accurate spatial statistics since they represent average estimates by FLR category with no ground validation.

5.2.3 Biodiversity impacts

Restoration projects in Quintana Roo are overlain by several types of KBA, including terrestrial priority regions, priority areas for birds, priority sites for primates, hydrological priority regions, epicontinental priority regions and biodiversity conservation priority regions. The Commission for the Knowledge and Use of Biodiversity (CONABIO) has identified all of these areas as relevant to conservation of Mexican biodiversity. In order to estimate the number of restored hectares within KBAs, polygons provided by CONAFOR that delineate areas receiving restoration subsidies were overlaid onto the biodiversity maps generated by CONABIO. An estimated 5,321 ha are under restoration in conservation areas (see Table 5.1). However, this is an underestimation since some polygons relating to subsidy programmes were not available.

Table 5.1 Area under restoration in conservation priority areas

Conservation area	Area under restoration (ha)
Terrestrial priority regions	3,861
Biodiversity conservation priority regions	956
Epicontinental priority regions	195
Hydrological priority regions	211
Priority sites for primates	98
Total	**5,321**

5.2.4 Socio-economic impacts

Socio-economic indicators were estimated in the same way as the climate impacts. The average number of jobs created per hectare was calculated for each restoration model developed under the ROAM assessment (Simonit et al., forthcoming). These were used as specific references for each subsidy programme according to the type of restoration projects supported. The analysis estimates the creation of jobs as 0.1–0.37 job

per ha, depending on the FLR activity. ROAM analysis for Quintana Roo indicates that a total of 22,480 jobs directly related to FLR activities may have been created in 2011–2017. This number is based on estimates of labour required to carry out specific technological packages related to each restoration category implemented.

5.3 Success factors

5.3.1 Policy and institutional framework

There are 18 policies, plans and/or strategies related to FLR that have been implemented by the federal and Quintana Roo governments. The overarching policy is the National Development Plan (PND), implemented by the federal government, which oversees the programming and budgeting of the entire federal public administration. The PND maps out the vision and strategy of the federal government, establishing goals over a six-year period. A particular link to FLR is provided in Objective 4.4: "Promoting socially inclusive green development to preserve Mexico's natural heritage and generating wealth, competitiveness and employment". The Environment and Natural Resources Sectoral Programme (PROMARNAT) implemented by the Secretariat of Environment and Natural Resources (SEMARNAT) complements the PND. PROMARNAT is the main programme for the implementation of Objective 4.4 within the Mexican environmental sector. It provides the legal grounds for establishing funds to support sustainable forest development in the form of subsidies distributed through CONAFOR.

The Yucatán Peninsula Framework Agreement on Sustainability for 2030 (ASPY 2030) initiative is fundamental to FLR implementation in Quintana Roo. ASPY 2030 sets common goals for the subnational governments of the Yucatán Peninsula (Quintana Roo, Campeche and Yucatán). It establishes a coordinated strategy to increase the sustainability of the region, while recognising the value of its unique biodiversity and the need for sustainable rural development. The agreement incorporates the Bonn Challenge restoration pledges of the three states, reiterating the goal of restoring 2 Mha of degraded land across the whole peninsula by 2030.

Nine government institutions, either at the federal or state levels, are instrumental in the process of establishing the policy and legal framework relevant to landscape restoration in Quintana Roo (see Appendix 1, Table A1.3). CONAFOR is a key institution, promoting at least seven policies applied at the country level. Among these, the

National Forestry Programme (PRONAFOR) represents the main operational instrument for the implementation of CONAFOR's Institutional Programme. PRONAFOR is the primary path for channelling public funds towards FLR and other activities related to sustainable forest management through the Mexican Forest Fund. Budget and operational rules established on a yearly basis determine PRONAFOR's implementation. Funds are channelled in the form of subsidies to potential beneficiaries through a set of different sub-programmes, each with specific eligibility criteria (size, location, land cover conditions, etc.). Potential beneficiaries can apply to a subsidy window following a call for applications published by CONAFOR at a specific time of year.

5.3.2 Financial flows

By 2018, a total of US$ 28,775,415 had been invested in FLR in Quintana Roo. The vast majority (97.6%) comes from domestic public expenditure, indicating the principal role played by the local and federal governments in restoration. International donations, mostly from the Global Environment Facility, represent the second biggest source of funding, providing US$ 381,191 (1.3% overall). Private investment accounts for 0.8% (US$ 233,314) and domestic philanthropic and non-profit sources for 0.2% (US$ 67,783) of the total amount spent up to 2018 (see Figure 5.2). Analysis of the financial flows to FLR applied in Quintana Roo show that the federal government is the main stakeholder engaged in restoration.

The data on financial flows in Mexico are based on public expenditure from subsidy programmes allocated to restoration under CONAFOR. The list of projects, the number of hectares under restoration and the funding received through this programme are published each year and are publicly available on CONAFOR's website, thus assigning a high level of confidence to the values reported (Tier 3). Not all subsidies reported by CONAFOR are included in this calculation – only those strictly related to restoration activities. These funds make up just a fraction of the initial investment and co-financing, mostly in kind, by private owners and communities is always required.

5.3.3 Technical underpinning

IUCN's ROAM was applied in the Yucatán Peninsula from 2015 to 2018 (Simonit et al., forthcoming). This participatory process aims to engage stakeholders, identify restoration opportunities and prioritise areas to be brought under restoration. Decisions were based on profit-maximising objectives, considering both the value of

Figure 5.2 Financial flows towards FRL activities per funding type
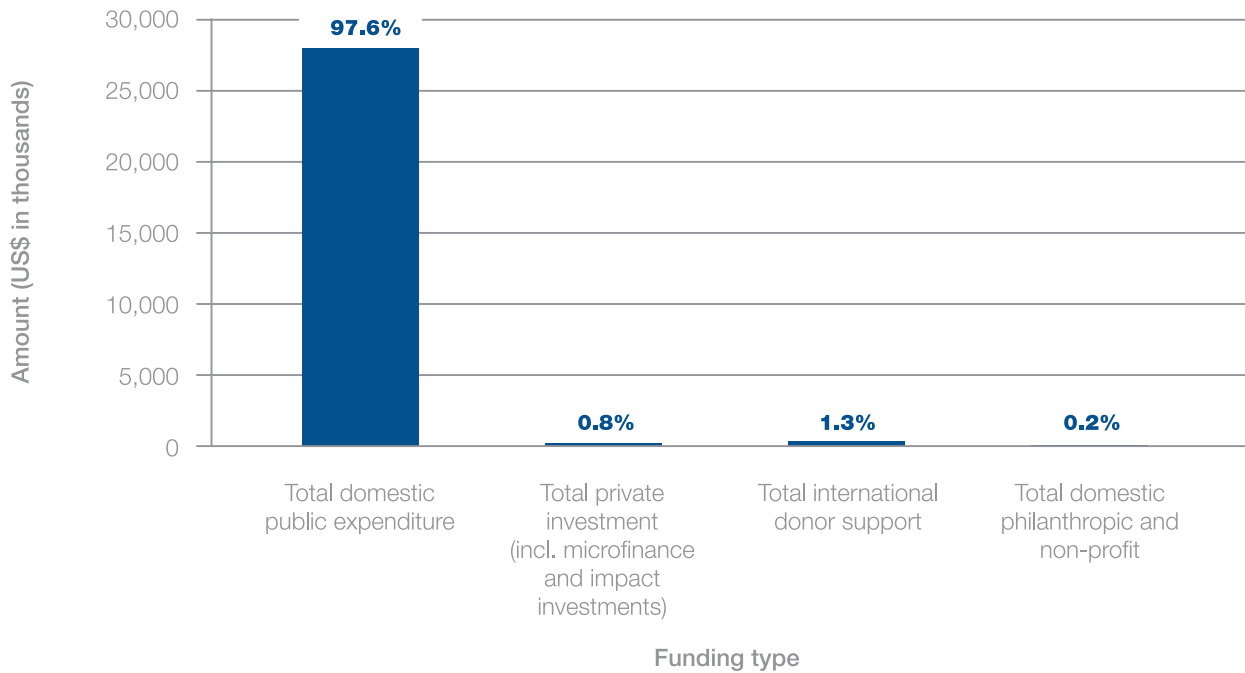
carbon sequestration and the market value of agricultural, livestock, non-wood forest produce and timber commodities. Following the identification and mapping of degraded areas, the landscape restoration potential was recognised only for those sites where the net economic return of implementing restoration models and related carbon mitigation and sequestration was higher than those of current land use. In addition, different sets of potential transitions were identified by applying environmental safeguards criteria, defined during the ROAM assessment. This implies that the choice of potential restoration models was limited by current land use, applying silvopastoral systems and forest plantations to degraded pastureland, agroforestry systems to agricultural areas, and natural regeneration and planted forest and woodlot models to areas of degraded natural vegetation.

Overall, Mexico and Quintana Roo have a suite of geospatial data underpinning technical support for FLR. Several institutions provide spatially explicit data using advanced technologies. The National Institute of Statistics and Geography (INEGI) manages the LULC map of Mexico at 1:250,000 scale. The LULC map depicts different categories of vegetation cover and anthropogenic land use, including 12 categories of agricultural use and livestock grazing. This geospatial database is consolidated using remote sensing and

field calibration across the whole country for specific time periods: Series I (1979–1991); Series II (1993–1999); Series III (2002–2005); Series IV (2006–2010); Series V (2011–2013); and Series VI (2014–2017). In addition to the LULC maps produced by INEGI, INECC hosts the Environmental Maps of Mexico, a platform that provides national maps monitoring LULC change dynamics over the period 1976–2008, based on comparison of the LULC maps in Series II–IV. The aim is that, in the near future, the Environmental Maps of Mexico will focus on providing updated information regarding LULC change, including both deforestation and restoration/afforestation, based on the most recent versions of field-calibrated LULC maps (Series V onwards) at 1:250,000 resolution. Once implemented, this system should be able to keep track of indicators of restoration from space. However, in order to verify that the restoration is actually bringing ecological benefits back to those land areas and their surroundings, it will need to be complemented by field data.

The National Forest and Soil Inventory (INFyS),[25] managed by CONAFOR, is the official instrument for the national forest policy. Its most recent map refers to 2004–2009, with an update for 2009–2014 currently in progress. CONABIO is responsible for the National Biodiversity Monitoring System (SNMB).[26] Set up in 2015, the SNMB monitors the status of national ecosystems

[25]   www.cnf.gob.mx:8443/snif/portal/infys.
[26]   http://monitoreo.conabio.gob.mx.

and their dynamics based on maps provided by the integration of INFyS, the LULC and the Monitoring Activity Data for the Mexican REDD+ program (MAD-Mex) (Gebhardt et al., 2014). The SNMB accounts for ecosystem function and structure, plus field observations through 1,800 monitoring sites across Mexico. It produces maps of ecosystems integrity, identifying changes at 1 km^2 pixel scale. If integrated with INFyS, it could help to identify improved ecosystem function and structure in the restored landscape.

Quintana Roo also has spatial data produced by renowned international institutions to monitor its GHG emissions. The Aboveground Forest Carbon Stocks in Mexico,[27] provided by the Woods Hole Research Center, integrates remote-sensing measurements made with high-spatial resolution ALOS PALSAR radar and optical Landsat data with INFyS, which hosts field measurements for 26,000 plots across Mexico. The fusion of these three datasets allows for continuous estimates at relatively fine scales, compared to the under-sampled INFyS, providing a layer that contains complementary information on forest density and structure that can be matched with polygon information of the areas receiving public subsidy under CONAFOR's restoration programmes. Additionally, the Mexico Carbon Calculator,[28] produced by a collaboration of the Amazon Research Institute, The Nature Conservancy and the Woods Hole Research Center, estimates annual carbon stock scenarios based on forest cover for 2000–2014. It focuses mostly on REDD+ and measuring the impact of deforestation, rather than estimating the net impact of restoration. The latter requires additional information on the average amount of carbon sequestered by each restoration activity to be applied to the polygons identifying the areas where FLR was implemented.

Overall, Quintana Roo has good technical capacity to plan, implement and monitor FLR activities. However, an evaluation by IUCN staff through interviews with local stakeholders determined that the technical underpinning is not sufficient to effectively support its restoration commitment. Data sharing should be improved and institutional mechanisms strengthened. Weak inter-sectoral coordination means there is a need for greater involvement from the agricultural sector through the development of integrated planning instruments and monitoring systems. This is partially compensated by the availability of high-quality geospatial data. Nevertheless, it is imperative that robust evidence of the social, economic and ecological benefits of landscape restoration be identified to support policy and planning.

5.4 Conclusion

Based on the number of hectares brought under restoration since 2011 (the baseline year for the Bonn Challenge initiative), we found an average annual restoration rate of 21,368 ha per year. If this rate is maintained, it will take another 25 years or so to reach the 700,000 ha target. At the same time, the reported areas represent hectares that can be directly related to restoration, not the wider landscape impacted by FLR interventions that can qualify against the Bonn Challenge target. These areas are represented by the plots that have benefited from public subsidies related to specific restoration activity since 2011, and are thus an underestimation of restoration and conservative estimates of progress on the ground. The wider impact of policies that have an impact on the restoration activities of other actors and private landowners is not possible to track in terms of hectares. Moreover, conservation activities such as areas benefiting from payment for ecosystem services schemes are not accounted for, since they are not strictly related to restoration. However, they can have an indirect impact on it. Nevertheless, it should be noted that deforestation dynamics are not accounted for and the net balance of restoration versus deforestation is highly negative in the region.

According to the analysis of the *policies, plans and/or strategies related to FLR* and *financial flows* indicators, it is clear that the state government is the main stakeholder in landscape planning and policy in Quintana Roo, while most of the funding for restoration comes from the federal government. It is evident that financial flows are not sufficient for achieving the proposed restoration target for Quintana Roo by 2030, with around US$ 29 million spent over the last eight years. Stronger involvement of the agricultural sector in terms of integrated planning, promoted by the state government, and funding, provided by the federal government, is required. Moreover, landscape restoration policies should be integrated with REDD+ implementation in Mexico and with the Mexican commitments to the Paris Agreement. Even though deforestation rates in Quintana Roo are not among the highest in Mexico, its reference 2016–2020 deforestation rate is still around 18,500 ha per year. Taking into account deforestation, the net positive impact of FLR is reduced to only 2,868 ha per year.

[27]   https://whrc.org/publications-data/datasets/aboveground-forest-carbon-stocks-in-mexico.
[28]   http://mexico.carboncal.org.

As part of the Governor's Climate and Forests Task Force, the government of Quintana Roo signed the Rio Branco Declaration committing to a goal of reducing deforestation to a rate of 3,700 ha per year by 2020. It is clear that both subnational commitments, the Bonn Challenge and the Rio Branco Declaration, are related, and integrated monitoring and implementation of these initiatives should be promoted.

6 Rwanda

The Bonn Challenge commitment made by the government of Rwanda set a target of bringing 2 Mha under restoration by 2030.[29] The country's target is to achieve border-to-border forest and landscape restoration that contributes to multiple sustainable development objectives. Since 2010, the year taken as baseline for implementation on the ground, Rwanda has succeeded in bringing 708,628 ha under restoration. This has been achieved through the work of smallholder farmers, along with grassroots organisations, government agencies and NGOs. This brings Rwanda to 35% of its goal. Restoration of land in Rwanda has involved a range of different activities but the majority has been through agroforestry initiatives.

The factors enabling progress on the ground include sustained investment from domestic public expenditure and from international donor support, either to the government or to NGOs, and a strong policy framework supporting FLR integration. Nonetheless, achieving the Bonn Challenge goal is also dependent upon enhanced investment in FLR approaches, and adequate technical expertise in the spatial planning, prioritisation and monitoring of FLR actions.

6.1 Piloting process

Barometer application in Rwanda was initiated with a technical consultation in April 2018 with members of the cross-sectoral task force chaired by the Rwanda Water and Forestry Authority (RWFA). Data were gathered mainly from the 2011–2018 IUCN FLR stock-take exercise for Rwanda (IUCN, 2018a) and from rapid appraisals by different private and public institutions participating in the FLR sector in the country. The majority of these actors participate in the FLR cross-sectoral taskforce. A total of 44 projects/programmes

were assessed in the Barometer. The assessment and ranking of different factors were mainly done by the IUCN Rwanda Office in consultation with the Bonn Challenge Focal Point at the Ministry of Environment.

6.2 Results and benefits

6.2.1 Area under restoration

In the case of Rwanda, restoration activities reported are: afforestation, agroforestry, improved management of public and private forest plantations, terracing, river bank protection, organic farming buffer zone protection, hillside irrigation, lake shore protection and natural forest protection.

A few institutions shared spatially explicit information for restoration actions on the ground. These, together with the IUCN FLR stock-take exercise, helped to produce an indicative map of administrative sectors where projects are being implemented and spatial data are available (see Figure 6.1). Considering the definition of "under restoration" and the data available, the number of hectares for each project reported on in the Barometer were added to provide a total for the number of hectares brought under restoration.

While 25% of the assessed projects presented the disaggregated number of hectares per FLR category, the remaining 75% had FLR categories approximated based on areas covered by different interventions mentioned in the project documents. Efforts are underway to sensitise practitioners to report disaggregated data. The Forestry Department began working in this way and generating shapefiles for spatial data starting in 2018 and this is expected to spread quickly among stakeholders.

6.2.2 Climate impacts

Using the information on hectares under restoration, the CO_2 removals tool for FLR showed that the assessed FLR projects achieved total cumulative removals of 27,860,228 tCO_2e from 2011 to 2018. The assumption was that watershed protection and erosion control measures involving tree planting could be considered to be agroforestry and were therefore merged with the area under agroforestry. The pool of agroforestry, planted woodlots and protective forests, together with natural regeneration, were all considered to be forest and therefore added to the area under planted forests and woodlots. This was based on a careful review of

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[29]   Initially Rwanda's commitment was made to 2020. This was later changed to 2030.

Figure 6.1 Map of FLR project coverage in Rwanda (2011–2018)
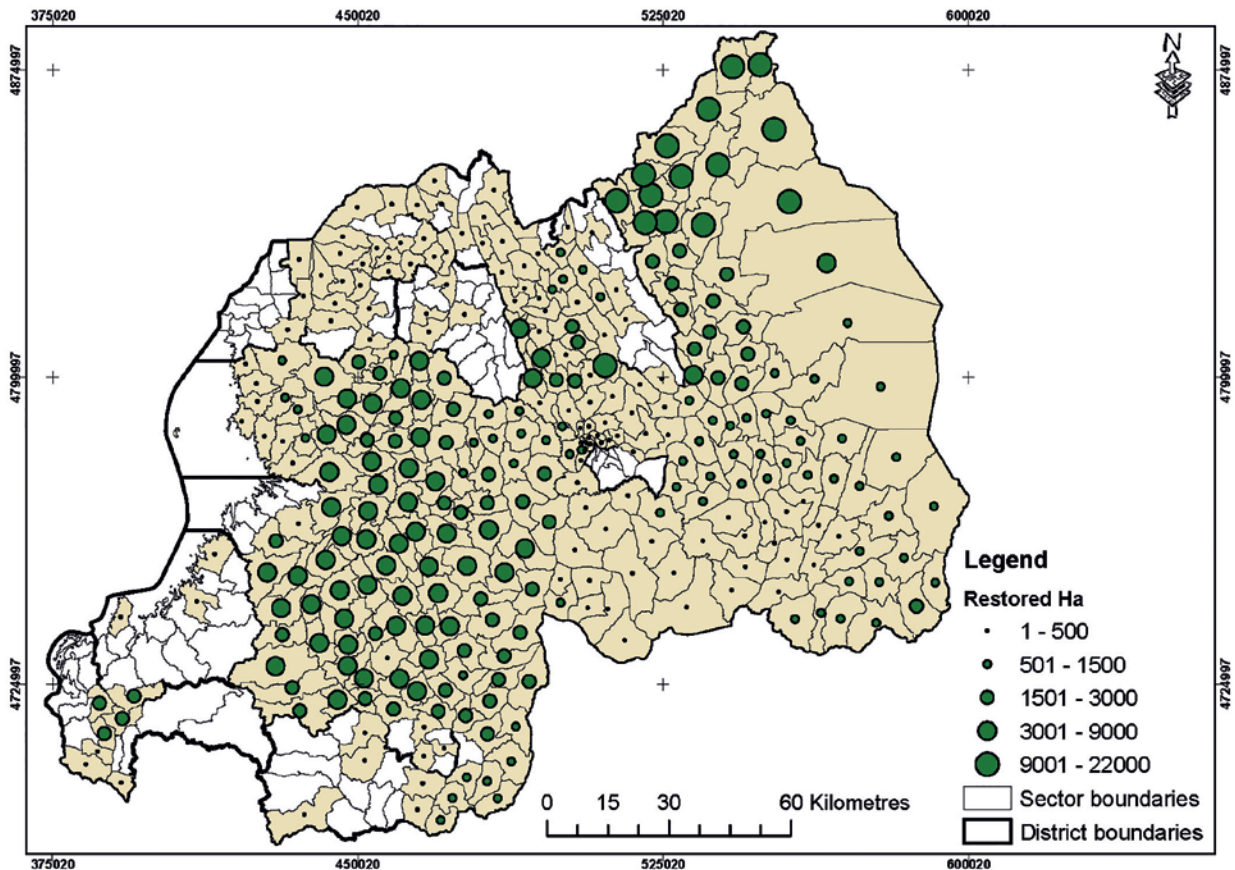
activities by individual projects, where it was found that different terminologies are used but interventions could be grouped into the above-mentioned FLR categories.

6.2.3 Biodiversity impacts

In this sub-section, the findings from an assessment of KBAs, protected areas, ecological corridors and other buffer zones in which FLR activities took place are presented. The assessment was done by overlaying the areas of intervention of the 44 FLR projects identified as KBAs. Eight projects were identified as being implemented in national parks or protected areas and thus had more biodiversity impacts. Rwanda's restoration efforts included some regeneration and assisted restoration in the vicinity of KBAs and protected areas, namely Volcanoes National Park, Akagera National Park, Lake Kivu, Cyamudongo Forest, and Gishwati-Mukura National Park and Gishwati Landscape. However, exact information for the type or amount of restoration taking place in these areas of conservation importance is not yet available.

6.2.4 Socio-economic impacts

There are limited data on jobs created and it is difficult to estimate the total social and economic benefits associated with FLR projects assessed here. A report from RWFA monitoring and evaluation officers for the year 2017–2018 identified 22,325 jobs created in the forestry sector and disaggregated by gender (RWFA, 2018, see Figure 6.2). The data reported here cover total jobs within the forestry sector pertaining to FLR but do not include employment statistics from different sectors that could also involve FLR interventions. Rwanda's Green Fund, FONERWA, indicated that 137,562 green jobs were created in 2013–2018 under 36 of the 44 Barometer projects evaluated. Efforts are underway to adopt and use a more systematic economic impact assessment framework.

Figure 6.2 Jobs created through the forestry sector
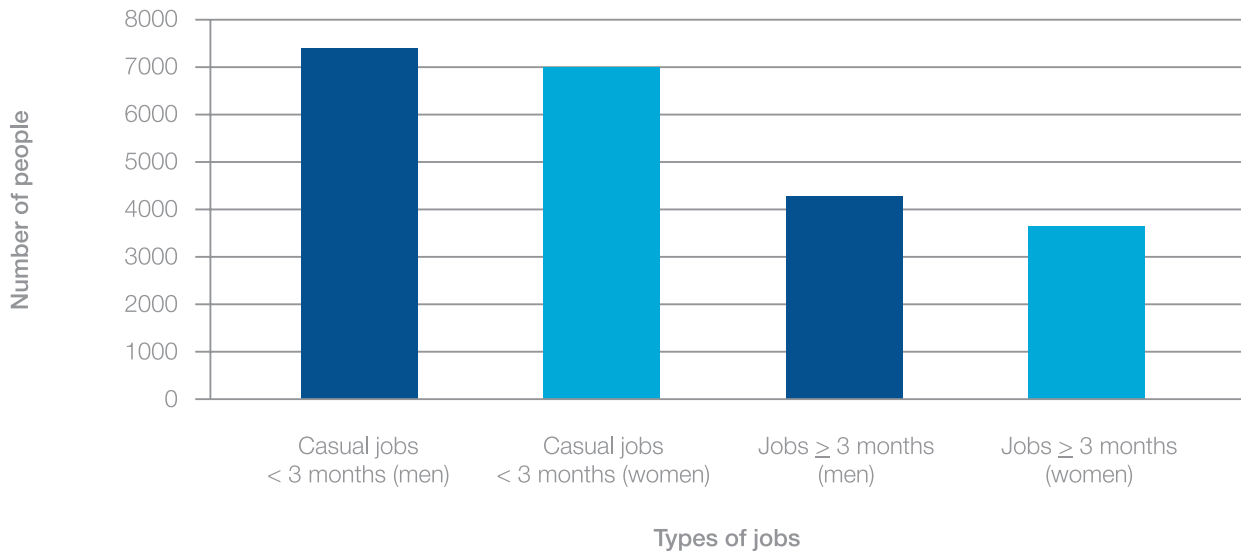
6.3 Success factors

The results presented above are driven by several enabling conditions, ranging from policies to institutional coordination mechanisms, financial support and technical planning.

6.3.1 Policy and institutional framework

Through the Barometer assessment, it was evident that there is an important category of new policies and strategies in 2018, especially in the forestry and environment sectors, being drafted, finalised and adopted as a response to prevailing issues such as climate change and the integration of new conventions that Rwanda has ratified. New concepts are also being developed, such as institutional arrangements for landscape restoration.

Rwanda has developed and is implementing different policies to shape its economic transformation agenda and the sustainable management of its environment and natural resources. The country's ambitious programme for development is encapsulated in Vision 2020, the Economic Development and Poverty Reduction Strategy (EDPRS) and the Green Growth and Climate Resilience Strategy (GGCRS) – two overriding policies and strategies that support Rwanda's sustainable development agenda. EDPRS II is based on three pillars: a green economy designed to accelerate economic growth and promote human development and social cohesion, economic empowerment and environmental intelligence (Government of Rwanda, 2013). GGCRS,

a strategic framework for Rwanda's low-carbon development, proposes "big wins" that will maintain rapid economic growth while taking into consideration the integration of environmental sustainability and climate resilience in Vision 2020 (Government of Rwanda, 2011). Some of the cross-cutting areas of the revised Vision 2020 that are directly linked to FLR are natural resources, environment and climate change.

In support of agroforestry, which accounts for almost 75% of the country's land area, Rwanda is implementing the Rwanda Biodiversity Policy and the Strategic Plan for the Transformation of Agriculture 4 (PSTA 4) 2018–2024, both of which advocate agroforestry, among other FLR practices that promote best practice. These include watershed management and promote increased agricultural productivity through strategies such as climate-smart agriculture, water conservation, soil fertility management, erosion control and soil management. Another key policy that supports agroforestry is the national horticulture policy, which promotes fruit tree planting by establishing incentive mechanisms, strengthening value chains and developing markets for horticulture products; it has a significant effect on the promotion of FLR in Rwanda. In particular, the horticulture policy promotes the establishment of village nurseries for fruit trees. Other policies that support agroforestry include the Agroforestry Strategy and Action Plan 2018–2027, which is being developed to promote leadership and synergies in agroforestry as well as to engage coordinated action and implementation in Rwanda's National Forestry Policy and National Agriculture Policy.

The National Tree Reproductive Materials Strategy 2018–2024 promotes the diversification of high-quality tree reproductive material adapted to the different agro-ecological regions, thus enhancing the economic and ecological functions of forest and agroforestry plantations in Rwanda. The policy has recently given significant support to the rehabilitation of tree seed centres across the country. Practices such as woodlot management and reforestation of degraded natural forest, along with policies such as the National Biomass Energy Strategy (BEST) and Forest Sector Strategic Plan (FSSP) 2018–2024, have led to the protection and proper management of various public and private woodlots and the rehabilitation of degraded natural forest.

In total 27 policies/strategies/plans were identified, and Table 6.1 lists their names, the year they were enacted and the lead implementing institution. Most of the policies, strategies and plans supporting FLR in Rwanda are hosted under the Ministry of Environment (MoE), the former Ministry of Lands and Forestry (MINILAF), the Ministry of Infrastructure (MININFRA) and the Ministry of Agriculture and Animal Resources (MINAGRI).

The self-evaluation conducted through the Barometer assessment showed that there are many policies, plans and strategies with a substantial level of implementation and enforcement. However, implementation is still not fully effective, mainly due to insufficient funding compared to what is required to sustainably support all activities associated with implementing FLR approaches. Other factors include weak coordination between institutions, which also hampers effective cross-sectoral and scalar cooperation and support to implement FLR approaches, and weak technical capacity to proactively support prioritisation and monitoring of ongoing efforts.

6.3.2 Financial flows

A rapid assessment conducted for the 44 FLR projects identified from 2011 to 2018 provides an indicative amount of funds flowing to FLR. This assessment revealed that a total of US$ 530,762,526 was invested in FLR from 2011 to 2018. Public investments represent US$ 274,479,097 (51.71%) and projects co-funded by international donors and the government represent a total of US$ 188,555,240 (35.61%). International donor support represents US$ 67,490,843 (12.63%), whereas the contribution of the private sector and non-profit organisations is still very low – US$ 216,680 (0.041%) and US$ 20,665 (0.004%), respectively (see Figure 6.3). The results of the stock-take were used to map the amount of investment in FLR projects per sector; more resources were invested in the western part of country than in the eastern part (see Figure 6.4).

Figure 6.3 Funding streams by type in support of FLR implementation
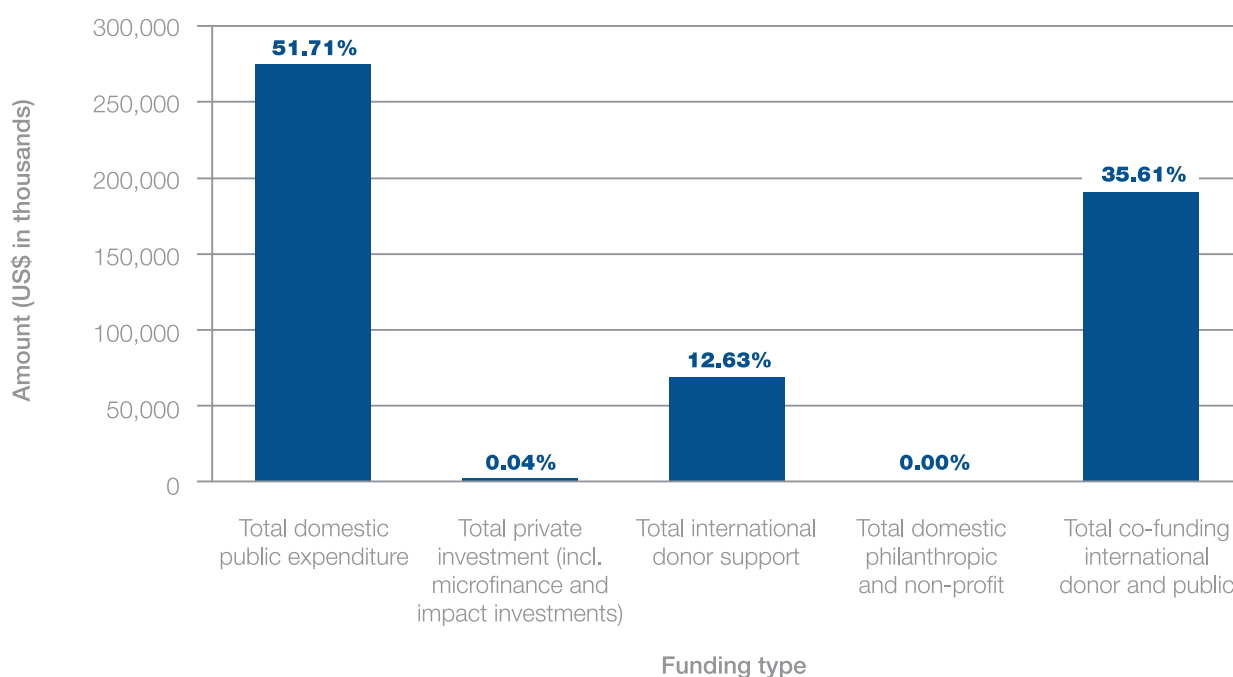
Table 6.1 FLR-supportive policies, strategies and plans

No.	Policy, plan or strategy and relation to FLR	Year enacted	Implementing institution
1	Green Growth and Climate Resilience Strategy (GGCRS)	2011	Ministry of Environment (MoE)
2	Rwanda Biodiversity Policy	2011	MoE
3	National Policy for Water Resources Management	2011	MoE
4	National Disaster Management Policy	2012	Ministry of Disaster Management and Refugee Affairs
5	Rwanda Vision 2020 (revised)	2012	Ministry of Finance and Economic Planning (MINECOFIN)
6	National Urbanisation and Rural Settlement Sector Strategic Plan (2012/13–2017/18)	2012	Ministry of Infrastructure (MININFRA)
7	Rwanda Wildlife Policy	2013	Ministry of Trade and Industry (MINICOM)
8	National Strategic Plan for the Environment and Natural Resources Sector 2014–2018	2013	MoE
9	Rwanda Protected Area Concessions Management Policy	2013	MINICOM
10	Economic Development and Poverty Reduction Strategy (EDPRS II) 2013–2018	2013	MINECOFIN
11	National Horticulture Policy	2014	Ministry of Agriculture and Animal Resources (MINAGRI)
12	National Energy Policy	2015	MININFRA
13	Energy Sector Strategic Plan 2013/14–2017/18	2015	MININFRA
14	The Constitution of the Republic of Rwanda of 2003, revised in 2015	2015	Government of Rwanda
15	National Urbanisation Policy	2015	MININFRA
16	National Youth Policy	2015	Ministry of Youth
17	National Biodiversity Strategy and Action Plan (NBSAP)	2016	MoE
18	7 Years Government Programme: National Strategy for Transformation (NST 1)	2017	Office of the Prime Minister
19	Rwanda National Forestry Policy	2018	Ministry of Lands and Forestry (MINILAF)
20	Forest Sector Strategic Plan (FSSP) 2018–2024	2018	MINILAF
21	Agroforestry Strategy and Action Plan 2018–2027 (draft 2018)	2018	MINILAF
22	National Tree Reproductive Materials Strategy 2018–2024	2018	MINILAF
23	Strategic Plan for the Transformation of Agriculture 4 (PSTA 4) 2018–2024	2018	MINAGRI
24	National Environment and Climate Change Policy (draft 2018)	2018	MoE
25	National Biomass Energy Strategy (BEST)	2018	MININFRA
26	National Agriculture Policy	2018	MINAGRI
27	National Land Policy (under revision 2018)	2018	MINILAF

Figure 6.4 Funding streams by type in support of FLR implementation
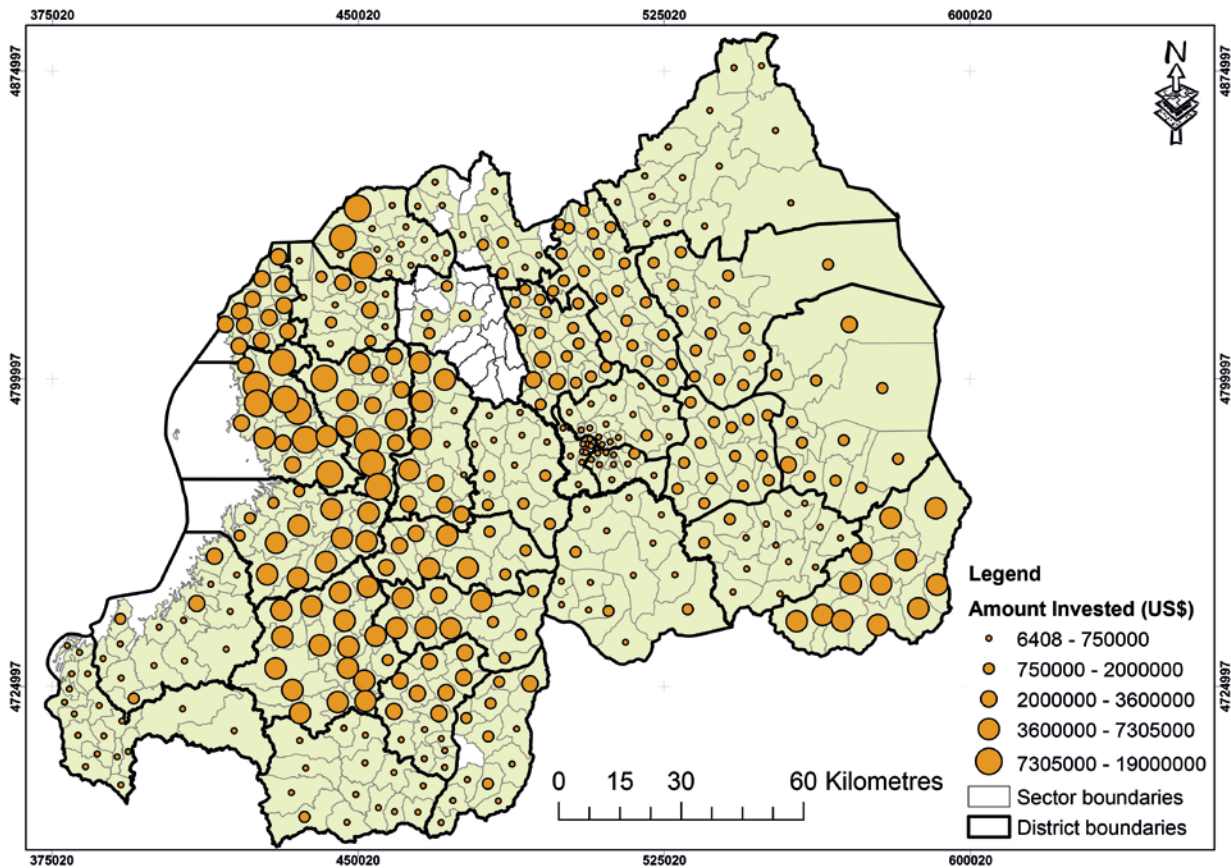
6.3.3 Technical underpinning: restoration planning

To guide and plan FLR implementation, Rwanda has followed two formal frameworks at national level since committing to the Bonn Challenge in 2011:

(i) it applied ROAM in 2014 as a flexible and affordable framework for the country to rapidly identify and analyse areas that are primed for FLR, and to identify specific priority areas at national or subnational levels (IUCN & WRI, 2014).

(ii) it completed its target-setting process for the UNCCD's LDN goals in June 2018. LDN is a global mechanism from the UNCCD that helps countries to counterbalance the expected loss of productive land with the recovery of degraded areas. It includes targets and associated measures for achieving LDN by 2030 (UNCCD, 2019).

In addition, the ROOT tool, developed by the Natural Capital Project, was also used to support decision making on the potential impacts of restoration in Rwanda.

6.3.4 Technical underpinning: monitoring systems

To date, Rwanda has two national monitoring platforms for some aspects of FLR. These are the Forestry Sector Monitoring and Evaluation System (FMES) under the RWFA and MINAGRI's monitoring information system (MIS). Currently, these two systems are not operational, and it was not possible to access the type of information that MINAGRI's MIS would generate; therefore, only the type of information that FMES generated was assessed. IUCN have started supporting the restructuring of FMES with updated FLR indicators.

FMES was designed to allow the following flow of forestry sector data (RNRA, 2016):

1. Data collection and data registration:
    - At *district level*, under the responsibility of district forestry officers: afforestation length shape, afforestation polygon shape, deforestation, harvesting permits, reforestation, forest disease, forest fires, forest sector company and

administration workers, including charcoal-makers' register and production, transport permits, forestry investment at district level, allocated district forest budgets and district forest expenditure;

- At *national and central level*, under the responsibility of the FMES officer and administrator, in collaboration with the National Institute of Statistics of Rwanda: non-household wood product consumption, household wood product consumption (national survey), skill assessment of forestry sector actors (national survey), forest management plan evaluation, national economic data, population data (total population, number of households, population growth, importance of forest in household incomes), wood product prices (surveys), wood product processing data (carbonisation rate survey), forestry investments at national and central levels, allocated central forest budgets, central forest budget expenditure, forest cover baseline (total, protected, non-protected, based on regular mapping), and forest inventory results (productivity, stock, number of stems per hectare);

2. Data element and indicator calculation: done automatically by the FMES system with the support of the FMES administrator;

3. Data element and indicator reporting: there are 22 indicators reported at the national level, and between 15 and 22 indicators at the district level.

Apart from these two systems (FMES and MIS), some standardised FLR monitoring, measurement and evaluation frameworks have been used in Rwanda at the district level. This is the case of Open Foris' Collect Earth Online, used by the Food and Agriculture Organization (FAO) and WRI to monitor restoration at the district level (in Rulindo, Gatsibo and Gicumbi districts) (FAO, 2018).

In response to the request to self-evaluate whether there is enough technical capacity to plan, implement and monitor FLR activity to achieve Bonn Challenge commitments, officials with the Forestry Department in the RWFA identified the lack of spatial analysis and mapping expertise as the main technical capacity gap. This gap exists mainly in the case of government staff, especially at the local levels (districts, sectors and cells) in terms of mapping tools and software in relation to forestry and other land uses. Officials also noted that even though it is important for most projects to have geographic information system (GIS) data for their area of intervention, these data are often not available or

lack detail. This has consequences for monitoring FLR, especially when it comes to estimating hectares under restoration.

6.4 Conclusions

The findings of the pilot application of the Barometer in Rwanda revealed that it has made much progress in developing policy frameworks that can boost restoration efforts in order to achieve its ambitious target of bringing 2 Mha under restoration. As stated in Vision 2020, EDPRS II and GGCRS, and all sectoral policies, environmental sustainability should be taken into consideration in all sectors involved in shaping Rwandan landscapes. However, the coordination and implementation of these policies is sometimes not fully achieved.

Restoration is happening across the country and the combined effort of government institutions, the private sector, international organisations and civil society, including faith-based organisations in this endeavour sets a good precedent for the collaborative effort required to advance complex and multisectoral agendas such as FLR. However, proper monitoring capacity needs to be developed to better track restoration progress. For instance, in addition to the 44 projects assessed here, there are other relevant FLR-focused initiatives across the country, but they could not be included in this first application of the Barometer due to insufficient or incomplete information on budgets and actual areas under restoration. Similar to the situation in Quintana Roo, it is likely that in-kind contributions and efforts by farmers and communities to implement FLR interventions are undervalued, and the total area reported as being under FLR activities could be an underestimate. In addition, as with other pilot cases, the results for the *area under restoration* indicator related to areas directly under restoration, which are embedded in wider landscapes that could also qualify as areas of impact under FLR. Therefore, estimates of progress on the ground are conservative. Appropriate monitoring from grassroots level to inform the different administrative cells, sectors and district officers on restoration efforts carried out by communities is needed. Finally, additional efforts to clarify FLR-linked jobs in sectors other than forestry are also required for a more complete picture of the economic impacts of FLR interventions.

7 Sri Lanka

The snapshot provided here is based on the preliminary application and discussion of the Barometer framework in Sri Lanka.

7.1 Bonn Challenge commitment

The government of Sri Lanka has pledged to restore 200,000 ha of forest land by 2030, in line with its presidential initiative – Sri Lanka NEXT: A Blue Green Era. As communicated in its NDC to the UNFCCC, the Sri Lankan government hopes to meet this pledge by increasing forest cover from 29% to 32% by 2030, and by establishing a forest land bank for FLR, which will provide local and global benefits, with the participation of all stakeholders, including the private sector. Thus far, the Forest Department reports the restoration of 9,500 ha, while 200 ha have been restored through private sector involvement.

While there are several government, private sector, non-government and civil society initiatives on the ground, there is a need for a system to collate information at the national level. The Forest Department has a monitoring system to audit restoration work at departmental level, but lacks a national monitoring system, which therefore hinders the ability to assess the total national restoration effort. The Bonn Challenge Barometer will be applied in 2019 to collect information on restoration and identify opportunities to help achieve the Bonn Challenge pledge.

The IUCN Sri Lanka Country Office, together with the Forest Department and Climate Change Secretariat of Sri Lanka, initiated discussions on the application of the Barometer framework in the Sri Lankan context during a workshop in October 2018 to promote public-private-people participation in the Wana Ropa Tree Planting Program. Government agencies, private sector companies, NGOs and other organisations that represent civil society participated in the event to

share their restoration activities. Through discussions and initial analysis of data presented, data gaps and recommendations for more effective FLR were identified. More intensive collaboration, with increased community involvement, clearer criteria for monitoring restoration, and improved funding for monitoring and data collection were found to be vital in order to strengthen Sri Lanka's FLR work.

The Sri Lankan government's approaches to restoration include (i) planting on heavily degraded land; (ii) assisting natural regeneration of degraded forests; (iii) establishing commercial plantations; (iv) restoring animal habitats; and (v) protecting moderately degraded forests from encroachment. Accordingly, a total of 27,500 ha are targeted for degraded forest restoration, and 9,500 ha will be restored via the improved management of existing secondary forests. A total of 130,000 ha of restoration is planned to be achieved through additional protection of degraded forests. Restoration of another 33,000 ha of degraded forests is anticipated through private sector and civil society engagement. The Wana Ropa Tree Planting Program is part of the Punarudaya National Environmental Conservation programme, which is implemented by the Ministry of Mahaweli Development and Environment. The main objective of this programme is to increase the forest cover of Sri Lanka to 32%.

The government of Sri Lanka is the key driving force of the national tree-planting programme, while the Forest Department is the main government agency involved in the restoration programme around the country. Furthermore, several other government agencies, including the Ministry of Defence, the Department of Wildlife Conservation, the Department of Coast Conservation and Coastal Resource Management, and the Mahaweli Authority are also involved in restoration programmes.

Private sector companies, as well as NGOs, community-based organisations and civil society are engaged in restoration programmes together with government agencies. For example, Finlays, a private sector tea company, is aiming to replant 956 ha of land by 2019. The Alliance Finance Company has pledged to replant 600,000 trees (2,583 ha) by 2021, with 191,518 already planted. MAS Holdings, one of Sri Lanka's largest clothing companies, has pledged to restore 25,000 ha of land (replanting and protecting) by 2030. By 2017, it had restored 241.2 ha of land, including the reforestation of 60.7 ha of land and the removal of invasive species from 155.4 ha of land. Biodiversity Sri Lanka has pledged to restore 10 ha of land between 2016 and 2023 using

US$ 210,000 from private sector funds collected for the purpose. Together with project partners, it has planted 20,000 trees, while also hiring local villagers to support project implementation.

The Small Fishers Federation of Sri Lanka, which represents the fisheries communities, is engaged in a replanting programme that began in 2015 and aims to restore 12,000 ha by 2019. The programme is funded by Seacology. The Federation has so far restored 480 ha of land using mangrove species such as *Rhizophora mucronata*, *Xylocarpus granatum*, *Lumnitzera racemosa* and *Avicennia marina*. The Friends of Biodiversity Runakanda Forest Conversation Centre, with funds from the philanthropic and non-profit sectors, is replanting in deforested regions in a lowland area close to the Sinharaja Forest Reserve (a UNESCO World Heritage Site). The organisation supports local communities by buying saplings for replanting from villagers with low incomes. Thuru, a volunteer organisation, aims to plant 2 million trees by 2020, with support from funds from the domestic philanthropic and non-profit sectors, and approximately 300 volunteers spread across Sri Lanka's 25 districts. A proportion of its work also overlaps with that of the Sinharaja Forest Reserve.

8 USA

The USA's Bonn Challenge commitment set an ambitious target of putting 15 Mha under restoration by 2020. In partnership with other government agencies, states, tribes, NGOs and private landowners, the US Department of Agriculture US Forest Service (USFS) has succeeded in placing over 17 Mha under restoration, surpassing its goal. As described in more detail below, FLR on USFS land has involved a range of different activities, but the majority are through silvicultural practices.

8.1 Piloting process

The USFS was an active and enthusiastic partner both in the development of the Barometer, providing invaluable feedback, and as a pilot country, compiling a robust and comprehensive set of data and information on Bonn Challenge commitment progress. In June 2018, a meeting with USFS personnel was held to formally introduce the protocol and solicit feedback on indicators and guidance. During this session, USFS staff offered constructive suggestions reflecting USFS perspectives and the national context, which was then incorporated into an updated version of the protocol. These suggestions included additional criteria under the *climate impact* indicator and describing additional non-carbon quantitative or qualitative climate impacts from FLR activities. This information has been integrated into the final version of the protocol (to be launched in 2019).

Over the following two months, USFS personnel gathered and processed data to respond to the protocol. While there were requests for clarifications, most of these necessary data were readily available and part of USFS monitoring and reporting processes, so responding to protocol indicators did not incur any delays or roadblocks.

8.1.1 Implementation of restoration pledges

Working with public and private sector partners, the USFS undertakes extensive ecological restoration efforts to support and re-establish functional ecosystems. The mandate for this work is among the core practices of the USFS and is reflected in official guidance that directs its staff in all 50 states and Puerto Rico. Work on restoration includes efforts to mitigate and recover after wildfires, combat invasive species and other insect infestations, and reduce the negative impacts of unsustainable logging and grazing practices as well as drought. This is achieved through measures including (but not limited to) prescribed burning and hazardous fuel reduction activities, improved silvicultural management practices, rangeland habitat restoration, assisted natural regeneration, and invasive species and insect treatments.

8.2 Results and benefits

8.2.1 Area under restoration

As of 2018, the USFS has undertaken FLR activities on 17.0 Mha, 2 Mha beyond the 15 Mha pledged. This number was reported with a high level of confidence (Tier 3), as the USFS maintains a record of restoration treatments, including spatial data.

As shown in Figure 8.1, the overwhelming majority (80%) of the area under restoration was restored via silviculture. This includes traditional silviculture activities, such as thinning and fire prevention, as well as actions undertaken to restore the function and resilience of USFS productive forests, such as wildfire treatment to achieve adapted forested landscapes and insect and disease treatments.

Rangeland restoration (11%) is also a significant activity with 1.7 Mha of the USFS Bonn Challenge commitment achieved through efforts such as rangeland vegetation improvement. Other FLR activities including watershed protection and erosion control (5%), natural regeneration (3%) and planted forest and woodlots (1%) were undertaken to a lesser extent.

8.2.2 Climate impacts

The USFS and its partners undertake a wide range of restoration activities, many of which are introduced to improve the resilience and adaptive capacity of forests, rather than carbon sequestration necessarily. As such, cumulative carbon sequestration impacts from USFS progress towards its Bonn Challenge commitments are only reported for reforestation activities.

From 2011 to 2017, the USFS and its partners restored 566,000 ha through a combination of tree planting and certified natural regeneration. Carbon sequestration was

Figure 8.1 Area under restoration by FLR intervention types
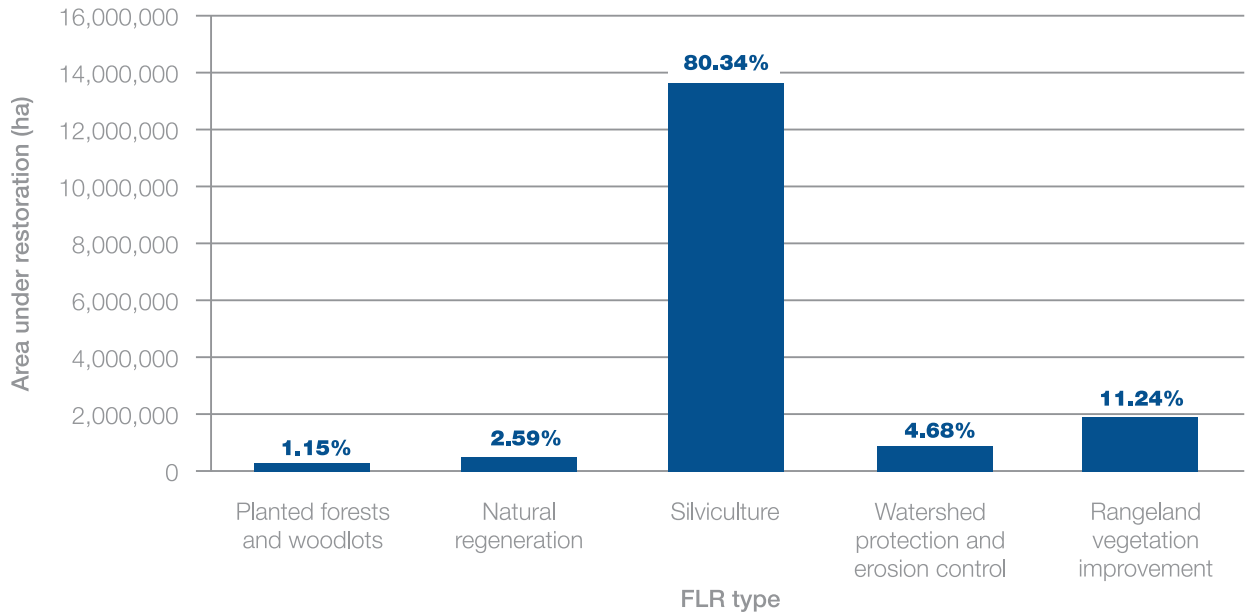
estimated using national average estimates of gross sequestration from above- and below-ground live trees for regeneration, adjusting for the difference in sequestration rates for the first zero to five years post-treatment. The estimate for total cumulative sequestration is 5.22 MMT CO_2, with an upper 95% CI of 17.6 MMT and a lower 95% CI of 187 MT. Given national average estimates of gross sequestration were applied for just a subset of FLR activity, this estimate was provided with moderate confidence (Tier 2).

8.2.3 Biodiversity impacts

Given the enormous size of the USA and the 155 national forests and 19 national grasslands the USFS oversees, implementation of ecosystem restoration activities by the USFS overlaps extensively with designated KBAs, protected areas, ecological corridors and buffer zones. The USFS reported that the area brought under restoration overlaps with a total of 98 KBAs.

8.2.4 Socio-economic impacts

A comprehensive assessment of the number of jobs generated through FLR activities undertaken by USFS and its partners was not available at the time of reporting. However, the restoration work associated with the 23 projects under the Collaborative Forest Landscape Restoration Program (comprising roughly 10% of USFS contributions to the Bonn Challenge) has supported an estimated 5,500 jobs per year since 2012. This was

estimated to contribute a total of US$ 1.5 billion in local labour income. Economic modelling applied to derive these estimates was completed using the Treatment for Restoration Economic Analysis Toolkit.[30]

Based on these results, the total number of jobs supported through USFS FLR activities annually was extrapolated to approximately 55,000 jobs. While the modelling undertaken was using field-reported data, given these results were an extrapolation based on modelling, USFS classified its response to this indicator with a moderate level of confidence (Tier 2).

8.3 Success factors

8.3.1 Policy and institutional framework

The USFS' dedication to FLR is clearly demonstrated through its land-use management planning rules and guidance issued to National Forest System (NFS) staff. The USFS 2012 Planning Rule sets forth processes and requirements that guide the development, amendment and revision of land management plans for the 155 national forests and 19 national grasslands of the NFS. These land management plans guide the design and implementation of restoration activities reported by the USA for the Bonn Challenge. The 2012 Planning Rule alone puts a strong emphasis on restoring land and water ecosystems, but through its 2016 Ecosystem Restoration Policy,[31] the USFS

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[30]   www.fs.fed.us/restoration/CFLRP/guidance.shtml.

[31]   www.gpo.gov/fdsys/pkg/FR-2016-04-27/pdf/2016-09750.pdf.

offers standard definitions and guidance for carrying out ecological restoration practices. With the goal of creating functioning, resilient ecosystems with multiple-use functions, this policy was implemented through an amendment to the official *Forest Service Manual* entitled "Chapter 2020: Ecosystem Restoration". As a result, ecosystem restoration has been further emphasised across the NFS, providing direction on incorporating restoration goals or objectives into land and resource management plans, project plans, and other Forest Service activities.

The Agricultural Act of 2014 (or the 2014 US Farm Bill) also supported the USFS's steady progress towards meeting its Bonn Challenge commitment. As part of national efforts to combat and mitigate the impacts of insects and disease on US forests, it included provisions for state governors to nominate landscapes for insect and disease treatment in national forests. While no additional funding from the 2014 Agricultural Act has been appropriated, some insect and disease treatment activities have been facilitated through this legislation. The legislation also permanently authorised the Good Neighbor Authority of the USFS, allowing states and their partners to perform restoration activities on NFS lands. Finally, the legislation facilitates acquiring additional experienced non-federal technical staff to support conservation programmes on a temporary basis.

FLR activities undertaken by the USFS have also benefited from legislation providing critical funding streams for restoration. Title IV of the Omnibus Public Land Management Act of 2009 authorises the Chief of the USFS to solicit nominations of areas in need of active restoration efforts from regional USFS offices. Under this Act, the Chief and an advisory board may select up to 10 of the proposals on an annual basis to receive financial support from the US Treasury Collaborative Forest Landscape Restoration Fund. In addition, Title III and IV of the Consolidated Appropriations Act of 2018 provide additional forest fire pre-suppression funding (i.e. hazardous fuel reduction, prescribed burning) and conservation and forest management funding for NFS lands.

While the USFS has a clear legal and regulatory mandate to plan and implement FLR activities, it reported that the quality of restoration treatments is inconsistent across the 155 units of the NFS. This inconsistency has been attributed to the varying levels of technical and staff capacity among government and non-government partners carrying out the work. Nevertheless, the USFS has exceeded its Bonn Challenge commitments and has been able to track this reliably through its monitoring systems, which will

continue to evolve to better support strategic placement of restoration treatments to address the highest risks.

8.3.2 Financial flows

Logically, as a government agency, the majority of funding for USFS FLR activity comes from public expenditure. This was reported to be US$ 8 billion (categorised under Tier 2). Yet through its partnerships, additional funding from the philanthropic, non-profit and private sector also contributed to implementing FLR activities under the USFS Bonn Challenge commitment, totalling an estimated US$ 1.5 billion, representing nearly 16% of the total.

8.3.3 Technical underpinning

All forest management activities are mandated to follow the 2012 Planning Rule mentioned above, which incorporates directives and policies for ecosystem restoration. Additionally, the Joint Chiefs' Landscape Restoration Partnership, a collaboration between the United States Department of Agriculture (USDA) Natural Resources Conservation Service and the USFS, has established a planning process for joint restoration work across federal and private lands. This process incorporates many of the same participatory, multidisciplinary planning approaches reflected in ROAM.

To monitor progress towards FLR goals, the USFS primarily uses a monitoring framework established by the 2012 Planning Rule, as well as policies established through the 1978 National Forest Management Act. Some programmes have additional monitoring methodologies, such as the multiparty monitoring and ecological indicators used by the Collaborative Forest Landscape Restoration Program[32] and the Watershed Condition Framework.[33]

8.4 Conclusion

The USA's Bonn Challenge commitment was realised through a concerted effort by the USFS and multiple NGO, public and private organisations. Relevant policy framework and strong institutional arrangements supporting implementation are some key factors in the successful realisation of the USA's goals. The USA also benefits from a strong reporting and monitoring system within the USFS, advanced technical underpinning and adequate funding. At the same time, there is varying quality in restoration work across the USFS and the focus on wildfire risk reduction has meant that silvicultural practices are emphasised as part of the suite of FLR activities.

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[32]   www.fs.fed.us/restoration/CFLRP.

[33]   www.fs.fed.us/naturalresources/watershed/condition_framework.shtml.

9 Applying the Barometer protocol in additional countries

IUCN initiated the development of the Bonn Challenge Barometer to capture and provide evidence of advances, partnership opportunities, needs and bottlenecks. While the Barometer has been thoroughly applied in five pilot jurisdictions (and on a preliminary basis in Sri Lanka), now is the time to apply the Barometer protocol more broadly. There is a growing demand from Bonn Challenge pledgers to better assess and report on progress towards the achievement of Bonn Challenge commitments. In this light, a rapid assessment of 13 additional focus countries was conducted from October to December 2018.

This chapter covers the rapid assessment of an additional set of countries: India, Uganda, Malawi, Kenya, Burundi, Côte d'Ivoire, the Democratic Republic of Congo, Mozambique, Cameroon, Ghana, Costa Rica, Guatemala and Colombia (see Figure 9.1). These countries contributed to the rapid assessment and provided information on some of the indicators of the Barometer protocol. Their current FLR implementation status and progress will be briefly described in this chapter. Participation in this rapid assessment enhanced the level of preparedness of these Bonn Challenge pledgers to use the Bonn Challenge Barometer protocol for the following year and will help create a baseline for these countries.

The data collection process for the rapid assessment consisted of multiple steps, starting with contacting Bonn Challenge focal points in the focus countries with the request to apply the protocol. It should be noted that as this was a rapid assessment and time was a limiting factor, the request made to contributing countries was to provide any data available at the time. Therefore, it was not possible to report on progress on all nine indicators of the protocol. In addition to data collection through the protocol and countries' self-assessment, available reports such as IUCN's ROAM, UNFCCC biennial reports and CBD reports were consulted to derive supporting data. This resulted in a dataset, varying per focus country, which was the input for the analyses in this chapter on additional countries.

9.1 Rapid assessment progress report of 13 countries

Since the launch of the Bonn Challenge in 2011, multiple countries have made voluntary commitments. The Bonn Challenge also provides an umbrella and framework for regional restoration initiatives and platforms, such as the AFR100, Initiative 20x20 in Latin American and Caribbean countries, the Caucasus and Central Asia, COMIFAC and the Mediterranean.

Each pledging country has its own approach towards designing and implementing large-scale FLR to achieve its Bonn Challenge goals. For the 13 countries in this rapid assessment, the success factors are summarised and some specific cases are highlighted. Furthermore, this report also includes the current results and benefits generated by the seven countries that were able to provide data on these indicators during the rapid assessment. A more detailed description of the success factors and current results and benefits for these pledge countries is given in Appendix 2.

9.1.1 Progress summary: success factors

During the rapid assessment, the following success factor indicators were assessed: indicator 1: FLR-supportive policies, plans, strategies, and institutional arrangements; indicator 2: financial flows; indicator 3: restoration planning; and indicator 4: monitoring systems, frameworks and protocols. Due to time limitations and complexity, identifying financial flows was challenging, so most countries in this rapid assessment did not report on this indicator. For the other indicators most countries were able to provide some information (see Table 9.1).

Figure 9.1 Map of countries participating in rapid assessment: India, Uganda, Malawi, Kenya, Burundi, Côte d'Ivoire, the Democratic Republic of Congo, Mozambique, Cameroon, Ghana, Costa Rica, Guatemala and Colombia
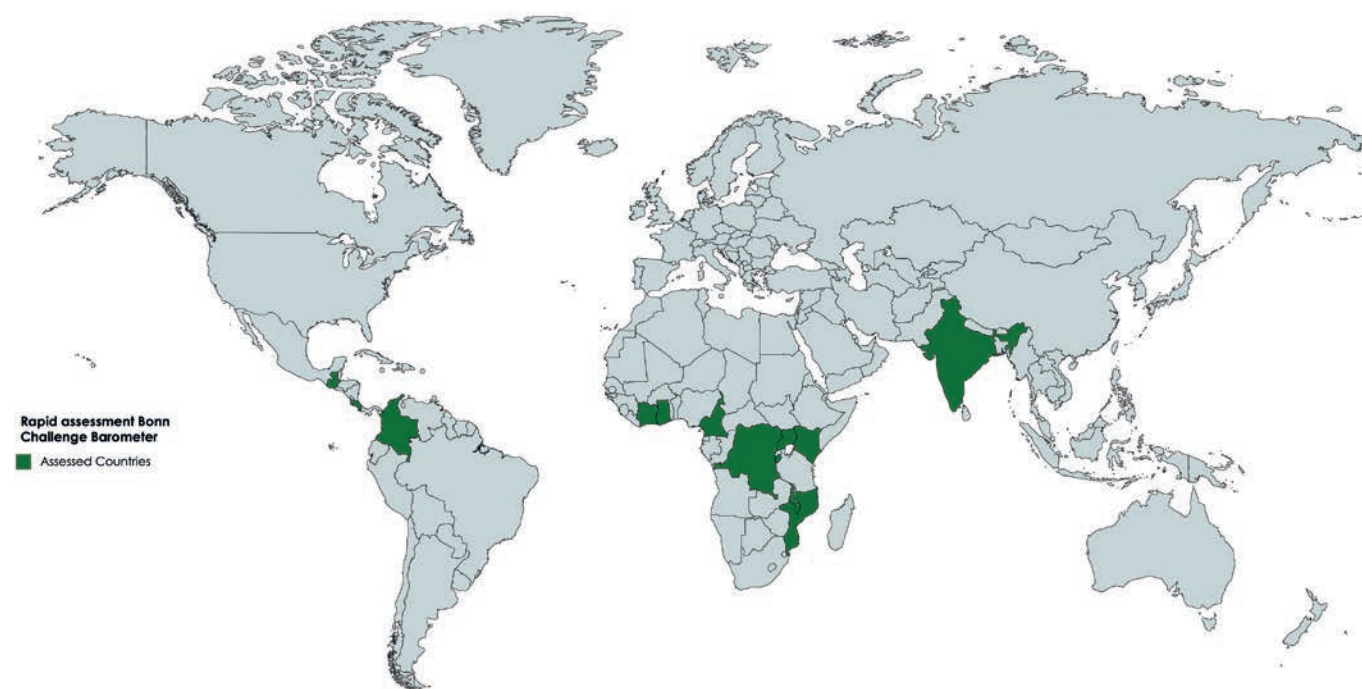
Table 9.1 Overview of data availability per success factor indicator per country (*yes* when data available, *no* when no data available or found at the time of the rapid assessment)

Country	Bonn Challenge pledge	Ind. 1: FLR policies, plans	Ind. 2: Financial flows	Ind. 3: Restoration planning	Ind. 4: Monitoring systems	Data source ***
Burundi	2.0 Mha (2015–2020)	Yes	No	Yes**	No	L
Cameroon	12.06 Mha (2017–2030)	Yes	No	–	Yes	L + O
Colombia	1 Mha (2014–2020)	Yes	No	Yes**	No	L
Costa Rica	1 Mha (2012–2020)	Yes	Yes*	Yes**	Yes	L + O
Côte d'Ivoire	5.0 Mha (2016–2030)	Yes	No	Yes	Yes	L
Democratic Republic of Congo	8.0 Mha (2014–2020)	Yes	No	Yes*	No	L
Ghana	2 Mha (2015–2030)	Yes	Yes	Yes**	No	P + L
Guatemala	1.2 Mha (2014–2020)	Yes	Yes*	Yes**	Yes	L + O
India	13 Mha (2015–2020) 8 Mha (2017–2030)	Yes	No	Yes	Yes	L + O
Kenya	5.1 Mha (2016–2030)	Yes	No	Yes	No	L
Malawi	2 Mha (2016–2020) 2.5 Mha (2016–2030)	Yes	No	Yes	Yes	P + L
Mozambique	1 Mha (2016–2030)	Yes	No	Yes**	No	L
Uganda	2.5 Mha (2014–2020)	Yes	No	Yes	No	L + O

* Only includes financial flows of FLR related to payment for ecosystem services (PES) and incentive schemes.
** Subnational ROAM report or ROAM under development.
*** Source of data: barometer protocol (P), literature review (L) or other (O). Other indicates that data were obtained by means different from application of the protocol or literature review, namely through IUCN regional officials and country focal points that were able to provide some data but did not fill in the protocol.

In most of these additional pledge countries, FLR commitments were made by the ministries responsible for land use and the environment. All countries have policies, laws and regulations that are pertinent to FLR implementation. These policies, laws and regulations on land, forests and other natural resources promote FLR and result in national strategies for FLR. Restoration planning in all countries, except Cameroon, has been undertaken through ROAM analyses facilitated by IUCN. Some plans are still under development or are currently only at the subnational scale. The ROAM country reports differ per country, nevertheless the reports conform in the identification of areas with restoration opportunities. These reports showed that, in most countries, monitoring and evaluation systems are not yet well developed or in place for FLR. In the following boxes each success factor indicator is highlighted and described for one country.

Box 9.1 Highlight indicator 1: FLR-supportive policies, plans, strategies, and institutional arrangements in Mozambique

Government institutions leading FLR implementation at national level are the Ministerial Council, Ministry of Land, Environment and Rural Development, and the National Directorate of Land and Forests. Of these, the latter has the mandate for policies and legislation, allocating large concessions, monitoring and law enforcement. The subnational ROAM report (IUCN, 2018d) lists the general findings that Mozambique has very good laws and policies that impact positively on restoration. However, there is limited or no law enforcement, and policies are not implemented. There is also a need for cross-institutional collaboration and harmonisation of strategies to enable efficiency and effectiveness at district and provincial levels. The government is operationalising the country's development through integrating plans such as the Action Plan for the Reduction of Absolute Poverty (PARPA), which ensure institutional coordination, the integration of all sectoral policies and programs, and geographical and thematic focus representativeness in order to achieve balanced sustainable development (Ministry for the Coordination of Environmental Affairs, 2014).

Box 9.2 Highlight indicator 2: financial flows in Ghana

Total domestic public expenditure on FLR in Ghana was US$ 10,613,545.52, which comprises the following cost elements: (i) government expenditure on the Youth in Afforestation Programme in 2018 (US$ 6,516,990.00); (ii) expenditure on other government-led forest plantation initiatives and procurement of tree seedlings between 2016 and 2018 (US$ 816,160); and (iii) Forestry Commission/Industry Plantation Fund revenue from 2016 to 2018 (US$ 3,280,395.52).* Although FLR is a priority national activity, the government is unable to commit more resources to it as a result of other equally pressing developmental needs.

Total private investment (including microfinance and impact investments) was US$ 16,895,460, which was estimated using a cost of US$ 1,750 per hectare for the establishment and maintenance of forest plantations established by private developers. Private investors prefer to undertake FLR activities in the High Forest Zone where access to large contiguous areas is becoming difficult. In addition, there are inadequate incentives to attract enhanced private sector investment in FLR.

Total international donor support (Ghana Investment Plan) was US$ 55,437,500. International donor support comprises: (i) total funds provided for implementation of the Forest Investment Programme in the Western and Brong Ahafo regions of Ghana (US$ 55,000,000); and (ii) expenditure incurred for the establishment of woodlots and green firebreaks under the Sustainable Land and Water Management Project (US$ 437,500). Although implementation of the programme has been largely successful, it has a limited scope as it is being implemented in only 2 out of the 10 administrative regions of Ghana.

Philanthropic and non-profit funding exists for FLR activities, but is highly insufficient or has not been made available. Currently, the activities of NGOs and civil society organisations are not well coordinated, whereas there are significant challenges in directly linking project activities being implemented by NGOs/civil society organisations to FLR, since many of these projects focus on general advocacy and safeguard-related issues.

*Exchange rate is based on Oanda's currency converter accessed at 11:15am on 13 November 2018 (US$ 1 = GHS4.84346).

Box 9.3 Highlight indicator 3: restoration planning in Kenya

In September 2014, the government of Kenya established a multi-stakeholder landscape restoration technical working group (LRTWG), led by the Kenya Forest Service, to carry out an assessment of potential restoration opportunities. The group identified the most pressing land-use challenges currently affecting Kenya, as well as a list of restoration options that could help address these challenges and restore the ecosystem services that are currently lacking. In addition, the LRTWG was tasked with mapping and quantifying where these different restoration options could potentially be implemented in order to help inform a national restoration target that will contribute to the many national priorities (IUCN, 2016). The process of producing the national forest and landscape restoration potential maps by the LRTWG and developing restoration commitment scenarios followed five steps, adapted from the ROAM mapping module (IUCN, 2016).

Box 9.4 Highlight indicator 4: monitoring systems, frameworks and protocols in Malawi

Malawi's monitoring evaluation framework focuses on measuring progress towards the goals and interventions outlined in the National Forest Landscape Restoration Strategy 2017. A total of 30 indicators form part of the framework, based on their relevance to national restoration and reliability of data collection, quality and ease of collation, and sensitivity of restoration to intervention. The framework provides the core indicator metrics, data sources and baseline data for monitoring progress on FLR in Malawi. Many of the core indicators and metrics are already being regularly collected as part of the National Statistical Office of Malawi's integrated household survey. Among the core indicators are: improve food security; increase energy resources; increase climate resilience; improve water quality and supply; conserve and restore biodiversity; ensure gender equity and equality; and alleviate poverty, as well as increase on-farm tree cover and the number of hectares of community forests and woodlots measured through remote sensing. Some of these indicators overlap with the Bonn Challenge Barometer indicators, therefore they can serve simultaneously as input for the protocol (IUCN and Ministry of Resources, Energy and Mining, 2017).

9.1.2 Progress summary: results and benefits

India, Uganda, Malawi, Cameroon, Ghana, Costa Rica and Guatemala were all able to provide data on the results and benefits from their FLR activities in the rapid assessment (see Table 9.2). While data were available for these countries, there was a difference in the quality and scale of the data provided. *Area under restoration* ranged from data on project scale (Uganda, Ghana, Costa Rica and Guatemala) to data on a subnational scale (India) and national scale (Malawi, Cameroon). The methodology for collecting this data ranged from remote-sensing techniques to field surveys, meaning that they are not directly comparable. The methodology used was not always reported by the country.

Climate impact, expressed in carbon dioxide sequestered, was a challenging indicator to report on for most countries. India, for example, has data available

on total carbon sequestered by its forests, but does not have the details on which proportion of this was sequestered through FLR activities. Quantifying this will be an exciting next step, not only for India but also for countries in the same position. *Biodiversity impact* was not reported in the rapid assessment, as this requires detailed spatial data for KBAs, FLR implementation and where they overlap; this could not be obtained for a rapid analysis. The *socio-economic impact* of FLR was also difficult to calculate or estimate at such short notice, and data were only reported by Ghana.

Table 9.2 Overview of the result and benefit indicators per country (only those countries that were able to provide data on FLR results during the rapid assessment are shown)

Country	Bonn Challenge pledge	Ind. 5: area (ha)	% of 2020 pledge imple-mented	% of 2030 (cumulative) pledges imple-mented	Ind. 6: Climate mitigation impact	Ind. 7: Biodiversity impact	Ind. 8: Socio-economic impact	Data source ****
India	13 Mha (2015–2020) 8 Mha (2017–2030)	9,810,944.2 ha	75.74%	46.72%	–	–	–	L + O
Uganda	2.5 Mha (2014–2020)	52,415.57 ha*	2.10%*	–	–	–	–	L + O
Malawi	2 Mha (2016–2020) 2.5 Mha (2016–2030)	125,000 ha	6.25%	2.78%	–	–	–	P + L
Cameroon	12.06 Mha (2017–2030)	1,663,117.88 ha**	–	–	237,097,828 tCO_2**	–	–	L + O
Ghana	2 Mha (2015–2030)	238,873.40 ha	11.94%	–	1,872,222.79 tCO_2	–	89,181 jobs created	P + L
Costa Rica	1 Mha (2012–2020)	3,031,115.9 ha***	303.11%***	–	–	–	–	L + O
Guatemala	1.2 Mha (2014–2020)	396,447.12 ha***	33.04%	–	–	–	–	L + O

Indicator 5: area under restoration; Indicator 6: climate impact; Indicator 7: biodiversity impacts; Indicator 8: socio-economic impacts.

* Uganda is still in the process of making an inventory of the area under restoration, therefore this figure only depicts a proportion of the actual area under restoration;
** Cameroon's pledge was made in 2017 and these figures show its FLR activities from 2004 to 2017;
*** Costa Rica's and Guatemala's figures only include information on FLR results from PES and incentive schemes. Furthermore, Costa Rica's figures include mostly agroforestry systems (accounting for 98.41% of the total current area under restoration).
**** Source of data: barometer protocol (P), literature review (L) or other (O). Other indicates that data were obtained by means different from application of the protocol or literature review, namely through IUCN regional officials and country focal points that were able to provide some data but did not fill in the protocol. For India this was Anushree Bhattacharjee (IUCN); Uganda, Bob Kazungu (Forestry Officer); Cameroon, Anicet Ngomin (MINFOF); Costa Rica, Leander Raes (IUCN); Guatemala, Leander Raes (IUCN).

10 Synthesis and conclusion

Previous chapters have shown how the application of the Bonn Challenge Barometer as a flexible and systematic framework has yielded a clear picture of tangible progress on FLR implementation and has helped to identify bottlenecks in achieving the targets set under the Bonn Challenge. The piloting process revealed the level of dedication of the jurisdictions in implementing FLR and meeting their Bonn Challenge commitments. In many cases, the Barometer also served as a catalyst for dialogue between different ministries, stakeholders and sectors. It has brought together institutions and actors to better understand what FLR activities are being implemented, what their impacts are, and how to more consistently and accurately report under various international commitments.

The process of piloting the Barometer in its first year has led to several insights and lessons learnt, which are useful for understanding the wider significance of the results reported here, as discussed below.

10.1 Accounting for diversity of FLR approaches, investments and scale of efforts

In most instances the Bonn Challenge pledge is made by a country, with some commitments made by associations and subnational governments. Substantial efforts were made to gather data and report a complete assessment of efforts on the ground from the landscape scale up to the scale of the pledge. However, challenges remain in comprehensively aggregating information from landscape level initiatives to adequately capture initiatives by farmers, communities and grassroots organisations. In addition, recording informal efforts or in-kind investments on private or communal lands, if these are not already captured in project documents or government databases, is challenging. The Mexico case study is a good example. Data providers should clearly articulate the process and timeframe for data collection carried out at the national scale and understand where such efforts are not or are poorly accounted for. Having national and subnational coordination committees composed of a diverse set of stakeholders including grassroots organisations, researchers, practitioners and officials is one way to reach a wider set of restoration actors. This will facilitate collection and aggregation of data from the landscape up.

The Barometer is useful in assessing and presenting different types of restoration interventions and their proportionate contributions to the overall target (see Figure 10.1 for relative proportions). For instance, it is evident from the pilot countries that silvicultural practices in degraded forests, followed by natural regeneration, account for the majority of FLR efforts, at 50% and 36% respectively. While agroforestry appears to be restricted to less than 1%, in fact, actions taken under watershed management and to reduce soil erosion overlap with agroforestry efforts (e.g. in Rwanda). Moreover, it is also the case that actual area planted is being reported in these instances, which is an underestimation of the total land area over which such FLR approaches may have an impact.

The distinction between different FLR approaches requires careful consideration and clear articulation. The *area under restoration* indicator in the protocol requests that jurisdictions list the types of FLR that have been implemented and, if data are available, specify how many hectares have been brought under restoration for each. The proposed seven FLR types in the Barometer reflect those delineated in ROAM guidance,[34] encompassing a very broad range of actively and passively managed systems. While there may be hundreds of unique types of FLR approaches, the types presented in ROAM are broad aggregations of these types. However, the definitions applied by jurisdictions may not always align with the FLR types proposed, and national forest definitions play an important role in how jurisdictions account for FLR activity. At the same time, the Barometer is reporting progress made in implementing FLR; thus, there is an implicit assumption that these efforts are respecting FLR principles.

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[34]   https://infoflr.org/what-flr/types-flr.

Figure 10.1 The relative proportions of different FLR intervention types in Brazil, El Salvador, Quintana Roo (Mexico), Rwanda and the USA
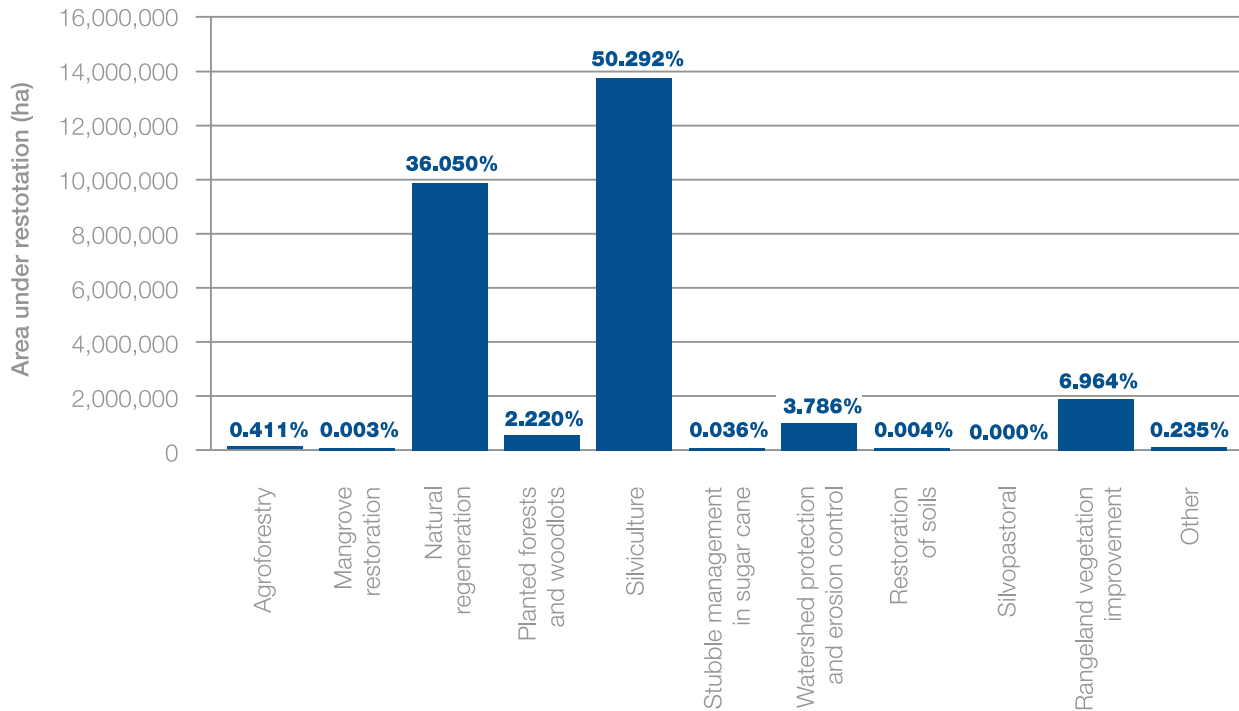
In addition, to get a complete picture of all efforts underway, further work is needed to clarify the specific meaning of "under restoration" and the area accounted as being under FLR implementation. A question often posed is whether land brought under restoration refers to the onset of an initiative, for example, area planted with seedlings, or to a mature restored area. Success rates vary in different habitats and climatic regions, and factoring this variable into reporting using the Barometer will help track and evaluate progress with a greater level of confidence over multiple decades. As with spatial scale, information on FLR efforts is strengthened if the start date of implementation on the ground is known. It will then be possible to assess costs and impacts for the multi-year to decadal timeframes over which restoration takes place.

The multidisciplinary and inter-sectoral nature of FLR is key for transforming landscapes, ensuring broad societal buy-in for restoration, but throws up challenges for monitoring. In the pilot application of the Barometer, diverse methods were used to capture the varied sources of information on restoration implementation, such as remote sensing, field surveys, national databases and project documents. Regular monitoring of restoration sites, for example through scientific advances in land-use or land-cover change monitoring developed in

Brazil under MapBiomas, can provide a blueprint for cost-efficient restoration tracking over multiple years and decades. Funding streams can be ongoing or one-off and the timeframes over which restoration takes place can affect the efficacy and impact evaluation.

Allocation of domestic funding to FLR has been impressive (see Figure 10.2), but in some cases the overall financial flows in support of FLR implementation are not enough, so the need remains for external investments and improved integration across sectors to access funding available for other sectors, such as the agricultural sector.

10.2 Technical planning and inter-sectoral coordination to enhance rate of implementation

Technical planning using ROAM has yielded a wealth of data, including through the calculation of estimated benefits from FLR providing methodologies and baseline information for Barometer application, such as in the case of El Salvador and Quintana Roo. The role of spatial prioritisation and technical planning in making progress is evident in the case of the USA, Rwanda and Brazil as well. At the same time, insufficient expertise in spatial

Figure 10.2 Relative proportions of the different funding flows supporting FLR planning, implementation and monitoring in Brazil, El Salvador, Quintana Roo (Mexico), Rwanda and the USA
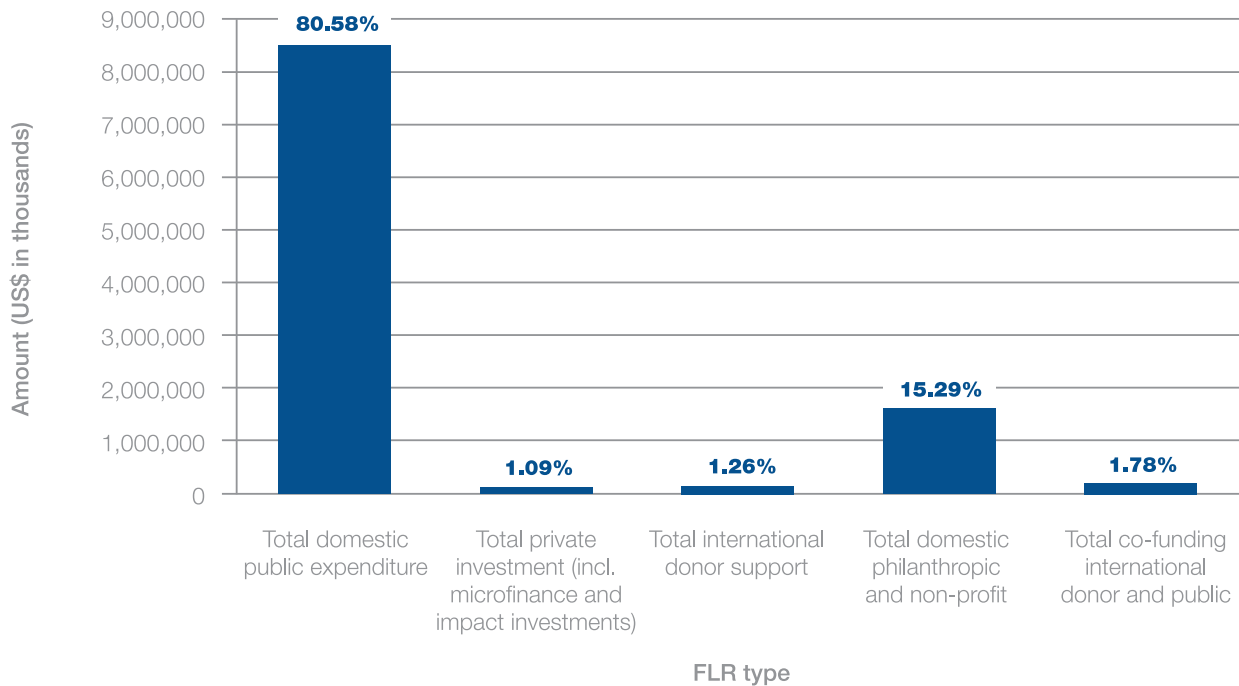
planning and implementation of restoration plans is flagged as a need by multiple pilot countries.

Cooperation mechanisms that enable cross-sectoral coordination are needed to enhance the rate of implementation and maximise the efficiency and outcomes of funding flows directed at restoration. An example of such a coordination is CONAVEG in Brazil, established with representation from multiple ministries, which is actively identifying financing to support implementation through the finance working group and reconciling different methods and information for monitoring restoration through the monitoring working group. Other examples include that of Rwanda, which in 2018 established a cross-sectoral task force with representatives of public, private and non-governmental organisations to accelerate progress towards its national commitment.

Bottlenecks to progress that need to be investigated further in this area include the level of engagement of the agricultural sector in restoration efforts, areas of weak cross-sectoral and scalar communication and cooperation, and integration of and/or raising awareness of how FLR approaches are already included in REDD+ strategies and within the NDCs under the Paris Agreement. Finally, there is a clear need to integrate the

outputs and reporting on FLR action from the Barometer with deforestation tracking as in many regions, the net balance of restoration versus deforestation is highly negative.

10.3 Assessing impacts of FLR implementation

10.3.1 Climate impacts

Currently under the Barometer the indicator of climate impacts is specifically focused on assessing the potential for CO_2 sequestered through FLR activities. While guidance was offered on quantifying climate mitigation benefits, these were not necessarily consistently estimated; Tier 2 methods with a moderate level of specificity and confidence were most often applied. In the coming years, countries will strive to fulfil NDC commitments, as well as recognise the COP24 outcome that all countries will have to report emissions every two years starting in 2024. This means that countries are likely to try to improve their carbon accounting practices, including for FLR activities.

10.3.2 Biodiversity impacts

The application of the Barometer in the countries piloting this tool has yielded useful insights into the level of restoration taking place in areas of conservation priorities, whether protected areas, KBAs or other areas of biodiversity importance as defined by the national context. As the Barometer tool evolves and consistent spatial data on where restoration is taking place becomes more available across the globe, analyses of biodiversity impacts are likely to become more specific. This will provide useful information on how different types of restoration actions are transforming previously degraded or deforested ecological corridors, protected areas and KBAs, and the timescales over which this transformation is occurring. In anticipation of accessing consistent spatial data on restoration efforts, the next steps to enhance the online Barometer portal include integration with existing and widely used biodiversity datasets (e.g. the World Database on Protected Areas) or tools such as the IBAT Alliance.

10.3.3 Socio-economic impacts

The Barometer reports on jobs created through the implementation of FLR aggregated over multiple projects across different landscapes in the pilot countries. The socio-economic impact of FLR approaches is an important indicator to measure and the pilot countries have used different methods. Owing to the difficulties in quantifying and defining the wide range of employment benefits that can arise from the multitude of activities associated with FLR (e.g. nursery maintenance, farm employment, tree planting), even where accounted for in pilot jurisdictions, this indicator was often evaluated using different methods. Some jurisdictions applied a modelling approach (e.g. El Salvador, Quintana Roo), whereas others relied on surveys (e.g. Rwanda). The outputs of these approaches for quantifying jobs resulted in different metrics, such as indirect and direct jobs, short-term and long-term jobs, as well as gender-disaggregated employment figures.

These experiences underscore the need for a consistent and feasible framework to assess the economic impacts of FLR approaches across different countries. IUCN is now working to develop a consistent framework to assess both jobs and induced economic impact from FLR actions. This framework will be tested and adapted to the diverse contexts found across the Bonn Challenge pledgers and ultimately offered as a means of reporting on this indicator.

Finally, the demand for applying the Barometer as a means to credibly track progress on FLR implementation continues to grow. Self-assessments allow more pledgers to participate; however, the need for capacity to record adequate data and analyse findings remains strong. Remote sensing technologies are rapidly evolving to detect the restoration of degraded areas or outside forested areas. Such spatially explicit monitoring of restoration over multiple years can contribute data to the Barometer and also serve to triangulate information received from secondary sources such as project reports. To allow for transparency in tracking restoration within a landscape and within a mosaic of land uses, and to detect leakage at the national scale, Bonn Challenge pledgers should prioritise spatially explicit information on restoration sites. Accessing and making this spatial data publicly available is part of ongoing efforts. Indeed the development and application of the Barometer has benefited from existing national monitoring systems, as in El Salvador and the USA, but has also catalysed efforts by governments in pilot countries to accelerate the establishment of national FLR monitoring systems, for example in Brazil, or enhance the type of monitoring taking place, as in Rwanda.

10.4 Future directions

This report is the first comprehensive assessment of FLR actions taken under the Bonn Challenge in various countries. The in-depth analyses underscore the prevalence of a diversity of restoration efforts underpinning FLR interventions, with silviculture and natural regeneration dominating. Thus, claims that the preponderance of landscape restoration efforts under the Bonn Challenge are simply focused on plantations are refuted by the evidence presented here. As 2020 approaches, several steps are needed to expand and strengthen reporting on Bonn Challenge commitments. These include:

- Applying the Barometer in additional countries, making it possible for all pledgers to participate by 2020 in rapid assessments, including data collection using the online tool, supplemented by additional research and adequate analysis and validation of information.
- Training in applying the Barometer framework and using the online tool, together with providing sensitisation workshops and consultations at the subnational, national or regional levels.
- Supporting countries to better disaggregate data into FLR intervention types and providing standards,

where needed, to spatially represent these. This includes capacity building on spatial analysis and mapping, and enhancing spatial data capture and synergies with other formats for participating countries.

- Development and application of a systematic economic assessment framework within the Barometer to more robustly measure jobs and economic growth attributable to the implementation of various FLR approaches.
- Applying specific indicators in greater depth at different scales to identify trends, opportunities and challenges, e.g. on the role of FLR interventions in supporting economic growth, biodiversity and climate benefits, and analysing in depth the bottlenecks that emerge. This includes continuing the development and refinement of (shared) methods for understanding the contribution of FLR activities to NDC activities, e.g. CO_2 removal, GHG accounting for FLR guidance, etc.
- Sharing good models of (sub)national monitoring systems for FLR, as in El Salvador, and identifying means for better capturing progress being made by communities, farmers, role of women and private sector entities in FLR implementation, which might not come up when looking at project documents and/or government databases.
- Identifying means for verification on the ground and triangulating results over the long term, in cooperation with partners working to advance remote sensing applications for FLR monitoring.

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Appendix 1 Policies, plans, strategies and institutional arrangements

Table A1.1 Brazil

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
Ministry of the Environment (MMA)	Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm)	2004	Targets the continual and consistent reduction of deforestation, and shapes and creates the conditions for a model of sustainable development in the Amazon.
	The National Policy on Climate Change (Law N° 12, 187, 2009)	2009	Officialises Brazil's voluntary commitment to the UNFCCC to reduce GHG emissions by 36.1%–38% (9% of projected emissions) by 2020.
	Native Vegetation Protection Law (LPVN) (Law 12.651/2012)	2012	Establishes general norms for: - the protection of native vegetation, including APPs, RLs and restricted use; - forestry, the supply of forest raw materials, the control of forest products, the control and prevention of forest fires; - the provision of economic and financial instruments for achieving these goals.
	Rural Environmental Registry SICAR (Law No. 12.651/2012, regulated by Decree N° 7,830/2012 and Decree N° 8.235/2014)	2012	The registry is a nationwide electronic public record that is mandatory for all rural properties in order to integrate environmental information for rural properties in terms of the status of APPs, RLs, forests and remnants of native vegetation, areas of restricted use and consolidated areas. It is therefore a database for environmental control and monitoring, economic planning, and combating deforestation.
	South–South Experience Exchange Initiative on Climate Change and Forests	2013	Draft version under evaluation of a South–South Cooperation in Climate Change and Forests to be created as an MMA ruling.
	Nationally determined contribution (NDC)	2015	Brazil's NDC to the Paris Agreement was presented in 2015; the country assumed the compromise of promoting a reduction in its GHG emissions by 37% below 2005 levels by 2025. Furthermore, it indicated a subsequent reduction of 43% below 2005 emission levels by 2030.

Table A1.1 Continued...

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
Ministry of the Environment (MMA)	National Biodiversity Strategy and Action Plan (NBSAP)	2016	Presents the Brazilian contribution to the achievement of CBD Aichi Biodiversity Target 17, which established that each state party should develop, adopt as a political instrument, and begin implementing an effective, participatory and up-to-date national biodiversity strategy and action plan.
	National Policy for the Recovery of Native Vegetation (PROVEG) (Decree Nº 8.972/2017)	2017	PROVEG aims to articulate, integrate and promote policies, programmes and actions to induce recovery of forests and other forms of native vegetation and to boost the environmental regulation of Brazilian farms.
	National Plan for Native Vegetation Recovery (PLANAVEG)	2017	Main instrument of implementation of PROVEG; was released by the Interministerial Ordinance No. 230/2017.
Brazilian Institute of Environment and Renewable Natural Resources (IBAMA)	National System for the Control of the Origin of Forest Products (SINAFLOR)	2014	Integrates control of the origin of wood, charcoal and other forest products or by-products, under the coordination, supervision and regulation of IBAMA.
	Decree No 9.179/2017 regulated Federal Law N° 9.605/1998 – § 4	2017	A single fine can be converted into conservation services, to enhance and restore the quality of the environment.
Ministry of Agriculture Livestock and Food Supply	MAPA 17/2017	2017	Regulates the production, trade and use, whether environmental or medicinal, of the seeds and seedlings of native and exotic forest species, in order to guarantee their origin, identity and quality.
	Improvement of Plano Safra	2018	Changed the rules to include the payment of inputs used for recovery of set-aside areas (RLs and APPs) and increase the whole financial amount available for the low-carbon agriculture programme and climate-smart agriculture.
Ministry of Planning, Development and Management	Decree for Sustainable Public Purchases	2017	Established criteria, practices and guidelines for the promotion of national sustainable development in hiring carried out by the direct federal public administration, autonomous agencies and foundations, and dependent state enterprises. Also established the Interministerial Commission for Sustainability in Public Administration.

Table A1.2 El Salvador

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
Ministry of Environment and Natural Resources (MARN)	National Ecosystem and Landscape Restoration Program (PREP)	2012	Within PREP, FLR is described as a means to adapt to climate change, foster rural development and ultimately achieve climate change mitigation.
	National Action Plan for the Restoration of Ecosystems and Landscapes	2017	Describes the techniques and areas prioritised through the application of ROAM.
	Institutional Strategic Plan	2014	As part of its five-year strategic plan, MARN has set a goal of restoring 300,000 ha by the end of 2019 (Specific activity 1.2.3).
	National Biodiversity Strategy and Action Plan (NBSAP)	2013	Two of the three axes of the NBSAP relate directly to FLR. The first axis describes how biodiversity could be integrated in the economy through improved agricultural practices such as agroforestry, silvopastoral systems and the green harvest of sugar cane. The second axis outlines the restoration and conservation of critical ecosystems (riparian forest, mangrove, coastal ecosystems).
Ministry of Agriculture and Livestock (MAG)	Institutional Strategic Plan	2014	MAG aims to promote the restoration of priority ecosystems, riverbeds and forests, and enhance sustainable agriculture to create integrated biological corridors.
	National Forestry Policy	2017	FLR activities linked to good agricultural practices and afforestation/reforestation activities should be supported by MAG to improve the resilience of farming systems and achieve climate change mitigation.
	National Strategy for Watersheds Management	2017	Includes promoting FLR activities such as reforestation, improved irrigation and soil management practices in aquifer recharge zones and dry regions.
	National Forestry Strategy	2017	Five activities directly relate to FLR: (1) managing financial resources to implement forest restoration projects; (2) establishing forestry incentives; (3) promoting forest conservation; (4) fostering agroforestry and commercial plantations; and (5) supporting the setting up of forest communities and non-profit associations that would implement reforestation and forest conservation (Actions 13, 16, 19, 17 and 21, respectively).
	National Policy on Climate Change for the Agriculture, Forestry, Fishery and Aquaculture Sectors	2017	Fostering FLR activities such as conservation agriculture and stubble management instead of burning staple grain is part of the proposed activities to achieve this objective (Actions 4 and 5, respectively).
National Council for Environmental Sustainability and Vulnerability (CONASAV)	The Sustainable Salvador Plan	2018	In relation to FLR, this plan set two targets: restoring 10,000 ha of mangrove forest by 2019 and 250,000 ha of degraded land by 2020.

Table A1.3 Quintana Roo, Mexico

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
Government of Mexico	National Development Plan (PND)	2013	The link to FLR is provided by Objective 4.4: "Promoting socially inclusive green development to preserve Mexico's natural heritage and generating wealth, competitiveness and employment".
Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) and the Intersecretarial Commission for Sustainable Rural Development (CIDRS)	Special Concurrent Programme for Sustainable Rural Development 2014–2018 (PEC)	2014	Multisectoral programme promoting sustainable rural development through the cooperation of several government institutions (Secretariat of Environment and Natural Resources – SEMARNAT, SAGARPA, the Secretariat for Social Development – SEDESOL, and the Secretariat for Agrarian, Land and Urban Development – SEDATU, among others). The relation to FLR is defined by Objective 3: "Implementing an integral development policy promoting the sustainable management of natural resources" and Objective 4: "Increasing productivity for ensuring food security".
SEMARNAT	Environment and Natural Resources Sectoral Programme (PROMARNAT)	2013	Provides the legal basis for setting up federal funding for sustainable forest development in the form of subsidies distributed through the National Forestry Commission (CONAFOR).
	National Climate Change Strategy	2013	National inter-sectoral framework action strategy on climate change. The relevance to FLR is provided by Objective M4: "Promoting agricultural, livestock and forestry best practices for increasing and preserving carbon stocks".
	Special Climate Change Programme (PECC)	2014	Defines strategic actions related to mitigation and adaptation to implement the National Climate Change Strategy aligned with the environmental objectives contained in the PND 2013–2018.
National Commission on Natural Protected Areas (CONANP)	Conservation Programme for Sustainable Development (PROCODES)	2009	A subsidy programme that promotes the conservation of ecosystems and their biodiversity in Mexico's protected areas by funding sustainable activities within them.
CONAFOR	ProÁrbol	2011	Comprehensive programme promoting actions for the conservation, restoration and sustainable use of Mexico's forests.
	Forestry Strategy Programme 2025 (PEF)	2001	Sets out objectives, strategies and priority actions to guide the long-term planning (to 2025) of the federal government on the development of sustainable forestry in Mexico, as well as providing a framework for the development of forestry strategies at the state level.
	CONAFOR's Institutional Programme 2014–2018	2014	Establishes, over a five-year period, strategies, programmes and lines of action for CONAFOR for implementing the PND and PROMARNAT in the forestry sector. Defines three categories of intervention and activity: (1) conservation and restricted use of natural resources; (2) production; and (3) restoration.

Table A1.3 Continued...

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
CONAFOR	National Forestry Programme (PRONAFOR)	2014	Represents the main operational instrument for the implementation of CONAFOR's Institutional Programme. It is the primary vector for channelling public funds towards FLR and other activities related to sustainable forest development through the Mexican Forest Fund.
	Environmental Compensation Programme for Land Use Change in Forest Land (CUSTF)	2001	A mechanism that compensates for a change of land use (authorised by SEMARNAT) in forest land with restoration activities over a larger area somewhere else.
	Special Program for the Conservation, Restoration and Sustainable Management of Natural Resources in the Yucatán Peninsula (PEPY)	2012	The programme's objectives were to address the drivers of deforestation as well as the degradation of forest ecosystems in the Yucatán Peninsula.
	ENAREDD+ National REDD+ Strategy 2017–2030	2017	Sets out strategies that simultaneously promote mitigation and adaptation measures for climate change through integrated territorial management for scaling up low-carbon rural development.
Secretary of Ecology and the Environment (SEMA)	State Action Programme on Climate Change of Quintana Roo (PEACCQROO)	2013	Seeks to determine actions in relation to climate change, as the country has been identified as extremely vulnerable (especially to hydrometeorological events).
	Ecological Territorial Planning Programs for Quintana Roo State (POET)	Several years from 2000	These programmes seek to promote economic dynamism in the state, securing tourism as the economic axis driving development that generates ecologically responsible economic processes. Restoration is a relevant component of the programme as it leads to conserved sites with attractive scenery for tourism.
	Quintana Roo's Environment and Sustainability Sectoral Program 2016–2022	2016	Defines the main actions to be carried out during the present state administration. FLR is particularly relevant in those addressing territorial planning; biodiversity; protected areas; climate change; sustainability of water and soil, among others.
SEMA and CONAFOR	Reduction Emission Initiative's Investment Program for Central and Southern Quintana Roo	2016	Quintana Roo's Forest Carbon Partnership Facility investment programme identifies the activities to be carried out within the selected REDD+ early action areas in the state: these aim to reduce deforestation and degradation, and promote local development and the sustainable use of natural resources, generating synergies among inter-sectoral government programmes in order to promote long-term impacts and sustainability of the investment programme.
SEMA (for Quintana Roo), Yucatán's state government (SEDUMA), Campeche's Secretariat for the Environment and Natural Resources (SEMARNATCAM)	Yucatán Peninsula Framework Agreement on Sustainability for 2030 (ASPY 2030	2016	Incorporates the Bonn Challenge restoration pledges of the three states, reiterating the goal of restoring 2 Mha of degraded land in the region by 2030, including the sustainable intensification of agricultural production, sustainable livestock production, and reforestation and restoration actions in degraded forests.

Table A1.4 Rwanda

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
Government of Rwanda	The Constitution of the Republic of Rwanda of 2003, revised in 2015	2015	Clearly provides the binding legal framework that is linked to FLR. Article 22: "Right to a clean environment": everyone has the right to live in a clean and healthy environment. Article 53: "Protection of the environment": everyone has a duty to protect, safeguard and promote the environment". It also indicates that the state should ensure the protection of the environment.
Ministry of Agriculture and Animal Resources (MINAGRI)	National Horticulture Policy	2014	The national horticulture policy promotes fruit tree planting by establishing incentive mechanisms, strengthening value chains and developing markets for horticulture products. In particular, it promotes the establishment of village nurseries for fruit trees.
	National Agriculture Policy	2018	Sets the basic principles and key strategic approaches followed by the agricultural sector in the country. It proposes to concentrate research efforts on tree/crop/soil interfaces and to develop suitable models and technologies to increase agroforestry; and to focus on domestic production and multiplication of quality planting materials in order to increase seedlings for agroforestry trees. It also encourages the use of a wide range of cost-effective erosion control solutions, such as agroforestry.
	Strategic Plan for the Transformation of Agriculture 4 (PSTA 4) 2018–2024	2018	Most Rwandan land is used for agriculture. As such, most FLR interventions are conducted on agricultural land or in agro-ecosystems. In its Priority Area 2, PSTA 4 emphasises an increased agricultural productivity and resilience that includes many FLR-compatible elements such as soil conservation and agroforestry. Its key strategies include: climate-smart agriculture, water conservation, and soil fertility management, erosion control and soil management.
Ministry of Disaster Management and Refugee Affairs (MIDMAR)	National Disaster Management Policy	2012	This policy identified landslides, mudslides and drought to be among the main issues that threaten people and the environment. With the Ministry of Environment as a co-lead, it recommends the promotion of afforestation programmes, the use of appropriate farming technologies and land-use practices, and the protection of water catchments.
Ministry of Environment	Green Growth and Climate Resilience Strategy (GGCRS)	2011	Formulates a programme of action for sustainable forestry, agroforestry and biomass, among others. It recognises that Rwanda does not have the land available to expand its forests and plantations, yet the majority of the population depends on wood for cooking and will continue to do so until electricity is available and affordable for all. Agroforestry will thus provide wood for fuel and social protection while avoiding deforestation.
	Rwanda Biodiversity Policy	2011	It considers the rehabilitation of degraded ecosystems in Rwanda as an urgent and major task that requires the commitment of significant resources from national budgets and other sources.

Table A1.4 Continued...

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
Ministry of Environment	National Policy for Water Resources Management	2011	One of the statements of this policy is that "water resources of Rwanda will be conserved, protected and managed in order to secure and enhance its availability for, and utility to, the present and future generations". To operationalise this, the policy sets out actions, among which the following are relevant to FLR: (1) to formulate a water resources management strategy addressing, for example, watershed protection and to provide mechanisms for the designation of special conservation and/or protection zones; (2) the development and promotion of best practices of efficient and appropriate watershed management (which include agroforestry) to maximise water yields and quality.
	National Strategic Plan for the Environment and Natural Resources Sector 2014–2018	2013	Particular attention is given to climate change management, rehabilitation of degraded ecosystems and watersheds, mainstreaming of environmental conservation into all development activities, consolidation of decentralised governance and participatory service delivery, and promotion of regional integration.
	National Biodiversity Strategy and Action Plan (NBSAP)	2016	Seeks to improve environmental stability for natural ecosystems and their biodiversity; restore degraded ecosystems and maintain equilibrium among biological communities; establish an appropriate framework for access to genetic resources and equitable sharing of benefits arising from biodiversity use and ecosystems services; and improve policy, legal and institutional frameworks for better management and conservation of national biodiversity.
	National Environment and Climate Change Policy	2018	Aims to promote the conservation, preservation and restoration of ecosystems and the maintenance of ecological and systems functions. Proposed actions include: regularly conduct an inventory of degraded ecosystems and prepare restoration development plans; promote afforestation and reforestation of critically degraded and residential areas; establish a statutory national coordination framework for the management of critical ecosystems.
Ministry of Finance and Economic Planning (MINECOFIN)	Rwanda Vision 2020 (revised)	2012	Vision 2020 puts in place policies and strategies to mitigate the impact of climate change by focusing on developing and promoting eco-friendly policies and strategies in all sectors of the economy and green growth that are, to some extent, in line with FLR.
	Economic Development and Poverty Reduction Strategy 2013–2018 (EDPRS II)	2013	The framework for achieving Vision 2020 and SDG goals. Achieving sustainable economic growth in Rwanda will require the prudent use of natural resources and ensuring that climate resilience is built into economic planning. Priority areas for environment and climate change linked to FLR are: mainstreaming environmental sustainability into productive and social sectors; and reducing vulnerability to climate change.

Table A1.4 Continued...

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
Ministry of Infrastructure (MININFRA)	National Urbanisation and Rural Settlement Sector Strategic Plan (2012/13–2017/18)	2012	Highlights the importance of environmentally sustainable and natural resource-saving principles in the construction industry.
	National Energy Policy	2015	Its main objective is to facilitate fuel switching from traditional biomass energy carriers towards modern biomass energy technologies and cleaner fuel alternatives in order to achieve a more sustainable wood fuel balance and to deliver environmental benefits. Existing biomass resources should be exploited in a manner that promotes greater sustainability of supply, while reducing the negative impacts of harvesting on the environment and Rwandan landscapes.
	National Urbanization Policy	2015	The rationale of the National Urbanization Policy includes the promotion of intensifying cost-effective public investment and reserving land for agricultural production, open spaces and conservation of the environment.
	Energy Sector Strategic Plan 2013/14–2017/18	2015	This is an implementation plan for the national energy policy. The overarching biomass sub-sector policy objective is to promote environmentally sustainable use of biomass fuels, thereby mitigating negative environmental, social and health impacts. As the economy develops, the strategy aims for alternative clean cooking stoves and technologies, such as biogas, LPG and peat briquettes, to displace unsustainable, traditional biomass fuels over time.
	National Biomass Energy Strategy (BEST)	2018	Will guide the national effort to transition to modern and efficient biomass energy sources and will propose many interventions that will help resolve cooking energy issues while preserving soil productivity and curbing the destruction of natural ecosystems.
Ministry of Lands and Forestry (MINILAF)	Rwanda National Forestry Policy	2018	This is the leading policy for FLR. Its vision is to manage forest resources so that they play an integral role in supporting Rwanda's goal to achieve sustainable, low-carbon and climate resilient development to improve the livelihoods of present and future generations. Its overall objective is to define, in concise statements, government's medium- to long-term intentions for the development and management of national forest resources.
	National Land Policy	2018	This policy calls for appropriate efforts in land demarcation while taking into account emerging socio-economic needs. It encourages systematic implementation of soil and water conservation measures to avoid risks related to land degradation and the depletion of soil nutrients. It also proposes the development of a regulatory framework for the reclamation, rehabilitation, restoration and use of reclaimed land. This policy stresses that agroforestry should be part of the agricultural landscape on hillsides, given that it contributes to soil protection.

Table A1.4 Continued...

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
Ministry of Lands and Forestry (MINILAF)	Forest Sector Strategic Plan (FSSP) 2018–2024	2018	An implementation plan for the National Forestry Policy. The following are the FSSP's objectives: (1) The capacity of forest institution and actors will be enhanced to match the requirements for sustainable forest management; (2) sustainable forest management will be ensured through the establishment and implementation of integrated forest management plans at all levels; (3) the private sector will be encouraged to increase its investment in the forestry sector; (4) appropriate regulatory instruments will be developed and implemented to ensure a sustainable and efficient biomass supply; (5) biodiversity and ecosystems services and values will be enhanced in accordance with national and international agendas; (6) the active participation of stakeholders in sustainable forest management will ensure ownership and proper benefit sharing; (7) the adoption of agroforestry and trees outside forests (TOF) techniques will be enhanced to contribute to overall forest resources and agricultural productivity.
	Agroforestry Strategy and Action Plan 2018–2027	2018	Developed to promote leadership and synergies in agroforestry and engage coordinated action and implementation. It identifies needs and priority actions to develop and implement agroforestry in all the agro-ecological areas and land-use systems of the country.
	National Tree Reproductive Materials Strategy 2018–2024	2018	Aims for a sustainable supply chain of high-quality seeds, which involves complementary models that consider the needs of each stakeholder according to agro-bioclimatic planting zones. Multi-stakeholder cooperation will create a unified system capable of meeting national and local seed needs.
Ministry of Trade and Industry (MINICOM)	Rwanda Wildlife Policy	2013	Recognises that protected areas significantly contribute to the production of global public goods and services, such as the protection of biodiversity, climate stabilisation, carbon sequestration and global waters. It proposes to increase the protected area system to at least 10% of the national territory by diversifying ownership and management regimes.
	Rwanda Protected Area Concessions Management Policy	2013	This policy seeks to lay the foundations for increased competence and expertise in the domestic private sector through concessions to increase the productivity of tourism in protected areas, as well as providing revenues to the government. It recognises that protected areas will continue to be managed in accordance with the fundamental purpose of conserving their wildlife and natural resources.
Ministry of Youth (MINIYOUTH)	National Youth Policy	2015	Recognises the leadership of youth in improving the environment and promoting sustainable use of national resources for socio-economic development.

Table A1.4 Continued...

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
Office of the Prime Minister (PRIMATURE)	7 Years Government Programme: National Strategy for Transformation (NST 1)	2017	NST 1 integrates global and regional commitments by embracing the SDGs (in this case Goal 15, which deals with the protection, restoration and promotion of the sustainable management of forests, and Goal 13, which deals with the sustainable management of forests, combating desertification, halting and reversing land degradation, halting biodiversity loss). The aim is to mainstream the Paris Agreement and be consistent with the African Union Agenda 2063 (Africa We Want), which is a "global strategy to optimise use of Africa's resources for the benefits of all Africans".

Table A1.5 USA

Implementing institution	Name of policy, plan or strategy	Year enacted	Policy, plan or strategy and relation to FLR
USDA Forest Service (USFS)	Title IV the Omnibus Public Land Management Act of 2009 (P.L. 111-11)	2009	While there has been substantial implementation of its policies and strategies, technical and staff capacity vary across the 155 units of the NFS and with its partners on non-federal land. This leads to variation in the quality of restoration treatments completed. The USFS has been successful in meeting its Bonn Challenge pledge and has a monitoring strategy; it has improvements it wants to make in its monitoring and in the strategic placement of its restoration treatments to address the highest risks.
	The Agricultural Act of 2014	2014	
	The 2012 Planning Rule (36 CFR 219)	2012	
	Forest Service Ecosystem Restoration Policy (Forest Service Directives FSM 2020)	2016	
	The Fire Suppression Funding and Forest Management Provisions of Titles III and IV of the Consolidated Appropriations Act, 2018	2018	

Appendix 2 In-depth additional country descriptions

Table A2.1 Overview of countries' restoration commitments, status of technical planning, hectares currently under restoration* and estimated carbon sequestered**

Country	Bonn Challenge pledge in millions of hectares (Mha) and time frame	ROAM (available, scale, year published)
India	13 Mha (2015–2020) and 8 Mha (2017–2030)	Subnational + national; 2018
Uganda	2.5 Mha (2014–2020)	National; 2016
Malawi	2 Mha (2016–2020) and 2.5 Mha (2016–2030)	National; 2017
Kenya	5.1 Mha (2016–2030)	National; 2016
Burundi	2.0 Mha (2015–2020)	Subnational; under development
Côte d'Ivoire	5.0 Mha (2016–2030)	National; 2016
Democratic Republic of Congo	8.0 Mha (2014–2020)	Subnational; under development
Mozambique	1 Mha (2016–2030)	Subnational; under development
Cameroon	12.06 Mha (2017–2030)	No report
Ghana	2 Mha (2015–2030)	National; under development
Costa Rica	1 Mha (2012–2020)	National; under development
Guatemala	1.2 Mha (2014–2020)	Subnational; under development
Colombia	1 Mha (2014–2020)	Subnational; 2018

* Not all countries in this assessment were able to provide data on these indicators in time, however FLR is being implemented in these countries.
** This was before the Bonn Challenge pledge of Cameroon (2017).

India

Bonn Challenge pledge and context

India's Bonn Challenge pledge to bring 13 Mha of degraded land under restoration by 2020, and an additional 8 Mha by 2030, was announced in 2015. In making this commitment to the Bonn Challenge, the contributions of restoration to "mitigation based on adaptation", as well as biodiversity conservation, improving livelihoods, ecosystem services and disaster resilience were all highlighted. The following paragraphs describe success factors, and results and benefits in realising India's Bonn Challenge commitment.

Success factor: policy frameworks, institutional arrangements, financial commitments

Many policies, laws and regulations in India have been established for the promotion of FLR implementation, namely: the National Forest Policy 1988, National Agroforestry Policy 2014, Wildlife Protection Act 1972, Forest Conservation Act 1980, Forest Rights Act 2006, and the Compensatory Afforestation Fund Management and Planning Authority Act (CAMPA) 2016. Furthermore, multiple government-led programmes aim to contribute to India's FLR activities, such as the: National Bamboo Mission, National Green Highway Mission, National Mission for a Clean Ganga, and the National Afforestation Programme (and the National Mission for a Green India). The Forest Department of India has working plans for the management of territorial forest divisions and management plans for protected areas; these are usually formulated for a decade. While the National Action Plan on Climate Change of 2008 has already been developed, the government of India also has a National Working Plan Code (2014) for formulation of future plans.

In the forestry sector, institutions such as the Forest Survey of India (FSI), National Remote Sensing Centre and Department of Land Resources have the task of monitoring forest resources. FSI has been collecting data on forest cover, the forest stock volume, and the trends of changes in the stocking of forest lands. From 1995 to the present, the FSI has been using Indian Remote-Sensing Data (LISS II, LISS III and AWiFS) for assessing forest resources and carbon stocks. Commonly, satellite images with 23 m or 30 m resolution have been used to assess the forest cover and forest types in India (Ministry of Environment, Forest and Climate Change, 2015). The Development and Planning Department is the nodal department for monitoring the Prime Minister's 20-Point Programme (TPP), a nationally implemented programme. The Ministry of Statistics and Programme Implementation, is the nodal department at the centre. The basic objective of the TPP is to eradicate poverty and to improve the quality of life of the poor and underprivileged population of the country.

Success factor: technical planning and preparation

Assessment of landscape restoration opportunities has been conducted thoroughly for the state of Uttarakhand, through IUCN's ROAM method, in 2018. Scaling this ROAM assessment up to national level would help identify the restoration opportunity for all states.

Results and benefits

In total 9,810,944.2 ha were brought under restoration across India (from 2011 to 2016/17). Of the total restoration efforts carried out across the country, 94.4% (9,264,976 ha) was by government agencies, 3.6% (352,667.9 ha) by NGOs and 2% (193,290.3 ha) by private companies.

As noted, the results and benefits presented here are illustrative and not intended as a total figure for the area under restoration in India, or a comprehensive report of all progress made in the jurisdictions enacting restoration initiatives.

Uganda

Bonn Challenge pledge and context

Uganda's Bonn Challenge and AFR100 pledge to bring 2.5 Mha of degraded land under restoration by 2020 was announced in 2014 by the Ministry of Water and Environment, and is supported by the Forest Sector Support Department.

Success factor: policy frameworks, institutional arrangements, financial commitments

The policy environment in Uganda is supportive, although implementation has been a challenge for most responsible agencies due to various structural and fiscal bottlenecks (IUCN & Ministry of Water and Environment, 2016). Uganda has an adequate policy framework relevant to FLR. The Vision 2040 framework

observes the need to address the increasing rate of landscape degradation and recommends restoration back to the 1990 target of 24% of forest cover. This is supported in other frameworks, such as the National Development Plan II, and policies such as the National Land Policy (2013), National Land-Use Policy (2007), Forestry Policy (2001), Agricultural Policy (2011), and the Draft Rangeland Management and Pastoralism Policy (2014) (IUCN & Ministry of Water and Environment 2016). Uganda has prioritised forest restoration as envisaged in existing targets provided in Vision 2040 and subsequent National Development Plans (I & II), as well as the National Forestry Plan (2011/12–2021/22). The primary target is to restore forest cover from the current 9% to a national target of 24% (IUCN & Ministry of Water and Environment 2016).

Success factor: technical planning and preparation

Uganda's National Biodiversity Strategic Action Plan will be monitored at different levels and intervals with the full involvement of different stakeholders. The National Environment Management Authority (NEMA) will coordinate monitoring and evaluation of NBSAP II with the support of the TCBC. NEMA should take responsibility to compile these reports received from stakeholders to produce an annual state of biodiversity report, which will provide a baseline of implementation and serve as a guide for future strategic planning (National Environment Management Authority, 2016). Through IUCN's landscape classification ROAM areas of priority were identified. This classification was validated and subsequently recommended for adoption by the technical workshop on development of the REDD+ National Baseline Scenario (reference emission level and/ or forest reference level – FREL/FRLs) and the National Forest Monitoring System.

Results and benefits

Uganda's Forest Department, Ministry of Water and Environment, reported that in total 52,415.57 ha have been restored through FLR interventions. Uganda is still in the process of making a complete inventory of the area under restoration, therefore this figure only depicts a proportion of the actual area under restoration. Types of implemented FLR range across restoration, afforestation, enrichment planting, commercial tree planting and agroforestry.

Malawi

Bonn Challenge pledge and context

Malawi's Bonn Challenge and AFR100 pledge to bring 2 Mha of degraded land under restoration by 2020, and an additional 2.5 Mha by 2030, was announced in 2016. In making this commitment to the Bonn Challenge, the contributions of restoration to "mitigation based on adaptation", as well as biodiversity conservation, improving livelihoods, ecosystem services and disaster resilience were all highlighted. The following paragraphs describe success factors, and results and benefits, in realising Malawi's Bonn Challenge commitment.

Success factor: policy frameworks, institutional arrangements, financial commitments

Many policies, laws and regulations in Malawi are pertinent to FLR implementation. These policies and regulations on land, forests and other natural resources have informed the Forest Landscape Restoration National Strategy and Action Plan, and analysis of associated institutional and policy challenges will assist improved coordination across sectors and policy frameworks. Key policies and other frameworks such as the National Resilience Strategy 2018, National Biodiversity Strategy and Action Plan II 2015, National Climate Change Investment Plan 2015, National Climate Change Policy 2012, National Charcoal Strategy 2017, Malawi National Agriculture Policy, 2010, and the National Agricultural Investment Plan 2018 all support FLR activities and implementation.

Success factor: technical planning and preparation

To operationalise its commitment, Malawi's Ministry of Natural Resources, Energy and Mining applied ROAM in collaboration with IUCN (2017), as well as the Land Degradation Neutrality Target Setting Programme, across all districts to identify priority areas for restoration and the interventions most suited to local socio-economic and ecological conditions. Malawi's monitoring evaluation framework, applied by the Department of Forestry, focuses on measuring progress towards the goals and interventions outlined in the National Forest Landscape Restoration Strategy 2017. Thirty indicators form part of the framework, and some provide the core indicator metrics, data sources and baseline data for monitoring progress on FLR in Malawi. Many of the core indicators

and metrics are already being regularly collected as part of the National Statistical Office's Integrated Household Survey and could directly contribute to the Bonn Challenge Barometer indicators (Ministry of Natural Resources, Energy and Mining, 2017).

Results and benefits

Malawi's Department of Forestry reported that, as of 2018, 25,000 ha of planted forest and woodlots have been brought under restoration. Furthermore, an additional 100,000 ha of planned natural regeneration also contribute to the progress of Malawi's FLR.

Kenya

Bonn Challenge pledge and context

In 2016, Kenya pledged to start the restoration of 5.1 Mha of forest landscapes and degraded lands, aiming to achieve this by 2030. This is part of the AFR100 and will contribute to the Bonn Challenge.

Success factor: policy frameworks, institutional arrangements, financial commitments

In Kenya, forest restoration is a high priority on the government's agenda and is reflected in a number of different legislations and policies. The government of Kenya has put in place several high-level initiatives and laws that are strongly linked to restoring land and its associated ecosystem services. These are listed in Kenya's ROAM report (IUCN & Ministry of Environment and Natural Resources, 2016) and include: the 2010 Constitution, which calls for reforesting and maintaining a tree cover of at least 10% of the country (currently it is less than that); the National Climate Change Response Strategy, which calls for growing 7.6 billion trees on 4.1 Mha of land over the next 20 years; Kenya's Vision 2030, a flagship project underway for rehabilitating and protecting indigenous forests in the five water towers (Mount Kenya, the Aberdare Range, the Mau Forest Complex, Mount Elgon and the Cherangani Hills), with the goal of increasing forest cover and the volume of water flowing from the catchment areas (Government of Kenya, 2007); and the Trees-for-Jobs Programme, which intends to plant 1 billion trees to increase forest cover and at the same time create employment for youth. In addition to these restoration initiatives, Kenya is also deeply involved with REDD+ Readiness Preparation. One of the priority topics in the national REDD+ Readiness

process focuses on the enhancement of forest carbon stocks and it proposes several strategy options to restore forests, including support for the government target to increase tree cover to 10%, and promote forest protection to increase carbon stocks, livelihood benefits and improve biodiversity (UNEP-WCMC, 2015).

Success factor: technical planning and preparation

In September 2014, Kenya established a multi-stakeholder landscape restoration technical working group (LRTWG) led by the Kenya Forest Service to carry out an assessment of potential restoration opportunities. The group identified the most pressing land-use challenges currently affecting Kenya, as well as a list of restoration options that could help address these challenges and restore the ecosystem services that are currently lacking. In addition, the LRTWG was tasked with mapping and quantifying where these different restoration options could potentially be implemented in order to help inform a national restoration target that will contribute to the many national priorities (IUCN & Ministry of Environment and Natural Resources, 2016). The process of producing the national forest and landscape restoration potential maps and developing restoration commitment scenarios followed five steps, adapted from ROAM's mapping module (IUCN & Ministry of Environment and Natural Resources, 2016).

Results and benefits

Currently, no results and benefits have been officially reported.

Burundi

Bonn Challenge pledge and context

In 2015, Burundi pledged to start with the restoration of 2 Mha of forest landscapes and degraded lands, aiming to achieve this by 2030. This is part of both the AFR100 and the Bonn Challenge.

Success factor: policy frameworks, institutional arrangements, financial commitments

Landscape restoration falls under several ministerial departments. The key government institutions directly involved are: the Ministry of Water, Environment, Land Management and Urban Planning (MEEATU), Ministry of

Agriculture and Livestock (MINAGRIE), and the Ministry of Internal Affairs, Ministry of Energy and Mines and the Ministry of Public Work. In addition to these ministries, there are research and training institutions such as the Institute of Agronomics (ISABU), Institute of Geography (IGEBU), Institute of Statistics and Studies (ISTEEBU), and the University of Burundi. Unfortunately, most of these ministries and institutions still need to develop and implement appropriate collaboration frameworks and mandates of collaboration, something that may hinder the implementation of FLR in the six provinces of the project (IUCN, 2018b). In Burundi Vision 2025, the state recognises the main factors involved in the destruction of the environment, leading to the erosion of biodiversity. It envisages priority actions to reverse trends by proposing efficient environmental management and advocating for the awareness of all sectors of society of the importance of a clean environment for the sustainable development of the country. Other national policy documents include chapters that focus on environmental management as a whole and others with biodiversity-focused themes. It should be noted that most of the consumer ministries of biodiversity goods and services have not yet integrated biodiversity management into their sectoral policies. These include the Ministry of Energy and Mines, Ministry of Public Health and the Fight against AIDS, and the Ministry of Trade (Ministère de l'Eau de l'Environnement de l'Aménagement du Territoire et de l'Urbanisme, 2013). To facilitate the smooth achievement of FLR objectives in Burundi, MEEATU has established an enabling institutional framework that includes the:

- National FLR Taskforce, tasked with promoting the implementation of FLR in Burundi. This includes representatives from the Presidency, 10 relevant ministries and development partners, as well as civil society, indigenous people, women, and research and training institutions.
- designation of a National FLR Focal Point.
- National FLR Technical Group, tasked with providing input and guidance to the process of the development of FLR projects in Burundi.
- establishment of the National FLR Programme to coordinate, monitor and report on FLR-related initiatives in terms of the achievement of the government's international commitments, including conventions, its NDC, the Bonn Challenge and the CBD Aichi Biodiversity Target.
- National Consultation Platform for Key FLR Partners, planned to facilitate complementarity and synergies between their initiatives.

Success factor: technical planning and preparation

The World Bank is working with the government of Burundi to prepare a landscape restoration project that is subject to approval by late 2017. The World Bank and the Burundian government contracted IUCN to use ROAM to gather the necessary data to inform the World Bank's proposal development process. The subnational assessment focused on six provinces (Bubanza, Bujumbura Rural and Kayanza in the western region and Cankuzo, Muyinga and Ruyigi in the eastern region of Burundi) identified by the World Bank, the Burundian government and IUCN (IUCN, 2018b).

Success factor: monitoring systems, frameworks or protocols

Currently, no effective FLR monitoring system is in place. To ensure effective monitoring and evaluation of the impact of FLR and restoration interventions, support should be provided to research and training institutions to improve their capacities in project implementation. The focus institutions are IGEBU, ISABU and ISTEEBU and the University of Burundi. The results of the project should help to finetune and improve FLR interventions. Support should also be given to the Office for the Protection of the Environment (OBPE) to contribute to the operationalisation of the National FLR Programme, which will help monitor and report on FLR initiatives implemented in Burundi (IUCN, 2018b).

Results and benefits

Currently, no results and benefits have been officially reported.

Côte d'Ivoire

Bonn Challenge pledge and context

In 2016, Côte d'Ivoire pledged to start the restoration of 5 Mha of forest landscapes and degraded lands, aiming to achieve this by 2030. This is part of both the AFR100 and the Bonn Challenge.

Success factor: policy frameworks, institutional arrangements, financial commitments

The ministry in charge of the environment has the institutional leadership on climate change in Côte d'Ivoire.

In 2012, the Ministry of Environment and Sustainable Development (MINEDD) was created by Decree n° 2012-1119 of 22 November 2012 instituting the 15th government of the Second Republic of Côte d'Ivoire. Several other ministries, public technical structures, local and international NGOs, development partners, as well as private sector actors also operate more or less directly in the field of climate change and FLR. Today, Côte d'Ivoire has merged two mechanisms, the Forest Law Enforcement, Governance and Trade (FLEGT) process and REDD+ to regain forest cover. The state pledged to produce "zero-deforestation cocoa" in 2017 and reverse the curve of deforestation. The government has been engaged in the Tropical Forest Alliance (TFA) 2020 Action Plan on Oil Palm Development (and other products) in Africa since March 2015. The speech of the President of the Republic at the United Nations Climate Summit in New York and the signing of the Declaration of Forests shows the importance that the country attaches to its forests. This commitment was reiterated in the official submission of the NDC to the UNFCCC. In addition to these commitments, the Forestry Development Corporation, the Ministry of Water and Forests and NGOs carry out management, protection and reforestation activities in the field (Ministère de l'Environnement de la Salubrité Urbaine et du Développement Durable, 2018). MINEDD is directly responsible for numerous forestry activities in Côte d'Ivoire, and for related conventions covering landscape restoration. There are comprehensive policies and legal and institutional frameworks existing or under development, and supporting landscape restoration in Côte d'Ivoire (IUCN, 2016).

Success factor: technical planning and preparation

In response to Côte d'Ivoire's national commitment, IUCN entered into a contractual relationship with the United Nations Environment Programme (UNEP) to assess opportunities for restoring degraded forests and landscapes in Côte d'Ivoire (IUCN, 2016).

Success factor: monitoring systems, frameworks or protocols

To meet the requirements for REDD+ related activities, Côte d'Ivoire has established a working group (at the national level) on land monitoring. This group is led by the Ministry of the Environment through the Permanent Executive REDD+ Secretariat, with the support of the Debt Reduction Contract (C2D) and the UNREDD Program, as well as an action plan (2017–2020) for the implementation of the National Forest Monitoring System.

In addition, Memoranda of Understanding have been concluded between the Ministry of the Environment and the national data-producing structures, with the former involved in this monitoring system. In this way, the data needed for monitoring are made available and compiled in a database accessible via a geoportal developed for this purpose. Technicians have been trained in the national structures involved in monitoring, reporting and verification (MRV) so that the data production protocols are harmonised, to ensure consistency and comparability of data. For example, Côte d'Ivoire received support from FAO to develop a harmonised land-use legend using the FAO Classification System (LCCSv3). This system works through the creation of a set of standard diagnostic attributes (called classifiers) to create and describe different classes of land cover, thus solving problems related to semantic interoperability in a context where many mapping initiatives exist (Ministère de l'Environnement de la Salubrité Urbaine et du Développement Durable, 2018).

Results and benefits

Currently, no results and benefits have been officially reported.

Democratic Republic of Congo

Bonn Challenge pledge and context

In 2014, the Democratic Republic of Congo pledged to start restoration of 8 Mha of forest landscapes and degraded lands, aiming to achieve this by 2020. This is part of both the AFR100 and Bonn Challenge.

Success factor: policy frameworks, institutional arrangements, financial commitments

Several strategic and programmatic tools for nature conservation and protected areas have been developed in the Democratic Republic of Congo over the past decade. The main frameworks include: the National Programme 2nd Generation Environment, Forests, Waters and Biodiversity (PNEFEB-2), NBSAP, National REDD+ Framework Strategy, Biodiversity in Protected Areas (SNCB DRC) (2012–2022), National Strategy for Community Conservation in Protected Areas, and the Congolese Institute for Nature Conservation (ICCN) Policy and Research Master Plan, which was published in 2011 (IUCN, 2018c).

Success factor: technical planning and preparation

The Democratic Republic of Congo is developing a subnational ROAM assessment in collaboration with IUCN to identify areas of priority for restoration. The successful restoration of the landscape, which covers more than 1.6 Mha, will contribute 20% of the Democratic Republic of Congo's commitment to restore 8 Mha of degraded and deforested land as a contribution to the Bonn Challenge.

Results and benefits

Currently, no results and benefits have been officially reported.

Mozambique

Bonn Challenge pledge and context

In 2016, Mozambique pledged to start the restoration of 1 Mha of forest landscapes and degraded lands, aiming to achieve this by 2030. This is part of both the AFR100 and Bonn Challenge.

Success factor: policy frameworks, institutional arrangements, financial commitments

Government institutions leading FLR implementation at national level are the Ministerial Council, Ministry of Land, Environment and Rural Development, and the National Directorate of Land and Forests. The latter has the mandate for policies and legislation, allocating large concessions, and monitoring and law enforcement. The subnational ROAM report (IUCN, 2018d) finds that overall Mozambique has very good laws and policies that impact positively on restoration. However, there is limited or no law enforcement, and policies are not implemented. There is also a need for cross-institutional collaboration and harmonisation of strategies to enable efficiency and effectiveness at district and provincial levels. Furthermore, the government is operationalising the country's development through integrating tools such as the Millennium Development Goals and the Poverty Reduction Strategy, which ensure (in its design and implementation) institutional coordination, the integration of all sectoral policies and programmes, and the representative geographical and thematic focus needed in order to achieve balanced and sustainable development (Ministry for the Coordination of Environmental Affairs, 2014).

Success factor: technical planning and preparation

Mozambique conducted a subnational ROAM assessment in 10 of its 11 districts to identify priority areas for restoration (IUCN, 2018d). Furthermore, the diversity of species in any sector, project or development activity is considered in accordance with the norms and regulations contained in the various legal frameworks: the principles of environmental impact assessment studies, district land-use plans and other planning instruments, including the principle of allocating 20% of the benefits to local communities. The country has adopted Community Based Natural Resources Management for the use of natural resources (Ministry for the Coordination of Environmental Affairs, 2014). Monitoring and evaluation systems are not in place for restoration at subnational level (IUCN, 2018d).

Results and benefits

Currently, no results and benefits have been officially reported.

Cameroon

Bonn Challenge pledge and context

As of 2017, Cameroon has pledged to start the restoration of 12,062,768 ha of forest landscapes and degraded lands, and aims to achieve this by 2030. This is part of both the AFR100 and Bonn Challenge. The process also fits into Programme 19 of Cameroon's NDC in the fight against climate change and helps with the country's ambition of reducing GHG emissions by 32% by 2030. The pledge by Cameroon's Ministry of Forestry and Wildlife is the biggest commitment made so far in the species-rich Congo Basin, home to the world's second-largest tropical rainforest.

Success factor: policy frameworks, institutional arrangements, financial commitments

Government institutions leading FLR implementation at national level are the Ministry of Forests of Wildlife (MINFOF) and the Ministry of Environment, Protection of Nature and Sustainable Development (MINEPDED); they have a joint commitment of over 12 Mha to be restored by 2030. To achieve this Cameroon has established a national task force and implemented APV/FLEGT, which also includes improved forest governance. Furthermore,

there is an ongoing review of Forest Policy and Law No. 94/01 of 20 January 1994 on Forest, Wildlife and Fisheries Regime/Consideration of Emerging Issues (REDD+, AFR100, Climate change, Voluntary Partnership Agreement/EU Action Plan for Forest Law Enforcement, Governance and Trade). Other guidelines and actions that contribute to Cameroon's FLR ambitions are the Strategy for Growth and Jobs, Forest and Wildlife Sub-Sector Strategy 2020: Sustainable Management + Forest Planting/Regeneration, Modernisation Strategy for the Wood Energy Value Chain, National Strategy for the Sustainable Management of Cameroon's Mangroves and Coastal Ecosystems, and its REDD+ Strategy.

Success factor: monitoring systems, frameworks or protocols

Cameroon has a training project in collaboration with WRI on Collect Earth, to collect biophysical data.

Results and benefits

Although Cameroon's pledge was recent (2017), the country already has a track record in FLR. Through Cameroon's efforts to close exploited areas off from further exploitation, 1,281,609.88 ha have been restored by natural regeneration between 2004 and 2017 (Dynaffo Project/Pallisco). Another 381,508 ha of forest reserves were transferred under management (47 Communes and ANAFOR, the National Forestry Development Agency); and individual parcels of the non-permanent forest estate (associations, traditional chiefdoms, cooperatives, private). Lastly, the Special Forest Development Fund of the Ministry of Forestry and Wildlife invested from 2006 to 2017 in the reforestation of an area of 30,000 ha under the National Reforestation Program (MINFOF, 2017). Considering the 1,281,609.88 ha of exploited areas of the DFPA now closed to exploitation and being restored by natural regeneration, the government of Cameroon estimates the amount of carbon sequestered at 237,097,828 tCO_2. In the forestry sector informal employment increased from 18,302 in 2005 to 20,681 in 2015.

Ghana

Bonn Challenge pledge and context

Ghana's Bonn Challenge and AFR100 pledge to bring 2 Mha of degraded land under restoration by 2030 was announced in 2015. One of the reasons for this restoration commitment was Ghana's Northern Savannah Ecological zone, which forms part of the West Africa Sahel region and is highly vulnerable to environmental degradation and climate change due its geographic location and the dependence of its population on natural resources, rainfed agriculture and transhumance systems.

Success factor: policy frameworks, institutional arrangements, financial commitments

The concept of FLR was introduced in Ghana when the government supported the establishment of a National Working Group on Forest Landscape Restoration in 2004 to develop a National Plan of Action on FLR to encourage innovative restoration efforts. In addition, a national workshop on International Tropical Timber Organization guidelines for the restoration, management and rehabilitation of degraded and secondary tropical forest was held in Ghana in 2006 (IUCN and Nyame, 2018). The Ministry of Environment, Science, Technology and Innovation is the sector lead for Environment and Climate Change Issues and works closely with the Environment Protection Agency. Ghana has developed multiple plans and programmes in relation to FLR: among them are the Forestry Development Master Plan (2016–2040), Youth in Afforestation Programme, Ghana REDD+ Strategy (2016–2035), Ghana Forest Plantation Strategy (2016–2040), Ghana Cocoa Forest REDD+ Programme and the Joint Framework for Action under the Cocoa & Forests Initiative (Ministry of Environment, Science, Technology and Innovation, and Environmental Protection Agency, 2018). Since Ghana's pledge in 2015, the total domestic public expenditure made available for FLR activities totals US$ 10,613,545.52. Total private investment (including microfinance and impact investments) is US$ 16,895,460, which was also supported by a total of international donor support of US$ 55,437,500.

Success factor: technical planning and preparation

Ghana has multiple approaches towards implementing FLR, including the Modified Taungya System, private developers on reserves, direct planting (hired labour), amenity planting, off-reserve plantations, model plantations, Forestry Commission industry plantations, development of seed orchards, woodlot establishment, restoration of degraded watersheds, forest reserve boundary planting, restoration of sacred groves, rehabilitation of failed plantation sites, enrichment

planting, and trees on-farm (climate-smart agriculture). In addition, to identify priority areas, the mapping exercise for ROAM in Ghana was accomplished through a participatory triangulation approach for forest reserve mapping, with forest stakeholders updating satellite imagery maps of forest cover, and experts consulting with district forestry staff and local communities to obtain a higher resolution spatial assessment. This merged the "best of science" (GIS data) with the "best of local knowledge" (multi-stakeholder workshops and community consultations). National expertise was provided by, among others, the Resource Management Support Centre of Ghana's Forestry Commission and the Centre for Remote Sensing and Geographical Information Systems of the University of Ghana (IUCN and Nyame, 2018).

Current monitoring frameworks consist of:

- REDD+ MRV, envisaged to be undertaken biennially to estimate emission reductions associated with implementation of REDD+ actions;
- Periodic field surveys, inspection and assessment of areas planted under various FLR approaches;
- Regular reporting and sample field audits to confirm areas planted;
- Programme-/project-based monitoring approaches (e.g. Forest Inventory Programme, REDD+ Readiness).

Results and benefits

In Ghana, 238,873.40 ha were brought under restoration between 2016 and 2018, of which 32,133.38 ha are plantations, 194470.68 ha are under agroforestry and 12269.34 ha are under enrichment planting. A total of 1,872,222.79 tCO$_2$ has been sequestered through these activities. Multiple FLR-related programmes, such as Ghana's Labour for Youth in Afforestation module, have created 89,181 jobs.

Costa Rica

Bonn Challenge pledge and context

Costa Rica is already well known for its progressive environmental policies and sustainable development. Currently, it seeks to include restoration as part of its national development. Costa Rica's guiding restoration goal is to integrate restoration into the nation's inclusive green development model. In 2012, it pledged to bring 1 Mha of degraded land under restoration by 2020

through the Ministry of Environment and Energy, as part of both the Bonn Challenge and Initiative 20x20. Part of this target is being achieved through issuing credits and providing incentives for sustainable forest management, forest projects that provide ecosystem services, and projects with social and environmental benefits, via Costa Rica's National Fund for Forestry Financing (FONAFIFO). For the Bonn Challenge Barometer of Progress 2018 report, these types of incentives were the focus. It should be noted that this only covers a part of Costa Rica's restoration activities.

Success factor: policy frameworks, institutional arrangements, financial commitments

Costa Rica's ROAM report (IUCN ORMACC, 2018) is still under development; however, the country already has a long history of FLR activities. The payment for ecosystem services (PES) programme was launched in 1997, with the Forestry Law providing the regulatory basis. Costa Rica was the first country to implement a national programme of PES, which is considered partially responsible for achieving net reforestation. Through PES, landowners receive an annual payment for the conservation of forest lands, and for the implementation of timber plantations, natural regeneration and forest management. Incentives are also disbursed to landowners for the adoption of agroforestry systems (IUCN ORMACC, 2018). The PES programme has helped to develop mechanisms to charge the users of environmental services for the services they receive. It has made substantial progress in charging water users, and more limited progress in charging biodiversity and carbon sequestration users (Pagiola, 2008). In 2007, the Costa Rican government, as part of its National Climate Change Strategy, announced its goal of becoming a carbon-neutral country by 2021. As agriculture is a major contributor to Costa Rica's GHG emissions (mainly methane emissions from livestock and nitrous oxide emissions, predominantly from the use of nitrogen fertilisers), the country has prioritised the agricultural sector as a pillar to achieve the carbon neutrality goal of, in particular, the coffee, banana, cattle, sugar cane, pineapple and rice sectors. A series of programmes have been developed, including Nationally Appropriate Mitigation Actions (NAMAs), seen as one of the key instruments to achieve emission reduction goals and achieve low-carbon development. Currently, Costa Rica has implemented NAMAs for the livestock and coffee sectors, which are framed within the Climate Change Action Plan Agro-Environmental Management 2011–2014 and the Livestock Development Strategy Low in

Emissions. As part of the NAMAs, measures are included to improve competitiveness and increase sustainability such as the promotion of pastoral systems, which involve the planting of trees in grazing areas for the provision of shade for livestock, or nitrogen-fixing species in the case of coffee plantations, which in addition to fixing carbon dioxide avoid the use of synthetic fertilisers in crops.

Success factor: technical planning and preparation

To support Costa Rica in achieving its commitment, IUCN ORMACC initiated the implementation of a ROAM evaluation in August 2014. As part of this process, a committee of restoration experts was established, whose first objective was to carry out a first proposal, consistent with a series of restoration actions and goals related to said actions (Beatty et al., 2018b). This proposal was based on unifying existing programmes in Costa Rica that have a restoration component; namely, the National Program of PES, the NAMAs and the programmes for the implementation of good agricultural practices.

Results and benefits

From 2012 to 2017 a total of 3,031,115.9 ha were brought under restoration through PES schemes, of which 17,486.9 ha (0.57%) were planted forests and woodlots, 2,982,801 ha (98.41%) agroforestry, and 30,828 ha (1.02%) natural regeneration. Currently, it is possible to track the incentive schemes and projects through an online database by FONAFIFO (www.fonafifo.go.cr/en/servicios/estadisticas-de-psa).

Guatemala

Bonn Challenge pledge and context

Guatemala is a multicultural and biodiverse country with a strong economic reliance on rural agriculture and natural resources. However, the nation is also vulnerable to the effects of climate change, and land degradation and deforestation threaten ecosystem services, agricultural productivity and the livelihoods of much of the nation's population. Considering these issues, in 2014, Guatemala pledged to bring 1.2 Mha of degraded land under restoration by 2020 through the Ministry of Environment as part of both the Bonn Challenge and Initiative 20x20. Coordination of FLR in Guatemala lies in the hands of the National Institute of Forestry (INAB), the National Protected Areas Council, the Ministry of Environment and Natural Resources (MARN) and the

Ministry of Agriculture, Livestock and Food (MAGA). Part of this target is being achieved through issuing credits and providing incentives for sustainable FLR projects that provide ecosystem services. In the assessment of Guatemala, there was a focus on the projects of INAB; only these specific projects were taken into account in the *Second Bonn Challenge progress report* and it should be noted that this only covers a part of Guatemala's restoration activities.

Success factor: policy frameworks, institutional arrangements, financial commitments

In 2012 INAB, together with MARN, the National Council of Protected Areas (CONAP) and MAGA convened for the National Roundtable of Restoration of the Forest Landscape of Guatemala. This is a governance platform led by INAB, where government institutions, NGOs, academia, international cooperation, communities, the private sector, civil society and the National Association of Municipalities meet. Additionally, in order to facilitate follow-up and carry out the technical tasks required, the Technical Secretariat of the Forest Landscape Restoration Roundtable was created, consisting of a principal representative and an alternate for each member institution; INAB and IUCN are responsible for coordination (Mesa Nacional de Restauración del Paisaje Forestal de Guatemala, 2018).

With the Restoration Roundtable, a first agreement was reached between government institutions: the creation of a participatory space to share and strengthen knowledge among the actors and sectors involved in the restoration of ecosystems. In addition, short-, medium- and long-term commitments were established for the development of restoration activities in Guatemala:

- National Forest Landscape Restoration Strategy as part of the National Planning process (2014–2015).
- National Strategy, to be executed over 30 years (2015–2045). The strategy was published by the government in May 2015, with the support of INAB, MARN, MAGA and CONAP.
- In September 2015, the Congress of the Republic of Guatemala approved the Probosque Law (Decree 2-2015), which includes a new forestry incentive programme that aims to promote the establishment, recovery, restoration, management, production and protection of forests in Guatemala.

Restoration efforts in Guatemala are part of the K'atun 2032 National Development Plan (CNDUR, 2014), which includes guidelines for public policy decision making and revolves around five pillars: urban and rural Guatemala; wellness for the people; wealth for all; natural resources today and for the future; state as a guarantor of human rights and driver of development. Each pillar has a series of goals, results and guidelines for its monitoring and institutional articulation. The restoration of the forest landscape appears in several pillars of the mentioned plan; in particular, it responds to the priority of conserving and sustainably using forests and biodiversity for climate change adaptation and mitigation (Mesa Nacional de Restauración del Paisaje Forestal de Guatemala, 2018).

Success factor: technical planning and preparation

Between 2016 and 2017, IUCN ORMACC conducted a financial analysis for the implementation of restoration actions, as the last phase of ROAM. In the first step, potential restoration actions and those considered to be priorities by the Restoration Roundtable were identified (Mesa Nacional de Restauración del Paisaje Forestal de Guatemala, 2018).

Results and benefits
From 2014 to 2018 a total of 396,447.12 ha were brought under restoration through PES schemes in Guatemala by PINFOR-PROBOSQUE (see Table A2.2). Currently, it is possible to track the incentive schemes and projects through an online database by PINFOR-PROBOSQUE (www.sifgua.org.gt/Probosque.aspx).

Table A2.2 FLR activities in Guatemala (2014–2018)

	Costs (Q)	Area (ha)
MBN Protection	303,303,548.05	266,478.83
Plantations	300,393,655.98	118,877.71
Restoration of degraded forest lands	12,637,167.80	10,365.50
Agroforestry	723,007.00	725.08
Total	**617,057,378.83**	**396,447.12**

Colombia

Bonn Challenge pledge and context

In 2014, Colombia pledged to restore 1 Mha by 2020, as part of both the Bonn Challenge and Initiative 20x20.

Success factor: policy frameworks, institutional arrangements, financial commitments

The Ministry of Environment and Sustainable Development (MADS) has been working on the restoration of degraded areas for more than two decades. The National Development Plan 2014–2018 commits to the restoration of 210,000 ha, which is monitored and partly implemented by MADS and related entities such as regional authorities and the private sector. Accordingly, the National Restoration Plan has been developed as a first step to frame this issue in the country and provide guidelines that must be considered to propose restoration projects from the short to long term. Likewise, the Colombian Restoration Network has been constituted; this specifies the different technical, academic and environmental actors needed to disseminate and position the issue through publications, events and network articulation (Isaacs Cubides et al., 2018).

In terms of the political framework, MADS has a number of instruments to implement environmental policy (Bustillo & McBreen, 2018). However, the current problem is how to articulate all the instruments that are available to achieve effective implementation. There are plans for forest management (POMCAS), and compensation manuals for biodiversity loss, among others. The latter has leveraged compliance of national restoration goals. There are also a series of legal and economic instruments, such as the Forestry Incentive Certificate (Law 139 of 94) and Decree 900. Additionally, economic resources can be leveraged, including the National Environmental Fund (FONAM), FCA environmental compensation fund, Financial Territorial Development (FINDETER), a general system of royalties (SGR), a compensation manual, and international cooperation.

Success factor: technical planning and preparation

Colombia has a National Restoration Plan, which includes an action plan, currently in the implementation phase. The first phase included the creation of a National Restoration Board in October 2017. The Inter-American

Institute for Cooperation on Agriculture represents the Secretariat of this Board and also the Sustainable Livestock Board, which has helped the articulation of both activities. MADS is still working to consolidate the National Restoration Board. Furthermore, Colombia conducted a ROAM assessment (subnational) to support its goal of recovering 1 Mha, according to the Bonn Challenge, in 2016. IUCN, in collaboration with the Alexander von Humboldt Biological Resources Research Institute, the Regional Autonomous Corporation of the Black-Nare River Basins (Cornare) and the Catholic University of the East, has developed the first application of ROAM in Colombia (Isaacs Cubides et al., 2018).

Results and benefits

Currently, land brought under restoration is approximately 130,000 ha (to October of 2017) (Bustillo & McBreen, 2018).

**INTERNATIONAL UNION
FOR CONSERVATION OF NATURE**

Rue Mauverney 28
1196 Gland, Switzerland
www.iucn.org/forest