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Craig R. Beatty, Adriana Vidal, Thomas Devesa and Mirjam E. Kuzee

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

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This publication was first posted online in a working paper version as information document CBD/COP/14/INF/18 at the 14th meeting of the Conference of Parties to the Convention on Biological Diversity, in 2018.

Published by: IUCN, Gland, Switzerland

Citation: Citation: Beatty, C.R., Vidal, A., Devesa, T., and M.E. Kuzee (2020). *Accelerating biodiversity commitments through forest landscape restoration; Evidence from assessments in 26 countries using the Restoration Opportunities Assessment Methodology (ROAM)*. Gland, Switzerland: IUCN. x + 74pp.

Cover photo: © Craig Beatty / IUCN

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Key messages

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Forest landscape restoration (FLR) is at the centre of global efforts to address some of the most existential challenges to humanity and species such as ecosystem degradation, land conversion and fragmentation, desertification, poverty, migration, inequity, and climate change. The current 56 pledges to the Bonn Challenge, a global effort to bring 150 million hectares of the world's deforested and degraded land into restoration by 2020, and 350 million hectares by 2030, reflect the growing political momentum to address these challenges.

2

The potential of FLR to both conserve and restore the components of biodiversity at large scales is unmatched. This potential includes enhancements of biodiversity by restoring critical habitat, reintroducing extirpated species, or increasing genetic diversity. It can also include approaches to increasing biodiversity in productive landscapes such as soil biodiversity through improved agricultural techniques and management, or diversion of threats to biodiversity when restoration focuses on the sustainable provision of what people require from landscapes (e.g. food, fuel, fibre). FLR can also build the social and economic conditions that cushion people from an outright subsistence-based reliance on natural resources. As a process and as an activity on the ground, FLR strongly contributes to Aichi Biodiversity Targets 2, 5, 7, 11, 12, 13, 14, and 15.

3

Over 450 million hectares of land area has been assessed for FLR opportunities in 26 countries across the Americas, Africa, and Asia—and over 160 million hectares of FLR opportunities have been identified through IUCN-facilitated processes using the Restoration Opportunities Assessment Methodology (ROAM). These assessments are demand-driven and government-owned through an extensive process of stakeholder engagement that allows multiple sectors to find common ground for nature-based solutions.

4

ROAM is referenced in Convention on Biological Diversity (CBD) documents as one of the tools and initiatives supporting ecosystem restoration and the Short Term Action Plan on Ecosystem Restoration – STAPER, adopted by Decision XIII/5, as it 'provides a flexible and affordable framework approach for countries to rapidly identify and analyse FLR potential and locate specific areas of opportunity at a national or subnational level'. FLR and ROAM contributions to STAPER also include monitoring, as a result of the ability of ROAM assessments to be utilised as baselines to track changes in biodiversity over time—as well through the application of the Bonn Challenge Barometer of Progress, the global progress tracking protocol focused on FLR and commitments to the Bonn Challenge.

5

FLR assessments using ROAM have equipped countries to report progress under their national biodiversity targets as both a direct and indirect result of the assessment, planning, and implementation of FLR. A complete list of the connections between the IUCN-facilitated ROAM assessments and the goals, targets, and indicators of the countries' National Biodiversity Strategies and Action Plans (NBSAPS) where the ROAM assessments were undertaken can be found in section 3 of this document. It is crucial that countries improve the amount and detail of information regarding their actions towards landscape restoration in their national reporting under the CBD, and there are many countries that are in a strategic position to demonstrate that they are advancing on these targets thanks to their efforts on FLR.

Executive summary

This document provides guidance, information and evidence about how forest landscape restoration (FLR) can accelerate progress towards achieving the Aichi Biodiversity Targets, tackling the current challenges of maintaining a balance of land productivity and ecosystem integrity. The main objective is to increase awareness and demonstrate how the planning and implementation of FLR ambitions, especially under the Bonn Challenge and through the application of ROAM, can translate into concrete and reportable contributions to the goals and strategic actions set out in countries' NBSAPs.

With 450 million hectares of land area currently assessed using ROAM in 26 countries and 40 separate jurisdictions, and with over 160 million hectares of FLR opportunities identified for restoration, this document builds on the information presented in UNEP/CBD/COP/13/INF/11, to demonstrate the significant biodiversity gains that can be achieved through restoring degraded and deforested landscapes. This is done through evidence provided by national and sub-national FLR assessments that are using ROAM and support the adoption of FLR as a key approach to achieving the Aichi Biodiversity Targets and the 2050 Vision for Biodiversity. This document provides specific examples of the links between planned or implemented FLR activities and their outcomes—as identified in the ROAM assessments—and the national biodiversity targets that countries have submitted as part of their National Biodiversity Strategies and Action Plans (NBSAPs).

In the twenty-second meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), parties reviewed the assessment of progress towards several Aichi Biodiversity Targets, as well as analysed possible options to accelerate progress. Although experts documented information of several projects on ecosystem restoration including forests, there is limited information on the scale of restoration activities being undertaken at the global level.[1] As such, it is crucial that countries improve the amount and detail of information regarding their actions towards landscape restoration in their national reporting under the CBD. Also, ecosystem restoration is prominently recognized as an option to accelerate progress towards the achievement of the Aichi Biodiversity Targets 14 and 15, and with regards to forest landscapes there are many countries that are in a strategic position to demonstrate that they are advancing on these targets thanks to their efforts on FLR.

After the first introductory section with key information regarding the Bonn Challenge, FLR, and FLR in the context of the CBD, section 2 of this document elaborates on the FLR contributions to biodiversity, using the Aichi Biodiversity Targets as the framework to qualify such contributions. The significant additions of FLR to the Targets are seen in two ways: (1) through supporting process-related activities (including biodiversity mainstreaming and capacity development) and (2) through activity-based restoration interventions (management, rehabilitation, and conservation), and the strongest contributions are identified with respect to Targets 2, 5, 7, 11, 12, 13, 14, and 15. As further guidance to ensure that biodiversity is mainstreamed adequately in the implementation of FLR activities, section 2 elaborates on the principles of FLR and provides guidance on how they could be applied as FLR strategies and actions are implemented. The last

[1] CBD/SBSTTA/22/INF/10

part of section 2 presents the three ways that monitoring the biodiversity benefits of FLR success can be accomplished, and provides specific examples on the connections with Target 12.

Finally, section 3 offers information from the ROAM assessments, both from the process perspective (including summary information from CBD/SBI/2/INF/19) as well as presenting concrete examples of FLR's connections to the corresponding countries' NBSAPs goals, strategies, actions and indicators. This document finishes with a list of recommendations for CBD parties to utilise the potential of FLR to realise many of their national biodiversity targets.

Acknowledgements

The authors of this report wish to acknowledge the contributions of Blaise Bodin and Catalina Santamaria of the Convention on Biological Diversity Secretariat in the development of this document.

The information presented in this report would not be possible without the dedicated contributions of current and former members of the IUCN Secretariat to FLR assessment work in many of the countries listed in this report through IUCN Regional and Country Offices. IUCN's Regional FLR coordinators include: Tania Amour in Mesoamerica, Central America and the Caribbean, Kenneth Angu Angu in West and Central Africa, Charles Karangwa in Eastern and Southern Africa, Li Jia in the Asia Regional Office, and James McBreen in South America.

Other key contributions from the IUCN Secretariat include: Salome Begeladze, Anushree Bhattacharjee, Jake Brunner, Miguel Calmon, Oscar Chacon, Melibea Gallo, Gerardo Garcia, Elie Hakizumwami, Vinícius de Araújo Klier, Sophie Kutegeka, Luciana Ludlow, Peter Mbile, Ronald McCarthy, Miguel Moraes, Francis Musoke, Polycarp Mwima, Melinka Nájera, Corbett Nash, Joseph Njue, German Obando, Ursula Parilla, Scott Perkin, Leander Raes, Cremildo Rungo, Carole Saint-Laurent, Emilie Sasseville, Silvio Simonit, Akshay Vishwanath and Robert Wild.

We also wish to thank the government agencies that have provided the institutional home and government commitment for assessments of FLR opportunity using ROAM. These include: **Brazil**: Município de Paragominas e Estado do Pará, Secretaria de Meio Ambiente e Sustentabilidade do Estado de Pernambuco (SEMAS/PE), Agência Estadual de Meio Ambiente de Pernambuco (CPRH), Governo do Estado do Espirito Santo Secretaria de Meio Ambiente e Recursos Hidricos, Secretariat for the Environment of the State of São Paulo, Santa Catarina Environment Foundation (FATMA) and the Department for Sustainable Development (SDS), Federal District Environmental Department and Cerrado Alliance; **Burundi:** Ministry of Water, Environment, Land Management and Urban Planning (MEEATU); **Central African Republic:** Ministère de l'Environnement et du Développement Durable, des Eaux, Forêts, Chasse et Pêche; **Colombia**: Alexander von Humboldt Biological Resources Research Institute; **Costa Rica:** Ministerio de Ambiente y Energía (MINAE); **Côte d'Ivoire** Ministry of Forests and Water Resources (MINEF); **El Salvador**: Ministerio de Medio Ambiente y Recursos Naturales; **Ethiopia**: Ministry of Environment, Forests, and Climate Change (MEFCC); **Ghana:** Ministry of Lands and Natural Resources; **Guatemala:** Ministerio de Agricultura, Ganadería y Alimentación and Ministerio de Ambiente y Recursos Naturales; **Honduras**: MiAmbiente+ La Secretaría de Recursos Naturales y Ambiente; **India**: The Ministry of Environment, Forest and Climate Change (MoEFCC); **Indonesia**: Mangrove Management Working Group (KKMD) of Gorontalo Province; **Kenya**: Ministry of Environment and Natural Resources; **Laos**: Department of Natural Resource and the Environment; **Madagascar**: Ministère de l'Environnement, de l'Écologie et des Forêts; **Malawi**: Ministry of Natural Resources, Energy and Environment; **Mexico**: Comisión Nacional Forestal (CONAFOR), Secretaria de Agricultura, Ganaderia, Desarrollo Rural, Pesca y Alimentacion (SAGARPA), and Secretaries of Environment of the States of Yucatan, Campeche, Quintana Roo, and Chiapas; **Mozambique:** Ministry of Land, Environment and Rural Development (MITADER); **Myanmar**: Ministry of Natural Resources and Environmental

Conservation (MONREC); Nicaragua: Específicamente para la gestión de los recursos naturales, la RACCN cuenta con la Secretaria Regional de Recursos Naturales y Ambiente (SERENA), el Comité Consultivo Forestal y Ambiental (CCF-A), y el Consejo Regional Autónomo de la Costa Caribe Norte (CRACCN); Peru: El Servicio Nacional Forestal y de Fauna Silvestre (SERFOR) del Ministerio de Agricultura y Riego; Rwanda: Ministry of Natural Resources; Uganda: Ministry of Water and Environment; Vietnam: Provincial Authority of Quang Tri and the Government of Vietnam, including the Vietnam Administration of Forestry (VNFOREST) of the Ministry of Agriculture and Rural Development (MARD).

Hundreds of IUCN members and partners have implemented full or partial assessments of FLR opportunity using ROAM or the tools contained within the methodology and credit to these organisations are included in each of the ROAM assessments. However, special acknowledgments are reserved here for those organisations that have adopted ROAM as a key tactic in the delivery of their work. Many of these organisations are members of The Global Partnership on Forest Landscape Restoration (GPFLR). Specific contributions to the ROAM assessments included in this analysis include contributions from the World Resources Institute (WRI), Clinton Climate Initiative (CCI), World Bank, and UN Food and Agriculture Organization (FAO). Additionally, the AFR100 and 20x20 Initiatives have catalysed continental interest in the application of ROAM in Africa and Latin America.

These ROAM assessments were supported by funding from a wide variety of public and private sources including UKaid, German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Norwegian Ministry of Climate and Environment, Norwegian Agency for Development Cooperation (NORAD), United Nations Food and Agriculture Organization (FAO), and World Bank.

1. Introduction

Evidence suggests that land degradation and conversion have led to the loss of between US$ 4.3–20.2 trillion a year in the value of ecosystem goods and services (Costanza et al., 2014). More directly, 1.5 billion people are affected by the world's estimated 2 billion hectares of deforested and degraded land (Sanz et al., 2017), and it is well established that the degradation and deforestation of landscapes can cause poverty (Dasgupta, et al., 2005). Degradation and deforestation have also been routinely linked to the frequency and intensity of natural disasters, particularly floods and landslides, which are now seen in all parts of the world (UNU-EHS, 2017). The international community's awareness and ambition to tackle these issues has grown, and landscape restoration is at the centre of nature-based solutions for many of those issues. There is a shared understanding that it is possible to break the cycle of degradation and restore ecosystem services and productivity of landscapes for people and planet.

1.1 The Bonn Challenge

The Bonn Challenge is a global effort to bring 150 million hectares (Mha) into restoration by 2020 and 350 Mha by 2030.[2] The Bonn Challenge is a voluntary, non-binding initiative, and is underpinned by the principles of FLR. It helps countries meet their current and future national priorities including rural development, and food, water and energy security, and international commitments including the Convention on Biological Diversity Aichi Targets, the Framework Convention on Climate Change's REDD+ (Reducing Emissions from Deforestation and Forest Degradation) goal and the Paris Agreement, the UN Land Degradation Neutrality Goal, the UN Global Objectives on Forests and the Sustainable Development Goals.[3] To date, 56 contributors have pledged more than 168.43 Mha to the Bonn Challenge.[4] Regional collaboration platforms such as the Agadir Commitment,[5] the African Forest Landscape Restoration Initiative (AFR100)[6] Initiative 20×20,[7] and the ministerial-level regional roundtables on the Bonn Challenge in Latin America, Asia, Eastern and Southern

[2] The Bonn Challenge was launched in September 2011 at a ministerial event hosted by the Government of Germany and IUCN and supported by the Global Partnership on Forest Landscape Restoration (GPFLR). The New York Declaration on Forests made at the 2014 Climate Summit built upon and extended the Bonn Challenge target of 150 million hectares under restoration by 2020 by an additional 200 million hectares by 2030.

[3] The CBD Aichi Targets include target 15 calling for restoration of 15% of degraded ecosystems by 2020. The UNFCCC REDD+ goal is to slow, halt and reverse the loss of forest and carbon stocks, and the Paris Agreement nationally determined contributions (NDCs) provide scope for restoration through reducing emissions and ecosystem based adaptation. The UN Convention to Combat Desertification (UNCCD) focuses on restoring unproductive land and achieving land degradation neutrality. The UN Global Objectives on Forests include the goal to reverse forest loss. Restoration is directly relevant to SDG Goal 15 to protect, restore and promote sustainable use of ecosystems, halt and reverse land degradation and desertification; Goal 13 to take urgent action on climate change, and Goal 2 to improve food security, among others

[4] www.bonnchallenge.org

[5] http://www.fao.org/forestry/45656-0ed7af343bc2e08d467c000593c2cd9ae.pdf

[6] http://afr100.org/content/nepad-agency

[7] 14 http://www.wri.org/our-work/project/initiative-20x20

Africa, Central Africa and Central Asia provide additional momentum for restoration action and contribute directly to the achievement of the Bonn Challenge.

While The Bonn Challenge is an international initiative, in practice it often serves as a mechanism for the recognition of a wide range of national visions, strategies, and development plans. Rarely do countries commit to restoring large areas of degraded and deforested land without first having interest, policy, legislation or other initiatives at the national or subnational level that act like fertile ground to build on restoration action. As such, the Bonn Challenge has been a successful way to communicate national ambitions and strategies on restoration to a global audience—showcasing government commitments to sustainable development in support of human livelihoods, ecological productivity, and climate change mitigation.

At the time that the 5th national reports were due to the CBD early in 2014, five countries had committed a combined total of 20 million hectares to FLR under the Bonn Challenge (USA 15 Mha, Rwanda 2 Mha, Brazil's Atlantic Forest Restoration Pact (PACTO) 1 Mha, El Salvador 1 Mha, and Costa Rica 1 Mha). Today, due in large part to the publication and application of ROAM (IUCN & WRI, 2014)[8], IUCN's leadership as the Secretariat of the Bonn Challenge, and the increasing realisation by governments and donors that FLR is a nature-based solution to many social, economic, and environmental challenges, the global commitment to landscape restoration has never been stronger.

1.2 The forest landscape restoration approach

Underlying the Bonn Challenge is the FLR approach.[9] FLR is the long-term process of regaining ecological functionality and enhancing human well-being across deforested and degraded landscapes, encompassing a mosaic of different land uses in space and over time. FLR is not an end in itself, but a means of regaining, improving, and maintaining vital ecological, economic and social functions for more resilient and sustainable landscapes. Importantly, FLR is about restoring forward to meet peoples' needs and not *per se* about restoring back to original vegetation or habitat, recognising that nature is dynamic, spatially and temporally.

Forest landscape restoration delivers transformational social and ecological change that both increases the ecological productivity of degraded and deforested areas and provides livelihood support for people.

While FLR sometimes involves the opportunity to restore large contiguous tracts of degraded forest land, the majority of restoration opportunities in the world are found on or adjacent to agricultural or pastoral land. In these situations, landscape restoration complements and does not displace existing land uses. This results in a patchwork or mosaic of different land uses including: agriculture, agroforestry systems and improved fallow

[8] The Restoration Opportunities Assessment Methodology (ROAM) is a methodological framework to support countries, but also communities, and private sector to spatially identify and prioritize FLR opportunities that are socially, ecologically and economically appropriate.

[9] InfoFLR.org

systems, ecological corridors, areas of forests and woodlands, and river or lakeside plantings to protect waterways.

The FLR approach meets societal needs and allows stakeholders to consider and negotiate multiple benefits from ecosystem services for food, nutrition and water security; promote local businesses and social justice; support rural development and national economies; and build resilience to disasters and climate change.

IUCN-facilitated assessments of landscape restoration opportunities alone cover 450 million ha, and have identified over 160 million ha of restoration opportunities in 26 countries across the Americas, Africa, and Asia. This means that for 160 million ha of degraded and deforested landscapes there is robust evidence for landscape restoration.

While the practice of restoration is not new, the concept of FLR and how it has been deployed in the past decade is novel. While restoration was once perhaps a more site-based and ecological pursuit, has been transformed into a social, economic, and biophysical approach to achieve large-scale transformational change. 'Large-scale' has even required a reset in definition, as the strategies for FLR seek not only to physically restore degraded sites, but also to confer the benefits of these actions across broad landscapes and for people; including entire countries. Forest landscape restoration has also broadened what counts as 'restoration' to include the necessary changes in the enabling conditions for more sustainable landscapes such as policy shifts, economic metrics, rights and governance issues and the wider effects of ecosystem service gains. While not on-the-ground restoration activities, these shifts are critical in the long-term success of more direct restoration actions.

There are many institutions and governments engaged today in FLR. However, IUCN-facilitated assessments of landscape restoration opportunities alone cover 450 million ha, and have identified over 160 million ha of restoration opportunities in 26 countries across the Americas, Africa, and Asia. This means that robust evidence exists for landscape restoration for 160 million ha of degraded and deforested landscapes. FLR is beginning to deliver transformational change that will increase the ecological productivity of degraded and deforested landscapes and provide the livelihood support from landscape and management changes that people and their governments expect.

Forest landscape restoration and biodiversity scenarios

Biodiversity loss is caused mainly by expansion of human activities at the expense of natural vegetation and habitats (IPBES, 2018). Combined with climate change, natural habitat loss is generating serious and growing impacts to the livelihoods of billions of people and to species survival across all regions in the world. Investing in landscape restoration to increase ecological productivity and promote human well-being will generate huge benefits with an estimated value 10 times greater than the cost of business as usual (IPBES, 2018).

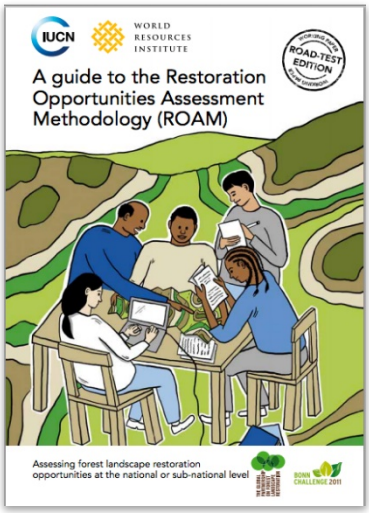
Restoring degraded and deforested landscapes provides key provisioning ecosystem services (such as food, fuelwood and genetic resources); regulating services (climate regulation, nutrient cycling and soil building, water regulation and purification, and pollination); cultural services (spiritual, religious, recreational, educational, and contributing to a sense of place); and much-needed habitat for threatened species as a large percentage of species on the IUCN Red List of Threatened Species are threatened due to habitat loss or degradation (Mace et al., 2005; IUCN, 2018). All these important services are typically underpinned by the biological richness of landscapes, with growing evidence that higher biodiversity is directly proportional to both the quantity (functions) and general stability (environmental resilience) of ecosystem services (Hooper et al., 2005; Hooper et al., 2012; Cardinale et al., 2012; Larsen et al., 2012; Oliver et al., 2015a; Oliver et al., 2015b; Walker and Salt, 2006).

To achieve the 2050 Vision for Biodiversity, a mix of the following five policy measures were explored in the fourth edition of the Global Biodiversity Outlook: sustainable agriculture, reduction of overexploitation of natural resources, climate change mitigation, reduction of waste and overconsumption, and reduction of ecosystem degradation and fragmentation. FLR emerged as an approach that addressed the problem of ecosystem degradation, a process that needs to be fundamentally addressed in order to achieve the 2050 Vision for Biodiversity.

There are different pathways that those with a mandate or interest in landscape restoration or biodiversity conservation can take to assess, engage, and implement positive contributions to sustainable development. While the merits of other methodologies in generating positive outputs for biodiversity conservation are well-recognised, ROAM was the methodology that was used to generate the results on which this document is based.

What is ROAM?

As an iterative and stakeholder-driven approach, ROAM defines how FLR can contribute to social, economic, and ecological goals, providing vital support to countries seeking to implement or accelerate landscape restoration programmes and strategies. ROAM supports decision-making on the relevance and feasibility of potential interventions across the assessment area, identifying priority areas for these interventions, quantifying cost and benefits, analysing finance and investment options, and provides guidance on assessing restoration readiness and addressing major policy and institutional bottlenecks. ROAM and its specific outputs as they relate to biodiversity are treated in more detail in section 3, with country examples highlighting how FLR planning and strategies are supporting national biodiversity strategies and progress for the Aichi Biodiversity Targets.



Since its publication in 2014, IUCN has used the Restoration Opportunities Assessment Methodology (ROAM) to help determine where restoration of degraded landscapes is possible, for what reasons landscape restoration is important and for whom. Within the methodology, tools and approaches are utilised to generate information on ecosystem services, degradation, biodiversity, food security, or the costs and benefits of restoration, to name a few. The

methodology also assesses the enabling conditions for landscape restoration and has been used to develop landscape restoration roadmaps at different spatial and temporal scales. These include many different types of restoration interventions that range from small management actions that can have a positive impact on the sustainability of a landscape to the complete ecological restoration of an area.

1.3 Forest landscape restoration at the CBD

Decisions supporting ecosystem restoration activities under the Convention guide the implementation and scaling-up of FLR activities. Decisions XI/16, XII/19, XIII/5 highlight the intrinsic connection between ecosystem restoration and goal D of the Strategic Plan for Biodiversity 2011–2020 ("enhance the benefits to all from biodiversity and ecosystem services"), as the rehabilitation of degraded ecosystems restores critical ecosystem functions and the delivery of benefits to people. Decision XXI/19 in particular, highlights the importance of promoting large-scale restoration activities which, together with aggregated small-scale restoration activities, contribute to "biodiversity conservation, climate-change adaptation and mitigation, and reducing desertification, in the context of sustainable development." It also recognises the existence of several initiatives that contribute through restoration to the achievement of the Aichi Biodiversity Targets, in particular, Targets 5, 12, 14, and 15, and FLR is naturally positioned as an effective approach for restoration at scale.

With an urgency to increase and scale-up action on ecosystem restoration through 2020; in 2016 parties adopted the "Short-Term Action Plan on Ecosystem Restoration" (STAPER) by decision XIII/5. The action plan aims to facilitate restoration of all ecosystems including forests and productive landscapes, and comprises four types of activities that guide restoration actions—namely the assessment of opportunities for ecosystem restoration, improving institutional enabling conditions, planning and implementation of restoration activities, and monitoring, evaluation, feedback and dissemination of results. ROAM is referenced in the preparatory documents of Decision XIII/5 as one of the tools and initiatives supporting ecosystem restoration,[10] as it "provides a flexible and affordable framework approach for countries to rapidly identify and analyse FLR potential and locate specific areas of opportunity at a national or subnational level."

Information on the contribution of FLR as an approach and ROAM as a methodology for the implementation of the STAPER was presented in the second meeting of the SBI in CBD/SBI/2/10/Add.2, where it is explained that the "assessment of opportunities for ecosystem restoration" and the "improvement of institutional enabling environment"—the first and second steps of STAPER—were directly addressed through country planning, design and implementation of early actions to restore landscapes under the umbrella of FLR and ROAM. These contributions are expanding to the "monitoring, evaluation, feedback and dissemination of results" step of STAPER as a result of the application of the Bonn Challenge Barometer of Progress, which is the global progress tracking protocol focused on FLR and commitments to the Bonn Challenge[11] (see pp.19).

[10] UNEP/CBD/SBSTTA/20/INF/35
[11] https://infoflr.org/bonn-challenge/bonn-challenge-barometer

Fort Portal, Uganda. Photo courtesy of Craig Beatty/IUCN

2. Generating biodiversity outcomes through forest landscape restoration

When working with degraded landscapes, the improvement of conditions that support biodiversity is a natural outcome of achieving any FLR objective. How biodiversity responds to FLR is positive and incremental; the biodiversity benefits of restoration will aggregate over time and may not be immediately apparent. As mentioned in the previous section, many of the opportunities for FLR are situated in mixed-use, human-dominated landscapes that often include remnant forests or vegetation. In fact, the majority of degraded land available for FLR is often on or adjacent to agricultural or pastoral land. It is also common that these degraded, productive lands exist near ecological corridors, areas of forests and woodlands, water sources, or other areas that are usually considered a higher-priority for conservation purposes. FLR addresses the challenges and opportunities of such areas at the landscape scale and can assess how the benefits to biodiversity are included within the diverse suite of interacting land-uses. While the success of FLR in productive lands can be measured by its ability to improve human livelihoods through criteria that include higher crop yields, diversified income sources, successful animal husbandry, jobs and others, the conditions that unite these outcomes are the improved components of biodiversity that support increased ecological productivity.

In the context of the Aichi Biodiversity Targets, FLR contributes to biodiversity in two ways:

1) through supporting process-related activities (including biodiversity mainstreaming and capacity development); and
2) through activity-based restoration interventions (management, rehabilitation, and conservation).

Section 2.1 provides a summary of FLR's contributions to all of the Aichi Biodiversity Targets and highlights the strong contributions FLR makes to Targets 2, 5, 7, 11, 12, 13, 14, and 15. This chart also indicates when these contributions are supporting process-related activities and enabling conditions, and when these contributions are expected as the result of targeted restoration actions on-the-ground.

Section 2.2 provides information on the practical application of FLR principles, maintained by the Global Partnership of Forest Landscape Restoration (GPFLR), to restoration on the ground, in the context of generating benefits for biodiversity in direct connection to progress of the Aichi Biodiversity Targets.

2.1 Summarizing forest landscape restoration's contributions to the Aichi Biodiversity Targets

This section provides an assessment for how FLR has the potential to contribute to each of the Aichi Biodiversity Targets, indicating the type of contribution (process-based or activity-based). Although FLR has the potential to contribute to each of the 20 Aichi biodiversity targets and the following table qualifies these contributions using gold, silver, and bronze medals to indicate, at a global level, how strongly the assessment and implementation of FLR opportunities will contribute to each target.

Table 1: *Medal system of FLR's contributions to the Aichi Biodiversity Targets, explained*

Medals		Meaning
Gold		Across jurisdictions and landscapes, FLR directly contributes to this Aichi Biodiversity Target
Silver		Depending on the type of restoration actions or strategy, FLR sometimes strongly contributes to this Aichi Biodiversity Target, while in other cases FLR does not necessarily align well with the Target
Bronze		Bronze typically indicates that FLR indirectly contributes to this Target in some meaningful way as a result of the broad objectives and principles of FLR.

This medal system should be understood as a broad interpretation of how FLR can contribute to the Aichi Biodiversity Targets. This is based on the information and experience generated from the application of ROAM in 40 jurisdictions and IUCN's demonstrated, long-term leadership on FLR as a concept. It is however, not a comprehensive assessment of how specific FLR actions contribute to each target. When considering local FLR implementation actions we would need to account for the particular context of a landscape, its people, and the FLR implementation strategy. For instance, in some places, FLR has made tremendous headway in reducing unsustainable agricultural subsidies and incentives that are harmful to biodiversity. In these cases, a national version of this table may indicate a higher quality of contribution from FLR to a particular Aichi Biodiversity Target. Nor should it be assumed that all FLR processes contribute to a gold standard to Aichi Targets 2, 5, 7, 11, 12, 13, 14, or 15, though these have broadly emerged as the strongest.

Table 2: *Summary table of FLR contributions to the Aichi Biodiversity Targets*

Aichi Biodiversity Target	Forest landscape restoration's contribution to Target Including whether FLR's contribution is based on the process of FLR opportunities assessment (process-based) or based on the actual or projected outcomes of FLR activities (activity-based).	
 By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	 Process-based	In each of the actions ultimately recommended by FLR assessments, the underlying objective is to restore, protect, and conserve the components of biodiversity. Due to the large global momentum behind the restoration of degraded and deforested areas through initiatives like The Bonn Challenge, FLR provides a significant practical contribution to the awareness and perceived value of biodiversity in many of its forms at different scales.
 By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	 Process-based	FLR is intended to provide nature-based solutions at both national and local levels to support food security, poverty reduction, rural enterprise, and other development strategies. The primary intent of FLR assessments is to generate the social, economic, and biophysical data and knowledge required to integrate large-scale restoration ambitions into policies and practices that support landscape restoration, and by natural extension the biodiversity values upon which restoration success will depend.
 By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	 Process-based	Through its focus on building dialogue regarding multiple and often interacting land uses within landscapes, FLR has already led to the elimination or modification of well-intentioned, but harmful agricultural subsidies. This combined with the data and knowledge on the production and flow of ecosystem services generated through ROAM, provides jurisdictions with additional information regarding their current natural capital and how landscape restoration activities can improve the delivery of ecosystem services, especially within payments for ecosystem services schemes.

By 2020, at the latest, governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption, and have kept the impacts of use of natural resources well within safe ecological limits.	Process-based	Businesses that rely on natural resources can invest in FLR to ensure that they can reduce costs and source natural resources sustainably and locally (including commitments to net-zero-deforestation). FLR provides recommendations and strategies for governments, businesses, and other stakeholders on specific interventions that support the sustainable production of natural resources as a component of human-dominated landscapes.
By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	Activity-based	One of the principles of FLR is to "maintain and enhance natural ecosystems within landscapes." As a result, resource consumption patterns are maintained or shifted to areas designated and planned for natural resource use. FLR includes actions that provide necessary resources for people such that the unsustainable use of native ecosystems and species is halted or reduced as part of potential land-sparing strategies to relieve pressure on species and natural ecosystems.
By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	Activity-based	FLR assessments have provided a stakeholder platform for discussions surrounding inland and coastal fisheries, including shrimp ponding and mangrove areas. In several cases, terrestrial restoration planning has direct and positive impacts on the conservation status of aquatic species. The restoration of mangrove landscapes/seascapes is often a critical component of maintaining viable juvenile populations of economically important species while supporting the human livelihoods that depend on the ecosystem services provided by mangroves.
By 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	Activity-based	One of the key concerns in FLR is the selection of appropriate restoration interventions across different land uses to increase resilience and ecological productivity (including to increase the yields of agriculture, aquaculture, and forestry) and conserving areas important for biodiversity. One of the key outputs of FLR processes are strategies and action plans that demonstrate the landscape-

		scale impacts of restoration interventions and sustainable land management on biodiversity.
By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	Activity-based	Excessive nutrient pollution, primarily from fertilizer use in agricultural intensification efforts has cascading effects across landscapes and watersheds. Forest landscape restoration seeks to use agricultural diversification and intensification strategies that build and support soil fertility to increase the agricultural production capacity of agricultural ecosystems (including soil).
By 2020, invasive alien species and pathways are identified and prioritised, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	Activity-based	FLR opportunities assessments can identify and analyse areas that are degraded due to the presence of invasive alien species, especially plants. By including invasive alien species in degradation assessments and mapping, appropriate FLR interventions can be assessed, and funding for the eradication of these species identified. In addition, FLR supports the use of native species where ever possible and appropriate, further reducing the proliferation and treat of invasive species.
By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	Activity-based	FLR can help relieve anthropogenic pressure on many vulnerable ecosystems. It supports the identification and classification and restoration of threatened ecosystems through information sharing and inclusion of the IUCN Red List of Ecosystems in ROAM assessments. Considering that FLR contributes to national carbon sequestration targets and global carbon sequestration goals it will presumably reduce carbon dioxide concentrations in the atmosphere, leading to less dissolved carbon dioxide in the oceans and less acidic conditions for corals and other calcium carbonate-based life-forms.
By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of	Activity-based	Many of the protected areas in the world are degraded and over-harvested for natural resources, and in need of FLR. Additionally, FLR assessments can help quantify the significant ecosystem services that protected areas generate for the wider degraded landscape. Therefore, FLR contributes to target 11 in two ways: (1) by restoring degraded protected areas and fragmented landscapes, and (2) by quantifying how protected areas contribute to the overall ecosystem provisioning of the landscape.

protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.		As a concept, FLR requires that functional landscapes provide the benefits and services upon which people rely, and therefore often includes some form of conservation strategy that uses systems of well-connected protected areas to support the biodiversity and ecosystem function of landscapes.
By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	Activity-based	Forest landscape restoration has the potential to restore critical degraded habitat as a component of diversified, landscape-based restoration strategies, thereby improving the conservation status of many threatened species. FLR will also address and halt many of the drivers of species decline through different FLR interventions relieving many species threats. Additionally, restoration interventions can employ planting or attracting strategies of threatened species, where appropriate.
By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	Activity-based	In the diversified approaches inherent in FLR strategies, the promotion, research, and use of genetically diverse agricultural and wild relative species in restoration interventions (e.g. agroforestry and successional planting strategies) is a key component of long term restoration success. Not only is genetic diversity important for minimizing genetic erosion, it is a critical component of local strategies for food security and climate change resilience – two common objectives for FLR initiatives.
By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	Activity-based	FLR relies on enhancing the ecological productivity that landscapes can provide to support human health, livelihoods, and well-being. Explicit in IUCN's approach to FLR assessments and strategies is a rights-based approach that takes stock of the needs of women, indigenous peoples and local communities (IPLCs), and minority groups. This helps to ensure that FLR interventions and strategies are gender responsive and serve to provide equitable and fair access to the benefits that flow from investments in FLR.

By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15% of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	Activity-based	While the contributions of biodiversity to carbon stocks is not a specific priority in the principles of FLR, Target 15's focus on the restoration of 15% of degraded ecosystems as a climate change and desertification mitigation strategy is central to FLR.
By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	Activity-based	As FLR interventions develop, there are significant opportunities for enterprise development and ingenuity in the production, distribution, and monetisation of FLR strategies and the processes that created them. The framework of stakeholder engagement and multi-sectoral platforms within FLR will assist in the communication and transfer of benefits, especially from the genetic resources resulting from FLR interventions.
By 2015, each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	Process-based	While most parties have already submitted an updated NBSAP since the adoption of the Aichi Biodiversity Targets, this document outlines how FLR has made a strong contribution to national and subnational commitments to biodiversity. Furthermore, this document demonstrates how FLR contributes to biodiversity strategies and action plans and how FLR will be a welcome initiative in the post2020 biodiversity framework.
By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective	Process-based	Within FLR assessments, planning and implementation, traditional knowledge and practices often form the baseline for what is possible under landscape restoration scenarios. It is expected that dialogue occurs between governments, IPLCs, and other key stakeholders regarding the targets and objectives of FLR and these processes are complimentary to the objectives of Target 18.

participation of indigenous and local communities, at all relevant levels.		
 By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	 Process-based	Large-scale FLR initiatives can be key knowledge dissemination platforms regarding the science and technologies of biodiversity as well as its status and trends. While FLR responds to the consequences of biodiversity loss, the connections between decreased landscape function and losses of biodiversity are not always clear to all stakeholders. The FLR opportunities assessments and planning processes can be a conduit for the transfer of this knowledge to stakeholders from the national to local scales.
 By 2020, at the latest, the mobilisation of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	 Process-based	While funding for FLR initiatives has thus far come from primarily from donors interested in climate change mitigation, the results of this funding contribute a great deal to Aichi Biodiversity Target 20 and the rest of the Aichi Biodiversity Targets, as outlined above. The CBD and parties now have a significant opportunity to leverage the results of the FLR movement to report progress on the 2020 biodiversity targets and to utilise this framework in the development of the post 2020 biodiversity framework.

Climate change mitigation and adaptation, and biodiversity in FLR activities

Research demonstrates that biodiversity levels in undisturbed forests are not statistically associated with carbon stocks, meaning that prioritising forest conservation for carbon outcomes does not necessarily protect areas with the highest biodiversity value (Ferreira et al., 2018). Unlike primary forest, human-dominated and deforested or degraded landscapes have the potential to generate correlative carbon and biodiversity gains. When restored, these areas not only increase carbon stocks, but also protect and enhance biodiversity. Promoting restoration at a landscape scale allows several types of interventions that prioritise different types of outcomes as part of a coordinated and holistic plan. In one landscape, restoration interventions can include carbon-intensive land stewardship areas while also protecting (or at least taking the pressure off) forested areas that are key for biodiversity conservation. Also, it is important to keep in mind that when the main outcome of restoring a particular landscape is carbon storage, carbon enhancement or carbon sequestration, and existing high-carbon forests are selected, conservation actions carried out to protect those forests do not translate automatically into a negative impact to biodiversity. The suggestion in those cases is to assess whether it is possible to select areas where both carbon and biodiversity can be enhanced in significant ways, or whether it is possible to carry out landscape restoration actions compounding different areas that generate high carbon stocks while others hold the most biodiversity potential (Beatty et al., 2018b).

The nature of FLR, represented in its definition and principles, limits interventions that could generate negative impacts to biodiversity through the selection of interventions that preferentially support only productive uses or carbon gains.

Under FLR interventions, the feared risks of clearing degraded forest areas for carbon-stock crops or for single-species plantations, or favouring high-carbon stock areas at the expense of biodiversity and species habitats should be discarded. As explained above, the nature of FLR, represented in its definition and principles, limits interventions that could generate negative impacts to biodiversity through the selection of interventions that preferentially support only productive uses or carbon gains. It is possible to design interventions where biodiversity and carbon are benefited simultaneously in landscapes that optimally integrate conservation for biodiversity priorities (landscape connectivity, habitat quality, among others ecosystem services), as well as selecting FLR interventions with higher carbon abatement potential.[12] What needs to be highlighted is that FLR usually generates the most benefits in degraded landscapes including highly disturbed forests, where carbon and biodiversity increase simultaneously as the landscape is restored (Anderson-Teixeira, 2018).

[12] https://www.sciencedirect.com/science/article/pii/S096098220901776X

Ecosystem-based approaches at the CBD and FLR

The topic of enhancing positive and reducing negative impacts of climate change activities on biodiversity has been brought up in the debates at COP throughout the years, where Decisions have addressed this by providing guidance, principles, scientific and technical advice, and encouraging cautionary actions by countries and non-governmental actors.[13] Prominently, ecosystem-based approaches have been raised as an approach to establish synergies between the actions driven by the prioritisation of carbon as the main desired outcome without generating negative trade-offs, for the conservation of biodiversity or sustainable development.

As an ecosystem-based approach, ecological restoration significantly contributes to climate change mitigation and adaptation. FLR, focused on forests and landscapes with trees, connects naturally with the latter in principles, visions and key considerations.[14] Regarding the obvious red flags when talking about examples of landscape restoration, activities such as the introduction of new species at the expense of existing biodiversity, afforestation of natural grasslands or areas with natural vegetation, among others[15], should be avoided as they negatively impact ecosystem integrity. FLR should be looked at as a constructive, forward-looking approach to the needs of the landscape and the communities who depend on it.

The landscape approach and principles under which FLR should be implemented responds to similar considerations as the ones identified under *ecosystem-based approaches for mitigation* at the CBD, including planning for the achievement of multiple benefits, improving biodiversity conservation and other ecosystem services while sequestering carbon, using native species in sustainable forest management activities, avoiding clearing or changing natural habitats, favouring the enhancement of landscape connectivity, among others.[16]

In the context of *ecosystem-based adaptation and disaster-risk reduction*, ecosystem restoration interventions, including in forest and landscapes areas, are identified by CBD decisions as options to address the impacts of climate change.[17] Likewise, it has been acknowledged that in order to maximise positive effects of activities directed to generating adaptation or mitigation outcomes, it is necessary to use a landscape planning approach, keeping in mind the ecosystems' functionality that will deliver goods and services in a resilient environment.[18] The other side of the coin belongs to activities aimed at reducing potential negative biodiversity impacts of climate change mitigation and adaptation measures, which translates into carrying out strategic environmental assessments and environmental impact assessments as a prior analysis of the options to implement and its potential impact.[19] In line with these environmental assessments, Decision X/33 indicates that countries should value the

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[13] Latest CBD Decisions include Decision XIII/4, XII/20, XI/19, XI/21, X/33

[14] Decision X/33 defines Ecosystem-based adaptation as the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change

[15] UNEP/CBD/SBSTTA/20/INF/1 par 34

[16] https://www.cbd.int/decision/cop/?id=12299 Decision X/33

[17] https://www.cbd.int/doc/recommendations/sbstta-22/sbstta-22-rec-07-en.pdf Page 6

[18] UNEP/CBD/SBSTTA/20/INF/1 https://www.cbd.int/kb/record/meetingDocument/107978?RecordType=meetingDocument&Event=SBSTTA-20

[19] https://www.cbd.int/decision/cop/?id=12299

biodiversity and ecosystem services which will contribute to the decision-making not only based on carbon outcomes but also on the full suite of benefits that can be generated from a particular set of restoration interventions.

2.2 How the FLR principles support biodiversity

With such an important focus on improving the ecological productivity of degraded landscapes, the benefits expected of biodiversity from the landscape restoration process play a central and guiding role in the assessments of landscape restoration opportunities. However, both restoration and biodiversity are complex and within the implementation of restoration activities there are bound to be trade-offs regarding the status and objectives of FLR as they relate to species, genes, and ecosystems. At all times, FLR interventions should focus on the principles outlined below, within their landscape context. Responsibility for ensuring that the principles of FLR (outlined in Table 3) inform the application of FLR strategies will always remain with sovereignties engaged in FLR, though processes like ROAM help build the capacity to institutionalise these principles within government and local administrative structures. That said, there are obvious trade-offs even among the components of biodiversity that will require deliberation and an assessment of costs and benefits among stakeholders.

When 'supporting biodiversity' is discussed as an objective of FLR, there are inherent value judgements. The types of biodiversity that stakeholders identify indicate stakeholder preferences for the biodiversity components that are important to them. The role of an FLR assessment, in this case, is to help bring multiple groups of stakeholders together to discuss the merits of different types of restoration actions as they may relate to biodiversity and how they support each other and the objectives of restoration within landscapes. In discussions of biodiversity trade-offs, it is essential that restoration plans work to generate diversified approaches to restoration at a landscape-scale that utilise a suite of strategies operating at different scales. The principles of FLR, outlined below, are well aligned with an ecosystem-based approach to restoration that also recognises that, among stakeholders, there are differences in restoration and conservation objectives, the importance placed on biodiversity, and the importance people attach to one species over another. In this sense, all biodiversity is not equal.

It is also important to recognise FLR actions that, in practice, may subvert some of the principles of FLR, including FLR actions that are not well-planned or are too narrowly focused on site-based instead of landscape-scale objectives. These may hinder the original objectives for undertaking landscape restoration in the first place. With that in mind, the FLR principles should always guide FLR strategies and actions to ensure that the incredible potential to mainstream biodiversity into large-scale landscape and development processes is realised, especially in ways that have so far eluded the biodiversity conservation community. As funding and restoration projects are approved and implemented, ideal opportunities are created to deploy several independent layers of project or donor-specific safeguard processes that help to mitigate against the risks of actions that might irresponsibly transform landscapes.

Table 3 shows the FLR principles as presented in the last Global Partnership for Forest Landscape Restoration report (Besseau et al., 2018) followed by an explanation on how each

of these principles address several potential concerns related to biodiversity and ecosystem integrity when implementing FLR.

Table 3: *FLR principles and practical application to biodiversity*

FLR principles	Application to biodiversity
Focus on landscapes Restore entire landscapes as opposed to individual sites. This typically entails balancing a mosaic of inter-dependent land uses, which include but are not limited to: agriculture, protected areas, agroforestry systems, well-managed planted forests, ecological corridors, riparian plantings and areas set aside for natural regeneration.	Concerns that may arise over the implementation of FLR strategies are often expressed as site-level concerns. For instance, some stakeholders could express concern that FLR is used as a justification to create single-species plantations that might have negative impacts on some prioritised components of biodiversity (e.g. threatened species). While this should be a serious consideration, it should also take into account that FLR focuses on restoring landscapes, not individual sites. Due to the inherent trade-offs and prioritisations of biodiversity within restoration strategies, these concerns should be raised within the landscape context of FLR. If approached holistically, the landscape approach should always produce positive contributions to landscape biodiversity.
Restore functionality Restore the functionality of the landscape, making it better able to provide a rich habitat, prevent erosion and flooding and withstand the impacts of climate change and other disturbances.	The assertion in this principle is that FLR improves the functions of landscapes in support of habitats and its people, with the implication that 'rich' is in reference to the biodiversity value of a specific place. This principle also addresses the contribution that FLR can make to resilience to climate change and landscape disturbances that threaten the functions that landscapes provide. This principle has distinct connections to the 'provisioning', 'regulating', and 'supporting' functions of ecosystem services.
Allow for multiple benefits Aim to generate a suite of ecosystem services and goods to allow for multiple benefits, by leveraging a suite of strategies. Consider a wide range of socially, economically and ecologically appropriate landscape restoration interventions, ranging from natural regeneration to tree planting for a wide range of social groups.	The principle of multiple benefits within restoration fits well within the landscape-scale of FLR, though it is also possible at the site level. At the landscape scale, generating multiple benefits from several intervention types is a fundamental requirement in an FLR strategy. Allowing for multiple benefits from FLR, from those that flow from the restoration or conservation of biologically 'rich habitats' as well as the establishment of timber plantations, for instance, is what makes a dialogue and landscape strategy for FLR possible. In this sense, the diversity and scale of FLR interventions dilutes the trade-offs associated with any one intervention type.
Involve stakeholders Actively engage stakeholders, including vulnerable groups, in	Similar to ecosystems within a landscape, tenure and governance are often dynamic and diverse. The engagement of people with the rights to manage lands

decisions regarding restoration goals, implementation methods and trade-offs. Respect rights to land and access to resources, ensure land management practices are adapted to the people living on the land and provides them with benefits. A well-designed process will benefit from the active voluntary involvement of all stakeholders.	for FLR will bring with it many perspectives on what FLR should address, how it can best contribute to social, economic, and ecological objectives, and how groups of stakeholders can work on common goals. How stakeholders prioritise the components of biodiversity within the FLR process will have direct consequences for the types and locations of biodiversity that FLR will ultimately support. In tandem with the concept of multiple benefits, the active engagement of multiple groups of stakeholders helps ensure that only one perspective on biodiversity priorities does not drive the FLR process.
Tailor to local conditions Adapt restoration strategies to fit local social, cultural, economic and ecological contexts; there is no 'one size fits all'. FLR considers local needs and landscape history. It draws on latest science and best practice, and traditional and indigenous knowledge.	Invoking landscape history, this principle helps ensure that as restoration is planned and implemented, it responds to the needs of local people and ecosystems. This means that although restoration strategies may suggest types of interventions that could be appropriate, the final decisions on the implementation of restoration are made at a fine spatial scale. This leads to a large diversity of restoration interventions adapted to local contexts and ensures better long-term adoption of the FLR practices since local implementation of restoration strategies is often a process that takes place over an extended period of time.
Maintain and enhance natural ecosystems and habitats within landscapes Avoid further reduction or conversion of natural habitats and forest cover. Address ongoing loss and conversion of primary and secondary natural forests, native grasslands, wetlands and other natural habitats. FLR enhances the conservation, recovery, and sustainable management of forests and other ecosystems within landscapes.	This FLR principle is directed at restoring and conserving natural ecosystems and habitats in degraded and deforested landscapes. Using a landscape-level approach to understand the necessary trade-offs between land-uses in human dominated mosaics, restoration for production purposes will largely take place on degraded agricultural and silvopastoral lands while conservation and protection may dominate in other areas. Moreover, these natural ecosystems and habitats provide many important regulatory (water cycle, climate, biodiversity), supportive (preventing of erosion for example) and production services (seed sources) in the wider landscape for other land uses. Natural ecosystems and habitats can be managed for non-timber forest products, medicinal purposes and other sustainable uses.
Adaptively manage for long-term resilience	This principle helps to ensure that FLR can respond to short and long term social, economic and ecological changes in landscapes, for example to climate change,

FLR seeks to enhance the resilience of the landscape and its stakeholders long-term. Be prepared to adjust the restoration strategy over time as environmental conditions, human knowledge, economic incentives, and societal values change. Track and monitor progress and develop a learning agenda to adaptively manage over time.	changing economic incentives or cultural ones, etc. In order to adapt to such changes, it is important to monitor and learn from the impacts of proposed FLR interventions on the system. When managing for change, biodiversity components to be considered are the potential for invasive species, occurrence of native species, genetic diversity, amongst others.

2.3 Monitoring the biodiversity benefits of forest landscape restoration

The assessment of FLR opportunities, such as through ROAM, is often separate from the implementation of restoration strategies. The roadmaps that explain potential nature-based solutions through FLR focus on the possibilities of the future success of FLR by analysing and projecting current and future landscape conditions and scenarios. These assessments form baselines against which restoration success can be measured and the proposed restoration scenarios provide not only a restoration strategy, but discrete opportunities for the adaptive management of these strategies.

At the scale of a nation, measuring increases in ecological productivity will be broad and, by necessity, composed of myriad different and interacting factors across many sectors. For instance, in the agriculture sector, increases in ecological productivity may play out as increased crop yields or as increased resistance to pests and disease – aggregated as statistics at the national level, but potentially with significant differences in subnational or local situations.

The information gathered during the assessment of FLR opportunities and the changes over time due to implementation of FLR activities could be used to report on progress of Aichi Biodiversity Target 7 – when restoration activities have taken place in productive landscapes—Aichi Biodiversity Target 9—if restoration activities include invasive species control or eradication—Aichi Biodiversity Target 13—as genetic diversity is maintained or enhanced through restoration activities—and Aichi Biodiversity Target 14 where changes in biodiversity can be reported as gains in ecosystem service provision and access.

In terms of biodiversity outcomes, monitoring the biodiversity benefits of FLR can be described in three different, but complementary ways:

- Biodiversity responses to FLR
- Measured increases in conditions beneficial for biodiversity responses to FLR
- Measured reductions in pressures/threats to biodiversity

Both how biodiversity responds to FLR as well as any measured reductions in pressures/threats to biodiversity can form a strong connection to Aichi Biodiversity Target 12. Measuring the increases in conditions beneficial for biodiversity can relate to process-based Aichi Targets as well as the improvement of physical habitat conditions for biodiversity as a result of implemented FLR strategies.

Biodiversity responses to FLR

These metrics describe how genes, species, and ecosystem diversity are directly restored through FLR. They focus on measuring biodiversity stocks and include, for instance, measurements of the diversity of species used to facilitate restoration efforts or in the direct responses of species' populations to FLR. Biodiversity increases can be measured as increases in species abundance or diversity of different taxonomic groups (e.g. birds, mammals, insects, fungi, plants). In FLR, planning processes integrating and building capacities

of local communities to undertake this type of monitoring, with the necessary guidance often suggested as part of FLR planning processes, is a good strategy.

Monitoring the establishment and persistence or the responses of biodiversity in a landscape that is undergoing restoration is the gold standard for monitoring and evaluating how biodiversity stocks respond to FLR. Additionally, as FLR interventions are strategically implemented across landscapes, the flows of biodiversity benefits among species, ecosystems and into social and cultural systems should align with the intended biodiversity benefits and/or ecosystem services expected. Schmeller et al. (2018) outline a helpful framework of 'essential biodiversity variables', mapped out by Aichi Target. This framework includes many variables that could be used to monitor FLR, including measurements of 'ecosystem structure', 'taxonomic diversity', and 'species populations'. Additionally, measurements of the flow of ecosystem services or the social and cultural outputs of biodiversity can also be included as measured responses of biodiversity to FLR.

Measured increase in conditions beneficial for biodiversity

FLR can create a measurable increase in the biophysical, social, economic and political conditions that come from the restoration, conservation, and protection of biodiversity. In order to achieve this, biodiversity needs to be mainstreamed into policies and management of landscapes. The overall success of FLR will, in large part, be accomplished by demonstrating that the conditions created by FLR planning and action have benefited both social and biophysical components of landscapes.

In practice this can mean utilising a diversity of species in FLR interventions to support improving habitat quality for threatened species, for example. Additionally, a focus on improving habitat for species of concern can take advantage of restoration and conservation practices to retain or improve structural complexity and genetic diversity across landscapes and to augment these factors in the types of restoration actions under consideration.

One of the best ways to objectify and measure improvement of biophysical conditions for biodiversity gains is to use changes in the provisioning of ecosystem services that result from FLR as a direct correlation. As described in the previous section, ecosystem services have the potential to satisfy metrics across environmental, economic, and social sectors. They provide a quantitative baseline for monitoring, and data for tools like the Restoration Opportunities Optimization Tool (ROOT) which was developed specifically for FLR assessments, and provides information for decision-makers on the optimised combination of FLR interventions to achieve desired multiple benefits (Beatty et al., 2018b).

The magnitude of the incremental changes in conditions that support biodiversity and the components of biodiversity itself are the fundamental metrics upon which 'increasing ecological productivity' relies, as a foundational principle of FLR. The metrics used to track restoration success are therefore wholly complementary and aligned with the metrics used and desired to monitor changes in the conditions beneficial to biodiversity, as outlined in many of the Aichi Targets.

A measured reduction in threats to biodiversity: Reporting on Aichi Target 12

The benefits of FLR to biodiversity can also be cast in terms of a measured reduction in drivers, threats and stresses to biodiversity. A holistic assessment of degradation and degradation drivers should accompany any FLR opportunities assessment. ROAM assessments in particular are replete with assessments of the components of degradation, the causes of degradation, and the suggested landscape scale interventions that will lead to transformational change.

As categorically described in here, the IUCN threat classification scheme (Version 3.2), while not a rubric against which landscape degradation is universally considered, does share content and provide a useful guideline against which a reduction in species threats through FLR can be measured.

These assessments can help validate the assessment of the threats faced by species in the IUCN Red List through a stakeholder consultation and spatial analysis that is independent of the Red Listing process. This approach utilises the lens of sustainable development rather than conservation to address landscape conditions. As such, assessments of degradation are completed with the objective of reducing degradation drivers in service of more sustainable land use objectives. The conditions against which restoration progress will be measured will ultimately be the degree to which degradation and its component features are halted, reversed, or eliminated.

IUCN Threats Classification Scheme (Version 3.2)

1. Residential and commercial development
2. Agriculture and aquaculture
3. Energy production and mining
4. Transportation and service corridors
5. Biological resource use
6. Human intrusions and disturbance
7. Natural system modifications
8. Invasive and other problematic species, genes and diseases
9. Pollution
10. Geological events
11. Climate change and severe weather

Degradation is often the physical result of many of these threats, which are driven by social, cultural or economic factors that have intensified in many landscapes over the past 70 years. Assessments of degradation in ROAM utilise stakeholder consultations, the best science, and the best knowledge to inventory the components of degradation (and threats) facing a landscape. ROAM then finds collaborative nature-based solutions for restoration that address many of

As one of the primary causes for increases in risk of extinction, a reduction in landscape degradation and its components—a fundamental objective of all FLR initiatives—would immediately confer a reduction in extinction pressures on a significant portion of threatened species in the world. Not only confined to terrestrial species, FLR actions that reduce sedimentation of watercourses and bodies would alleviate significant extinction risks for many of the world's most threatened freshwater species. This work across even a small fraction of the millions of hectares committed to FLR could confer a tremendous amount of support to national biodiversity commitments, the Convention on Biological Diversity and specifically to Aichi Biodiversity Target 12 by aligning restoration's success in halting or eliminating landscape degradation with measured reductions in extinction pressure to threatened species.

FLR not only provides this information, but does so over large areas. Biodiversity conservation often prioritises conservation funding to support areas of concentrated threatened species and habitat —"biodiversity hotspots". However, the pressures facing common species are often no less intense. Many common species formerly included in the IUCN Red List as Least Concern are undergoing drastic population declines (hippos, giraffes, others) and many once common species have, or will soon be added to the threatened species categories within the IUCN Red List. FLR has the real potential to provide broader habitat and species monitoring across a wider range of habitat for a wider range of species in a way that, since it does not have to prioritise areas of high biodiversity or high extinction threat may be better able to help monitor changes in biodiversity at larger scales.

The majority of FLR strategies, based on ROAM, have not yet been implemented. This presents an immediate opportunity to use the baseline results of FLR assessments to measure biodiversity responses to landscape-scale FLR projects. At this time, it is entirely possible that scientists studying components of biodiversity can utilise upcoming large-scale restoration programmes as a treatment factor in their experimental design to demonstrate how the components of biodiversity respond to FLR and if these responses are aligned with the expectations of their national biodiversity strategy and action plans and their FLR objectives.

The information gathered during the assessment of FLR opportunities and the changes over time due to implementation of FLR activities could be used to report on progress of Aichi Biodiversity Target 7 – when restoration activities have taken place in productive landscapes Aichi Biodiversity Target 9 – if restoration activities include invasive species control or eradication – Aichi Biodiversity Target 13 – as genetic diversity is maintained or enhanced through restoration activities – and Aichi Biodiversity Target 14 where changes in biodiversity can be reported as gains and improvement for ecosystems.

Tracking FLR progress across the world: The Bonn Challenge Barometer of Progress[20]

The Bonn Challenge Barometer will support jurisdictions that have committed to the Bonn Challenge in evaluating progress toward meeting their commitments by offering a framework to consistently and systematically take stock of hectares brought under restoration. The Bonn Challenge Barometer will also utilise a standardised set of policy, regulatory, financial, and technical components deemed important for achieving successful landscape restoration.

IUCN is leading the design of the Bonn Challenge Barometer and its associated protocol, with the participation and contributions from government and non-government stakeholders in six pilot countries: Brazil, El Salvador, Mexico, Rwanda, Sri Lanka, and USA. The main features of the protocol are:

- It offers the ability to customise scale and national circumstances regarding the availability of information on FLR, adapting to the amount and type of data available for reporting and offering a 3-tier structure representing levels of accuracy.

[20] The information in this section is a summary of the draft publication of the Bonn Challenge Barometer – Progress Tracking Protocol, to be officially launched in December 2018 and posted online on www.infoflr.org

- It minimises the reporting burden by drawing information from existing reporting efforts under existing international commitments (UNFCCC, CBD, LDN, UNFF). The Barometer provides ample guidance and resources, and limits data collection only to indicators for which information can realistically and reliably compiled.
- Assigns institutions or individuals to collect all the necessary information for the Bonn Challenge Barometer reporting. Reporting will likely be undertaken every two years, aligning with other international reporting commitments where possible to ensure consistency and minimise workloads.
- The reporting under the Barometer is done through the Bonn Challenge Barometer Data Form, soon to be migrated into an online platform available at the end of 2018.

The Bonn Challenge Barometer protocol is structured into two main components comprised of an assessment of key enabling conditions determined crucial for ensuring long-term success of FLR efforts/ These 'Success Factors' which include policy and institutional arrangements, and financial and technical planning parameters. The second component focuses on progress and impacts—called Results and Benefits—and includes hectares under restoration including climate impacts, biodiversity impacts, socio-economic impacts, among others.

The Bonn Challenge Barometer and the CBD

Most Bonn Challenge jurisdictions are parties to the Convention on Biological Diversity and undertake national reporting on measures taken for the implementation of the Convention, addressing progress regarding their NBSAPs. Several of the Aichi Biodiversity Targets around which NBSAPs are built are highly relevant within the context of Bonn Challenge FLR commitments. The aim is to utilise the reporting under the CBD and provide the relevant connections to progress on FLR action. Countries can review their reporting and their strategies and goals to achieve several of the Aichi Biodiversity Targets and identify which actions represent progress that can be connected to FLR and be reported under the Barometer.

The Bonn Challenge Barometer can help monitor whether FLR has helped combat fragmentation of forest habitats (Target 5) or if areas under sustainable agriculture and/or forestry have increased (Target 7). It can also help catalogue where cultivating and planting native species *in situ* or *ex situ* are part of restoration actions (Target 13), and whether efforts are being made to measure the extent to which ecosystems and ecosystem services are being restored (especially if Key Biodiversity Area spatial layers are used to assess this) (Target 14 and 15), among others. Also, those with Bonn Challenge commitments will be asked to list Key Biodiversity Areas, protected areas and ecological corridors where FLR activities take place, indicating the total number of hectares where FLR activities are being implemented in close proximity to areas important for biodiversity.

The Bonn Challenge Barometer Progress Tracking Protocol will be launched in December 2018. It will provide comprehensive guidance on reporting progress on FLR and will add to the evidence base on the role of FLR in meeting international commitments as well as national goals on sustainable development, biodiversity and human well-being.

3. ROAM results for enhancing the implementation of national biodiversity strategies

That restoration and biodiversity are intricately linked is not a revolutionary idea. The growth and conservation of species is a fundamental precondition for any success in restoration. However, landscape restoration need not completely restore all species and their individual functions to achieve the benefits sought from restoration, and in many cases this is neither practical nor possible. Conversely, an approach that does not account for the role of biodiversity in landscape restoration risks investment in an approach that may not provide the full restoration outcomes that are of interest to stakeholders and practitioners. With this in mind it is not a question of whether to integrate biodiversity into FLR but where to emphasise it and to what degree.

To answer these and other questions surrounding FLR, The IUCN Secretariat's Global Forest and Climate Change Programme, along with IUCN's Regional Offices in Costa Rica, Ecuador, Kenya, Burkina Faso, and Thailand, and several IUCN country offices have worked with IUCN Members and partners from governments, non-governmental organisations, and academia to implement ROAM. The breadth of these assessments truly reflects the value of IUCN as an organisation that can convene stakeholders from many sectors to combine the best available science and the best available knowledge to develop nature-based solutions to conservation and development challenges.

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The results of these assessments are not uniform. Each jurisdiction has different levels, types and drivers of degradation, restoration objectives, stakeholders, data availability, and desired benefits. However, FLR assessments facilitated by IUCN using ROAM address the social, economic, and biophysical components of restoration through an adaptive, stakeholder driven process that generates a diversity of restoration opportunities to support increased ecological productivity and improved livelihoods across landscapes.

While some FLR assessments through ROAM focus on specific biodiversity elements, it is important to note that the absence of biodiversity from a ROAM assessment is not necessarily a reflection of a jurisdiction's interest in biodiversity conservation. Countries may have strong commitments and results in biodiversity conservation, protected areas, biodiversity access and benefit sharing whose mechanisms characteristically fall outside the mandate of government departments charged with leading on FLR. In light of this, it is even more important to

strengthen the institutional connections between those with an outright mandate for biodiversity conservation and those for whom the benefits of biodiversity are an inferred precondition (e.g. agricultural productivity). For guidance on how these connections can be strengthened, see Beatty et al. (2018).

The IUCN Red List of Threatened Species provides information on a species-by-species basis and much of this information has now been linked to assessments of the conservation status of ecosystems through The Red List of Ecosystems and through the Key Biodiversity Areas Partnership.

All of these 'knowledge products' provide information that can inform decision-making, especially within an FLR context. Through the ROAM process, data on species and biodiversity are often integrated into the forest landscape opportunity assessment process to pair areas that are important for biodiversity with areas that are important for FLR. These analyses help jurisdictions not only to define where biodiversity is most threatened or important to conserve, but where FLR initiatives can be designed or utilised to provide the framework for decision-making that supports multiple objectives, including those of the Convention on Biological Diversity.

Muranga county, Kenya. Photo courtesy of Craig

Malawi's National Forest Landscape Restoration Assessment (Malawi Ministry of Natural Resources, Energy and Mining, 2017) discovered that degraded Key Biodiversity Areas (2017) accounted for roughly 12% of nationally-determined degraded land. As such, methods of restoration that support biodiversity and critical habitats in this 12% could conceivably restore all of the degraded land within Key Biodiversity Areas, leading to tremendous gains for biodiversity in support of Malawi's National Biodiversity Strategy and Action Plan. Furthermore, forest landscape restoration outside of these areas would have significant positive impact on species threatened by poor water quality and sedimentation, the major threat to Malawi's threatened aquatic species.

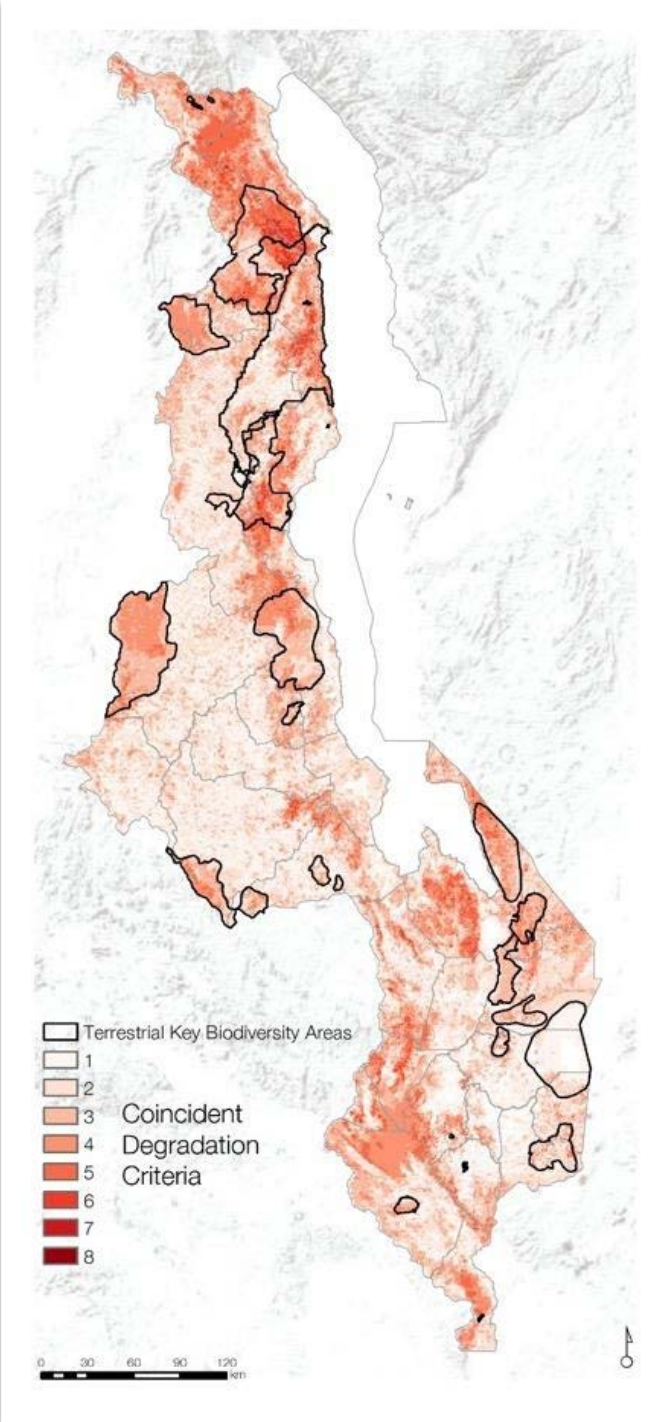

Figure 1 Malawi's key biodiversity areas and coincident degradation criteria[21]

[21] Ministry of Natural Resources, Energy and Mining -Malawi (2017). Forest Landscape Restoration Opportunities Assessment for Malawi. NFLRA (Malawi), IUCN, WRI. xv + 126pp. https://portals.iucn.org/library/node/46837

Figure 2 below shows the biodiversity components of a multi-criteria analysis during a ROAM assessment for the government of Burundi. Areas of darker green indicate a higher frequency of overlap of input data layers, of which there are six. These data are used to tailor landscape restoration programmes to support areas where biodiversity is important to conserve and restore.

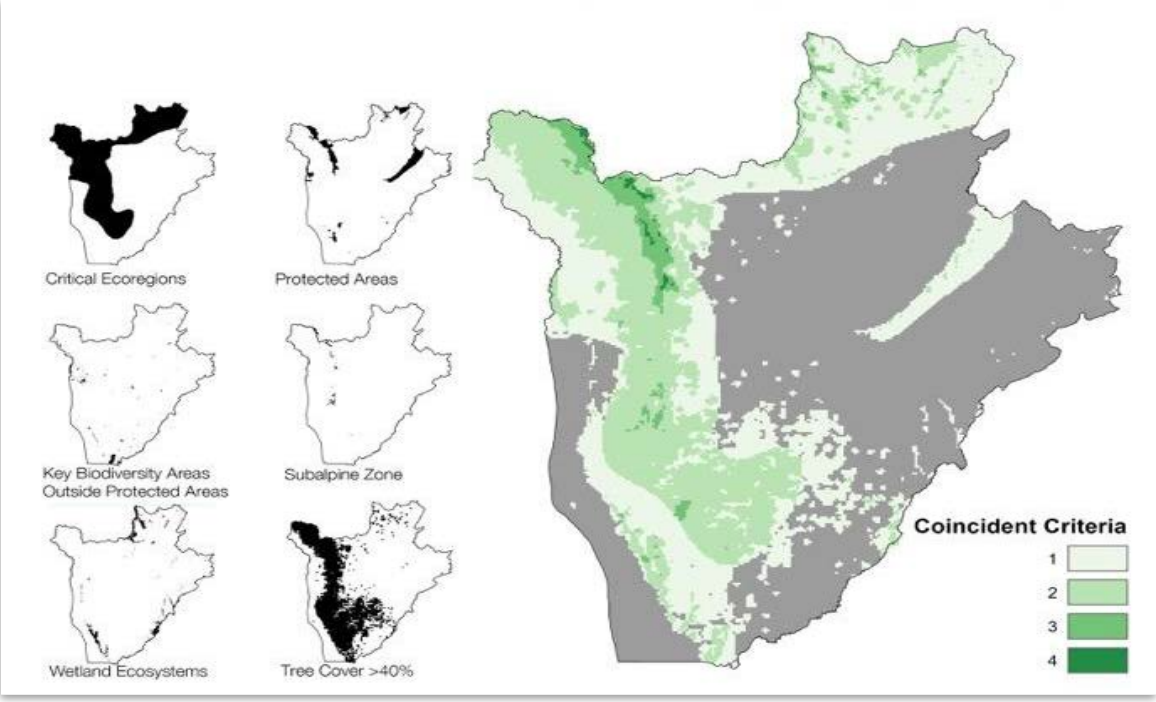

Figure 2 *Burundi forest landscape restoration multi-criteria analysis – biological diversity*[22]

The FLR assessment in Viet Nam's Quang Tri province was largely focused on improving biodiversity for increased livelihood sustainability and landscape resilience. Dominated by short-rotation acacia plantations and cassava farming, the recommendations from the ROAM assessment outline forest landscape restoration interventions that can improve acacia management and improve biodiversity for more diversified livelihood and conservation outcomes.

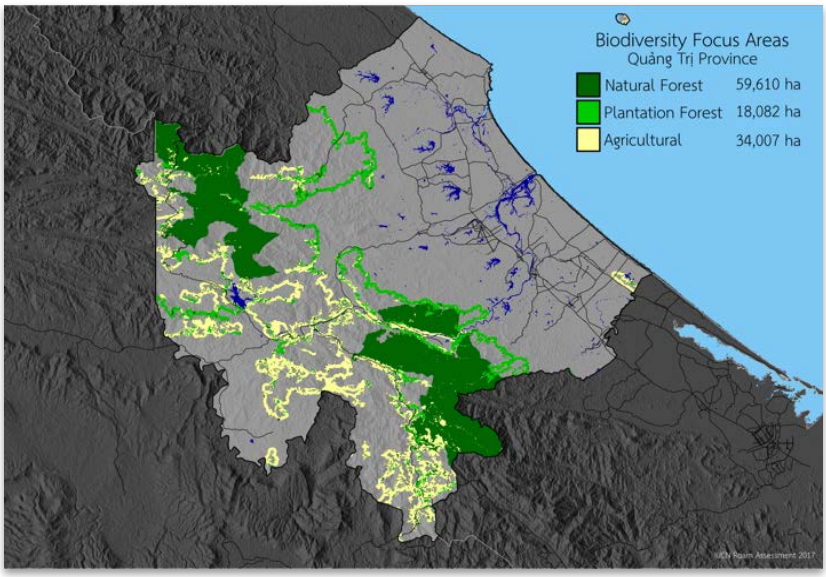

Figure 3 *Biodiversity Focus Areas in Quang Tri province, Viet Nam*[23]

[22] Burundi: Burundi subnational forest landscape restoration assessment (2017)Ministry of Water, Environment, Land Management and Urban Planning (MEEATU). Restricted distribution

[23] Forest Landscape Restoration in Quang Tri, Vietnam Transition from quantity to quality. (2018). IUCN. https://www.iucn.org/sites/dev/files/content/documents/2018/iucn_27.7.pdf

Figure 4 below shows 'forest fragmentation' and 'forest connectivity priority' in support of building biodiversity corridors for puma and jaguar in a portion of the Antioquia region of Colombia. Completed in partnership with the Alexander von Humboldt Biodiversity Institute (among other partners), the ROAM assessment in this part of Colombia focused both on how forest landscape restoration could support biodiversity corridors and how a diversified approach to the restoration of degraded agricultural areas could support large improvements in the regions biodiversity and ecosystem services.

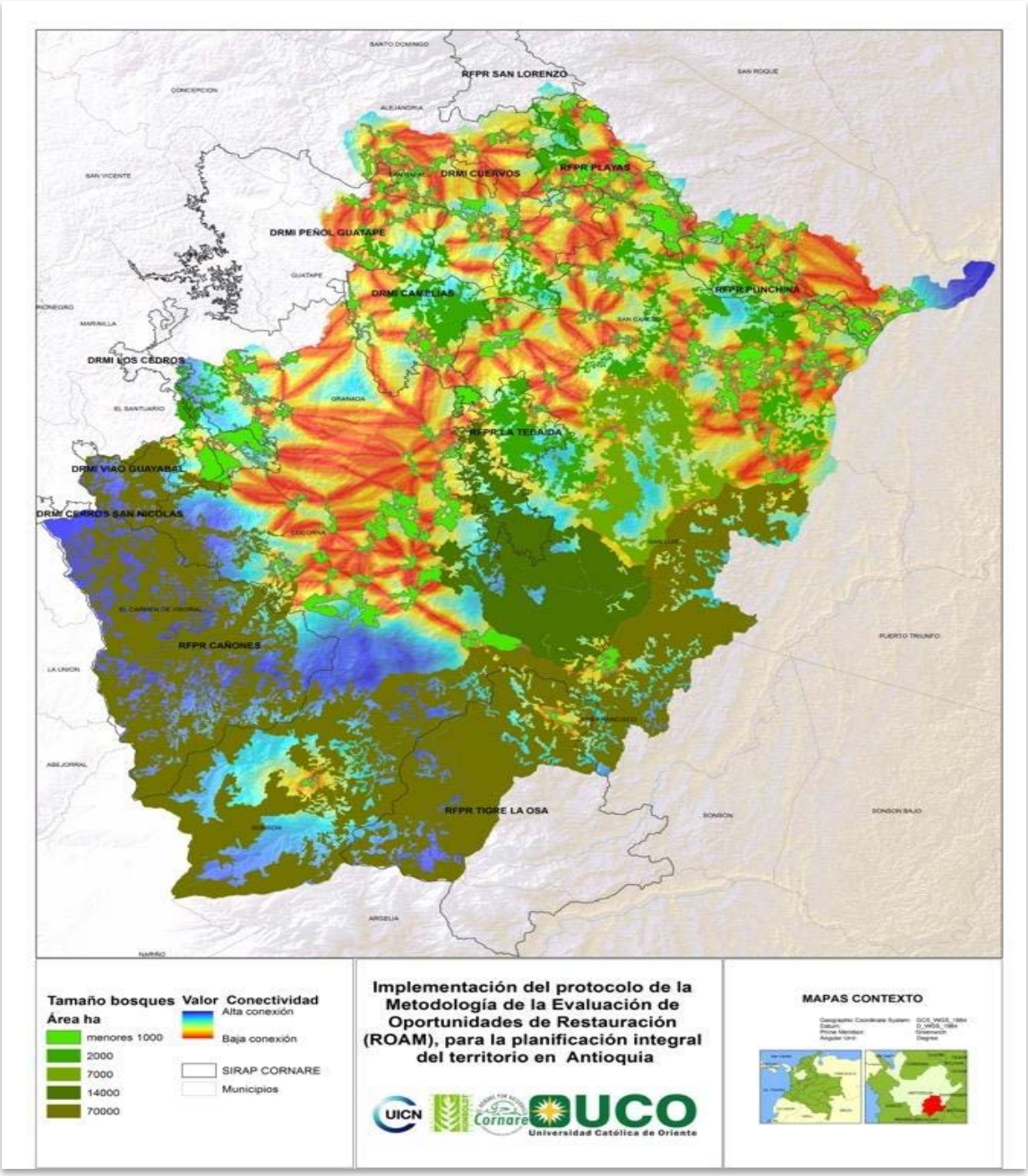

Figure 4 Forest connectivity priorities to implement FLR in the Antioquia Region, Colombia[24]

[24] Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Cornare, Universidad Católica de Oriente, UICN (2018) Implementación protocolo Metodología la Evaluación de Oportunidades de Restauración (ROAM): Inforeme final. Restricted distribution.

The figures above demonstrate a few examples of how biodiversity information has been integrated into FLR opportunities assessments and planning through ROAM. Most ROAM assessments strongly support the process-based targets in Aichi Target Strategic Goal A as well as some of the residual process-based components of other targets (especially Aichi target 15 for assessing degradation).

The second way that these ROAM assessments contribute to CBD targets are in the design and implementation of restoration strategies—the FLR implementation phase. The landscape approach inherent in FLR implementation can not only demonstrate where restoration supports the most threatened species and ecosystems, but it can also demonstrate that the site-level benefits from one intervention can interact with FLR benefits from multiple other sites to raise the quality of biodiversity throughout the landscape. This is more than just an overlap of restoration opportunity and biodiversity conservation priority, it is an acknowledgement of the spatial and temporal interactions among species across land uses and landscapes that support biodiversity restoration and conservation.

The past five years have seen a multitude of FLR opportunities assessments, and by the end of 2018 a significant portion of the administrations that undertook these assessments will have moved towards implementation of their FLR strategies. As FLR moves from assessment to implementation there are significant opportunities to monitor the landscape changes that are positive for the components of biodiversity and FLR, as outlined in section 2.4. However, these possibilities are dependent on the integration of biodiversity components in the assessment and strategy development phases during ROAM. If biodiversity is not strongly incorporated, it will be difficult to attribute biodiversity gains to FLR implementation. If biodiversity is included, as outlined in the *Biodiversity guidelines for FLR opportunities assessments* (Beatty et al., 2018), the potential contributions of large-scale landscape investments in FLR activities has the very likely potential to lead to transformational landscape and societal change.

Several countries have already recognised the synergy between their forest landscape restoration commitments under the Bonn Challenge (or regional FLR initiatives) and their Aichi commitments. These synergies, in some cases, are incorporated into national biodiversity strategies and action plans. In other examples, countries are already reporting progress on restoration action in their national progress reports to the CBD. Finally, several countries have included biodiversity as an explicit component of the process to identify restoration opportunities and have taken steps to ensure that investments in FLR are broadly catalogued and implemented with mutually beneficial outcomes under national and international policies and commitments.

The next and final section of this document will outline a sample of the results of twenty-three FLR assessments using ROAM. In this section, we first demonstrate how each of the referenced ROAM assessments contribute to broad Aichi Biodiversity Target goals for the "gold" Aichi Targets. However, it should be clear that these assessments, in all cases, contribute to other 'bronze' and 'silver' Aichi Targets as well. The document concludes by providing specific examples of how information contained in the ROAM assessments can be used to report against targets outlined in a country's NBSAP. Due to the large volume of country-specific information for reporting on NBSAPs it was not possible to include a complete

analysis of how FLR assessments have contributed to all NBSAP targets for all countries. However, this information is available by contacting the authors of this report.

3.1 Consolidated review of ROAM assessments, the Aichi Biodiversity Targets, and NBSAPs

Table 4 shows ROAM assessments' potential contributions to reporting under each of the "gold" Aichi Targets identified in Table 2, above. Results from national or subnational ROAM can either be used to report national progress on the indicated Aichi Targets (or its complimentary national target indicated in the NBSAP) or the implementation of FLR strategies developed by the ROAM process can lead to direct outcomes that can be reported on under the CBD.

Table 4 *ROAM assessments' contributions to selected Aichi Biodiversity Targets*

ROAM Assessment Country	2	5	7	11	12	13	14	15
Brazil	•	•	•	•	•		•	•
Burundi	•	•	•		•		•	•
Cambodia	•	•	•	•	•	•	•	•
C.A.R.	•	•	•	•	•		•	•
Colombia	•	•	•	•	•		•	•
Costa Rica	•	•	•		•		•	•
Côte d'Ivoire	•	•	•	•	•		•	•
El Salvador	•	•	•	•				•
Ethiopia	•	•	•		•		•	•
Ghana	•	•	•	•	•	•	•	•
Guatemala	•		•					•
Honduras		•	•	•				•
India	•	•			•		•	•
Indonesia	•	•	•	•			•	•
Kenya	•	•	•				•	•
Laos	•	•	•		•	•	•	
Madagascar	•	•	•	•	•		•	•
Malawi	•	•	•		•	•	•	•
Mexico	•	•	•	•				•
Mozambique	•	•	•		•	•	•	•

Myanmar	•	•	•		•		•	•
Nicaragua	•							•
Peru		•		•		•		•
Rwanda	•	•	•				•	•
Uganda	•	•	•		•	•	•	•
Viet Nam	•	•	•		•		•	•

While the correlations among biodiversity and forest landscape restoration are important for building a case for why biodiversity should be an explicit component of FLR opportunities assessments, and implementation, we no longer need to rely only on explaining the correlations. Many countries have already directly incorporated components of biodiversity within their FLR assessments using ROAM. However, despite the obvious connections to the Aichi Targets, the focus of these opportunity assessments is typically on ecological productivity and increasing human livelihoods. As such, although most assessments mention the Convention on Biological Diversity and/or The Aichi Biodiversity Targets, the reports tend to highlight the more development-focused objectives of FLR, rather than the conservation or biodiversity benefits.

The section that follows closes this gap by reviewing how FLR assessments from 26 countries where contribute or have the potential to contribute to the Aichi Targets. While FLR contributes to all of the Aichi Targets (as outlined in Table 2), here we highlight how these assessments, completed using the ROAM process, contribute to the Aichi Targets to which FLR can make the most substantive and direct contributions to targets 2, 5, 7, 11, 12, 13, 14, and 15.

Although we explore the contributions that these FLR assessments and their resultant reports and strategies make to these eight Aichi Targets, it is helpful to keep in mind that the FLR interventions that support the achievement or progress on these targets exist within much broader, landscape-scale strategies that have many different and interacting components. It is, however, our thesis that while FLR may be selected to generate nature-based solutions to climate and sustainable development challenges, the benefits to each of the components of biodiversity can be equally as potent.

Table 5 Synopsis reports of the general geography, FLR commitments, FLR objectives, selected FLR interventions, total identified FLR opportunity area (in hectares) and Aichi Biodiversity Target contributions for each of the 26 ROAM reports analysed for this section.

Country	FLR objectives within ROAM assessments and linkages with Aichi Biodiversity Targets
Brazil	Brazil's five subnational ROAM assessments were carried out in the States of Pernambuco, Federal District, Espírito Santo, São Paulo, and Santa Catarina. These assessments have been compiled under one publication which aims to outline what was learned during implementation so as to share results, as well as to present conditions and institutional mechanisms needed to obtain those results. General objectives from the subnational reports include identifying priority areas for restoration, determining costs and benefits of each restoration intervention, and analysing investment and financing options for restoration. Restoration interventions included agroforestry and restoration of native forest species with opportunity areas across all five states totalling an estimated 3,937,722 hectares for various small-scale ROAM pilots and a larger ROAM assessment of Pernambuco which identified an opportunity area of an estimated 3,452,722 hectares.
Burundi	Burundi's completed a subnational ROAM assessment in 2017 that focused on six provinces (Bubanza, Bujumbura Rural and Kayanza in Western region and Cankuzo, Muyinga and Ruyigi in Eastern region of Burundi). The objectives of forest landscape restoration in Burundi are to combat soil erosion, increase soil productivity, preserve and restore biodiversity, tackle rural poverty, generate lasting social, economic and environmental returns, decrease siltation of marshes, and enhance climate resilience especially for the rural poor. Restoration interventions suggested in the assessment include reforestation, rehabilitation of quarries, agroforestry, ecological agriculture, terracing, and plantations of bamboos and other appropriate indigenous plant species. The restoration opportunity area, which includes defined quotas of hectares for each intervention type, totals 345,615 hectares within the six provinces. Pilot implementation is underway in two communes. The implementation of the recommendations of this ROAM assessment through active government funding and external lending will produce results for ABT 2, 5, 7, 12, 14, and 15.
Cambodia	A ROAM assessment in Kampong Thom, Preah Videar, and Siem Reap, Cambodia highlighted restoration transitions with key linkages, both direct and indirect, to many related Aichi Biodiversity Targets across an opportunity area of 209,000 hectares. Suggested restoration interventions are native forest restoration (comprised of tree planting

	enriched with economic timber and non-timber forest product (NTFP) species, protection, assisted natural regeneration, tree planting, enrichment for locally extirpated species), enrichment planting for locally extirpated species, flooded forest restoration with invasive species management and fire prevention, and conservation agriculture. Overall, key Aichi Biodiversity Targets addressed by ROAM in Cambodia are 2, 5, 7, 11, 12, 13, 14, and 15.
Central African Republic	ROAM in C.A.R. was undertaken to analyse opportunities to support the government in developing a national strategy for FLR, ensuring rapid implementation. FLR interventions proposed for restoration in C.A.R. include afforestation/reforestation, agroforestry, plantations (agricultural /forestry), and restocking of degraded areas across a high priority opportunity area of roughly 7.65 million hectares.
Colombia	Together with the Regional Environmental Authority in eastern Antioquia (Corporación Autónoma Regional de las Cuencas de los Ríos Negro y Nare – CORNARE) and the Humboldt Institute a regional ROAM was carried out which identified high biodiverse habitat patches and assessed the viability of establishing biodiversity corridors to reduce the threats to species like jaguars (*Panthera onca*) and puma (*Puma concolor*). Acknowledging that the conservation of natural ecosystems depends on the sustainability of the productive systems, it was identified that a combination of good agricultural production practices, landscape restoration actions, and clear definitions of protected areas and buffer zones are prerequisites for the corridors to be a successful system. In addition to identifying options for increased connectivity between landscapes, ecosystems and habitats, the ROAM process has provided valuable insight into the importance FLR in post-conflict Colombia, emphasising the importance of restoring ecological integrity, avoiding degradation, and providing alternative livelihoods for displaced people. Colombia has made a pledge to the Bonn Challenge and Initiative 20x20 to restore 1 million hectares by 2020.
Costa Rica	ROAM in Costa Rica aims to assist the nation in achieving its Bonn Challenge commitment of 1 million hectares through an assessment of restoration priorities for the provision of ecosystem services. Restoration transitions proposed by the Technical Committee of restoration of Costa Rica included: silvopasture/improved pastures; passive regeneration; wood plantations; fertiliser management; outline and crop residues management; agroforestry; and restoration of riparian forest. These interventions are targeted at pastureland, coffee plantations, and banana, palm oil and pineapple cropland. FLR and the ROAM report feed directly into national biodiversity policy and Costa Rica's NBSAP. FLR relates to key goals within the NBSAP with ecosystem service provisioning at the core. FLR is a valuable tool to

	address land use challenges and restoration offers the opportunity to break away from the cycle of degradation and loss, providing both economic and environmental benefits.
Côte d'Ivoire	The ROAM was implemented in Côte d'Ivoire with the aim to assess opportunities for restoring degraded forests and landscapes. Proposed restoration interventions focus on agroforestry, reforestation and enrichment planting, and protection and natural regeneration of parks and reserves over a priority area estimated at 5,077,672 hectares. Overall, Aichi Biodiversity Targets 2, 5, 7, 11, 12, 14, and 15 can all directly benefit from application of the recommendations for FLR laid out in the ROAM for Côte d'Ivoire.
El Salvador	El Salvador's pledge to the Bonn Challenge – 1 million hectares, half of its territory – reflects the country's determination to restore its degraded lands and forest areas to mitigate and adapt to climate change, to contribute to biodiversity conservation; improving livelihoods, ecosystem services and disaster risk reduction. The National Programme for the Restoration of Ecosystems and Landscapes (PNREL) promoted by the Ministry of Environment and Natural Resources identifies nine priority restoration actions which potential impact has been assessed in terms of both monetary and environmental benefits. The cost benefit analysis undertaken as part of ROAM in El Salvador provides key information on the economic valuation of restoration activities in relation to criteria such as landscape connectivity, carbon storage, fuelwood production, as well as other ecosystem services measured spatially such as erosion improvement and nutrient delivery. This could complement the actions set out in El Salvador's NBSAP to achieve Aichi Biodiversity Target 2. Also, the priority restoration actions identified in the PNREL – agroforestry, shade grown cacao and coffee, riparian forests, and mangrove restoration – directly contribute to the actions identified in the country's NBSAP to achieve Aichi Biodiversity Target 5, 7, 11, and 15.
Ethiopia	A subnational ROAM assessment for Ethiopia's vastly degraded Amhara National Regional State (ANRS) identified several FLR options which were then assessed and prioritised. These included: afforestation/reforestation; improved management of natural forest; improved management of woodlands; afro-alpine restoration; and woodlot establishment over an estimated opportunity area of 4,212,630 hectares, calculated from a spatial analysis conducted within the ROAM assessment.
Ghana	ROAM in Ghana aims to support the development of national restoration programmes and strategies in Ghana and enabling West African countries to define and implement pledges to their Bonn

	Challenge target and AFR100 commitments. Through stakeholder consultation, restoration interventions were proposed and their opportunity areas mapped. They include planted forests and woodlots, natural regeneration of forests and woodlots on non-forest land, rehabilitation and maintenance of degraded forests and woodlands, agroforestry, improved fallow, and mangrove restoration over an opportunity area of 13,995,878 hectares. Overall, Aichi Biodiversity Target s 2, 5, 7, 11, 12, 13, 14, and 15 will all benefit from FLR in Ghana.
Guatemala	The National Development Plan K'atun 2032 is the framework to implement restoration actions, which are to be found in many of the Plan's pillars, especially the one on conservation and sustainable use of forests and biodiversity for climate change adaptation and mitigation. The details of the implementation of these restoration actions are established in Guatemala's National Strategy of Forest Landscape Restoration, which was a result of close coordination of different government and non-governmental institutions as part of the National Roundtable of FLR, and the national map with potential areas for restoration. According to this map, there are over 3.7 million hectares in Guatemala with restoration potential, and decision makers decided to focus on a specific area of almost 900,000 hectares where more than half the land is low, shrubby vegetation, roughly 30% is dedicated to pasture lands, and 18% is dedicated to crops. Restoration activities in these areas aim to bring back the value of the land through sustainable timber, agroforestry, and silvopastoral activities, pairing it with forest conservation activities (riparian forests and natural forests). These restoration activities have financing available through the government-led incentives of the PROBOSQUE policy, which aims to leverage additional private investment sources to scale-up activities across the country. Aichi Biodiversity Target s 2, 7, and 15 will benefit from implementation of these activities.
Honduras	Protection of habitats, surface and underground water availability, and mangrove restoration are some of the key goals for the FLR opportunities assessment in Honduras. The draft document of the National Programme of Restoration of Sustainable Productive Landscapes, under preparation by the Ministry of Environment, applies the ROAM methodology to determine the best restoration actions, which are expected to generate benefits for both climate mitigation and adaptation (Aichi Biodiversity Target 15), the enhancement of genetic diversity in preparation for restoration activities (Target 13), transition to sustainable agricultural practices that are compatible with conservation and ecological integrity (Target 7), among others. For the implementation of the proposed national programme, inter-institutional

	coordination mechanisms and governance are part of the pillar of actions that will improve the execution of effective measures to integrate biodiversity and improve biodiversity protection. Honduras pledged 1 million hectares to the Bonn Challenge, although the ROAM analysis has identified at least 2 million hectares with landscape restoration opportunities.
India	A subnational ROAM was carried out in Uttarakhand, India to increase productivity of degraded landscapes, improve livelihoods, improve the supply and provision of ecosystem services, and enhance resilience of local communities to climate change through FLR. 37.2% of Uttarakhand was identified as having a very high (18.1%), or high (19.1%) priority for restoration. Restoration strategies were designed for three distinct altitude zones within the state, taking into account the various ecosystems and habitats.
Indonesia	The ROAM assessment in Tanjung Panjang, Phuwato District, Gorantolo Province, Sulawesi, Indonesia focused on mangrove forest landscape restoration. This assessment showcases how mangrove landscape restoration can contribute to Indonesia's NBSAP and associated Aichi Biodiversity Targets. An in-depth stakeholder consultation resulted in the identification of several key FLR objectives which include reversing the trend of mangrove degradation and restoring a significant area of mangroves to ensure long-term provision of ecosystem services; and developing opportunity maps and disseminating key findings to relevant national and sub-national institutions. Restoration interventions included ecological mangrove restoration and hinterland agroforestry over a total estimated opportunity area of 3,018 hectares containing degraded mangrove ecosystems and extensive aquaculture. Illegal land conversion for aquaculture is a strong driver of degradation in the area and the ROAM process resulted in an FLR strategy and plan that all stakeholders have adopted to implement over time. The convening and negotiation element of ROAM was perhaps one of the most important aspects for successful FLR planning and implementation.
Kenya	A national-level ROAM report for Kenya can feed into its proposed NBSAP national goals and contributes towards the Aichi Biodiversity Targets 2, 5, 7, 14, and 15. The report documents the process taken by the government of Kenya to identify and map potential areas suitable for different landscape restoration options. The five restoration interventions highlighted include reforestation and rehabilitation of degraded natural forests; agroforestry and woodlots on cropland; commercial tree and bamboo plantations; tree-based buffers along waterways, wetlands and roads; and silvopastoral and rangeland restoration. In total, an estimated opportunity area of 38,800,00

	hectares across a variety of different land uses including: forest, cropland and rangeland, roads, and wetlands was identified.
Laos	A ROAM assessment was conducted in Sangthong district as part of the national-level objective of promoting the application of FLR and building FLR capacities for the Lao Government. FLR interventions highlighted in the assessment include woodlots; natural regeneration; agroforestry; and protection forest over an opportunity area of 52,985 hectares for the district. The ROAM assessment has strong correlations with several of the Aichi Biodiversity Targets including 2, 5 7 , 12, 14, and 15. The results of this assessment can be applied as a useful tool for contributing towards both national and international biodiversity goals.
Madagascar	ROAM in Madagascar aims to contribute towards Madagascar's AFR100 commitment through the identification and prioritisation of criteria for restoration through FLR. It aims to align with national FLR strategy guidelines and national policy related to areas associated with FLR activities. As restoration potential for biodiversity is one of three key scenarios mapped in the spatial analysis. Potential restoration activities highlighted within Madagascar's ROAM include reforestation of degraded land, restoration of degraded national forests, agroforestry, mangrove restoration, and restoring degraded pine forests. The total priority area identified for FLR was estimated at 11,122,540 hectares. Overall contributions towards Aichi Biodiversity Targets 2, 5, 7, 11, 12, 14, and 15 are possible through FLR in Madagascar.
Malawi	In 2017, Malawi published its ROAM assessment in the form of a National Forest Landscape Restoration Assessment (NFRLA) and accompanying Strategy with the aim of equipping its government with a framework to address land degradation and deforestation, leveraging both technical and financial support to implement FLR at scale. A participatory stakeholder process was used to develop goals for FLR implementation, these were: increase agricultural productivity and food security; enhance community resilience to climate change; address water scarcity for household consumption, irrigated agriculture and hydropower generation; and enhance the availability and sustainability of biomass energy and other forest products. To achieve this, five general restoration interventions were selected for scaling up, targeted at degraded conventional agriculture and degraded woodland/forest. The interventions include agricultural technologies, forest management, soil and water conservation, community forests and woodlots, and river and stream bank restoration, all across an opportunity area of an estimated 7,700,000 hectares. Implementation of the suggestions in Malawi's NFLRA will not only restore degraded land but make

	significant contributions to the achievement of the Aichi Biodiversity Targets and Malawi's NBSAP. Malawi is currently implementing a 5-year FLR plan with a budget of US$7 million per year, and includes FLR interventions that will be specifically implemented through youth engagement.
Mexico	In 2016, two different ROAM assessments were developed for the Yucatán Peninsula states (Yucatán, Quintana Roo, and Campeche) and for Chiapas, both located in the southeast of Mexico. FLR was adopted as an approach to address the ongoing effects of climate change and reinforce the adaptability and resilience capacity in the land use sector to respond to events of food and water insecurity, climate disasters, land degradation, deforestation and habitat integrity. Considering the specific local context, the assessments identified several restoration activities including: ecological restoration, rehabilitation of degraded forests, conservation agriculture, agroforestry systems, forest plantations, and silvopastoral systems. The approach to ensure the long-term success of these activities is to generate a productive vision of the restoration activities, adequately valuing ecosystem services with regards to the activities in landscapes, and promote the effective participation of vulnerable population. The information from the ROAM assessments can be integrated in Mexico's National Development Plan and in its national strategies for the integration of biodiversity in the agricultural and forest sectors (Targets 2, 7). As the FLR strategies are implemented in the before mentioned states, there will be a contribution in the actions towards the reduction of habitat loss and degradation (Target 5, 11) and the contribution to climate change mitigation and adaptation (Target 15). For the Yucatán Peninsula, a detailed analysis of business packages was developed and further integrated into the Peninsula's FLR strategy, which in turn has strong linkages with the strategy of emission reductions. States from the Yucatán Peninsula and Chiapas State have made pledges for over 2 million hectares to the Bonn Challenge.
Mozambique	A subnational ROAM assessment was completed in Zambézia and Nampula provinces. The aim was to support the government of Mozambique's land-use planning and decision-making for the Integrated Management of Agriculture and Natural Resources Initiative (SUSTENTA), which seeks to improve rural incomes in Mozambique through the promotion of agriculture and forestry value chains, strengthening the resilience of natural resources, and promoting land tenure. Direct linkages to the Aichi Biodiversity Targets and Mozambique's NBSAP can be drawn from both the ROAM report and from SUSTENTA. Restoration interventions identified after a

	stakeholder consultation include agroforestry; forest restoration (natural regeneration, enhancement of existing forests and woodlands); water and watershed conservation; soil conservation; and new forest plantations (planted forests and woodlots) over an opportunity area of an estimated 1,639,961 hectares.
Myanmar	Myanmar's Forest Department (FD) has developed the National Reforestation and Rehabilitation Program in Myanmar (NRRPM), a project lasting until 2026 which acts within the timescale of the country's NBSAP and the Aichi Biodiversity Targets. The overall goal of the NRRPM is to enhance economic and environmental conditions of the country through a national reforestation and rehabilitation programme. Typical management activities undertaken by the FD include natural regeneration; enrichment planting; improvement felling; climber cutting; and thinning among natural regeneration. Additionally, a national FLR opportunity mapping process was undertaken which included a significant biodiversity component in identifying degraded forest types (including dry deciduous and mangrove forests) and also included key biodiversity areas and ecosystem services. This analysis identified an estimated 1.2 million hectares of degraded land that would benefit from FLR interventions and support Aichi Biodiversity Targets 5, 7, 12, 14, and 15.
Nicaragua	IUCN has been supporting the Autonomous Region of the North Caribbean Coast (RACCN) in developing a regional restoration strategy to be implemented in the next 20 years, setting the pathway to sustainable development and improvement of livelihoods, the recovery of degraded soils, water security, disaster risk reduction, climate change mitigation, and enhancement of ecosystems and biodiversity in the region. Thanks to the application of ROAM, it was possible to identify over 1.2 million hectares with restoration potential, from which 100,000 hectares were prioritised with specific restoration actions including reforestation, natural and assisted regeneration, recovery of perennial crops, silvopasture systems, change in technologies, and agroforestry. These restoration actions will enhance the current land uses such as natural pastures, shrub land, degraded forests, eroded land, crops, and savannahs. This restoration strategy is in line with existing framework policies and plans including the national strategy of climate change (ENDE – REDD+). If implemented, interventions would support Aichi Biodiversity Targets 2, 5, 11 and 15.
Peru	The National Program for Ecosystem Restoration and Degraded Lands (PNREST) is being developed by the Peruvian National Forest Service (SERFOR). The PNREST aims to bring together the different existing initiatives to advance the country's ambition to restore 3.2 million hectares, a pledge made to the Bonn Challenge and Initiative 20x20.

	The design of the PNREST is underpinned ROAM, which was applied in order to identify priority areas for restoration at the regional and national level –a national restoration opportunity map was presented by SERFOR in January 2018. ROAM assessments have been conducted since 2016 in 17 regions in Peru aiming to generate, through a participatory process, spatial data information on priority areas to be restored, suggested cost-effective restoration options and potential financial mechanisms available for implementation. This opens a pathway for a more local-level type of analysis to identify best practices, species, and other information that responds to the local needs and context. Ultimately, benefits to biodiversity can translate into protected areas expansion, creation of species migration corridors, reintroduction of habitats, as well as taking away pressure from high-conservation value forests. The information from the ROAM assessments can be integrated in the implementation strategies of the different official instruments that exist to catalyse mitigation outcomes (NAMAs), PNREST, and investment programmes (such as PIF, public-private partnerships, etc), which are activities under NBSAP Goal 7 aimed at reducing the degradation rate of ecosystems by 5% and acting on the main drivers of deforestation and degradation, linked to Aichi Biodiversity Target 5 and 15. Target 13 has also been addressed through the restoration planning activities led by IUCN and partners, where a database was created in order to collect information of native species, their characteristics and attributes relevant for restoration activities combined with livelihoods for communities in the Amazon.
Rwanda	The ROAM report set out to discuss and present opportunities for scaling up pilot projects to support the government of Rwanda in achieving “border to border” FLR. Key components of this objective include increased agricultural productivity, food security and rural incomes; increased resilience to climate change; and improved water supplies. Contributions to Aichi Biodiversity Targets 2, 5, 7, 14 and 15 can be linked from this objective. Restoration interventions proposed for scaling up include agroforestry; woodlot management; timber plantation management; forest restoration interventions; and protective forests over an estimated opportunity area of 1,526,379 hectares.
Uganda	Uganda’s ROAM results and the implementation of FLR strategies can be used to directly assist with Uganda’s related NBSAP targets and its progress towards achieving the Aichi Biodiversity Targets 2, 5, 7, 12, 13, 14, 15. Restoration interventions proposed in the ROAM focus on natural regeneration, agroforestry, and woodlots and FLR over an estimated opportunity area of 8,079,622 hectares across all landscape zones of Uganda.

Viet Nam	Stakeholder consultation during the ROAM in Quảng Trị Province highlighted key FLR goals which directly relate to the Aichi Biodiversity Targets. These included: increased forest biodiversity and quality; conservation and enhancement of ecosystem services; and the improvement of livelihoods for local people to reduce incentives to encroach on the forest. These goals apply directly to Aichi Biodiversity Targets 5, 7, 12, 14 and 15 as well as Quảng Trị's goal of restoring 25% of its degraded ecosystems of international importance by 2025. Key interventions proposed in the ROAM assessment include enrichment planting/assisted natural regeneration, extended rotations, native species introduction, and soil and water conservation across an estimated opportunity area of 54,000 hectares. Within the opportunity area, key land uses for restoration included special-use forest, biodiversity corridors, plantations upstream of key river basins, and agriculture at high risk of erosion.

3.2 Selected examples of potential NBSAP implementation through FLR and ROAM

The following pages outline a sample of the instances where the processes surrounding the assessment of FLR opportunities or the planned FLR implementation strategies using ROAM, can or have the potential to contribute to national reporting on biodiversity strategies. As in the section above, for the sake of brevity only the targets associated with Aichi Targets 2, 5, 7, 11, 12, 13, 14 and 15 are included, though analysis revealed many more connections to a wide range of national biodiversity targets. As such, the following section is arranged by target and includes a more in-depth description of the relevance of FLR to each specific Aichi Biodiversity Target. This is followed by case examples for a sample of countries that directly demonstrate how the results from ROAM and the actual or planned restoration actions will support reporting on the relevant national targets. This was accomplished by analysing both the ROAM assessments for each of the jurisdictions and the National Biodiversity Strategy and Action Plans.

By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

How FLR contributes to this Target

FLR is intended to provide nature-based solutions at both national and local levels to support food security, poverty reduction, rural enterprise, and other development strategies. The primary intent of FLR assessments is to generate the social, economic, and biophysical data and knowledge required to integrate large scale restoration ambitions into policies and practices that support restoration, and by natural extension the biodiversity values upon which restoration success will depend.

Rationale:

The generic and specific indicators suggested for monitoring this target[25] indicate that progress can be monitored by calculating the number of countries that have incorporated biodiversity values into development and natural resource accounting strategies. This, by necessity, is quite broad. However, progress on achieving this target has been underwhelming with only one country (Georgia) providing a national target similar or higher in scope and level of ambition as of COP 13, and only 7% of NBSAPs contain national targets that match the ambition of the target. For those countries that have set national targets to achieve Aichi Target 2 almost all of them provide only general recommendations on integrating biodiversity values into decision making processes or policy development, with a noticeable lack of specific recommendations (UNEP/CBD/COP/13/8/Add.2/Rev.1).

In this respect, the forest landscape assessments completed using ROAM have generated significant contributions to Aichi Target 2, though this may not have been their intent. With a

[25] https://www.cbd.int/doc/strategic-plan/strategic-plan-indicators-en.pdf

focus on restoration objectives that tend to include themes like food security, climate resilience, and ecosystem services, in addition to explicitly including biodiversity – these assessments have functionally integrated the values of genetic diversity, species diversity, and ecosystem complexity within landscapes into national and subnational development plans. As such, any country that has undertaken an FLR assessment using ROAM and has not considered how the ROAM process and the resulting restoration strategies contribute to Aichi Target 2, is missing what would be a strong and defensible contribution to this Target.

Table 6: *Sample FLR alignments for Aichi Target 2 in National Biodiversity Strategy and Action Plans*

Brazil: Subnational ROAM assessments across five states: Pernambuco, Federal District, Espírito Santo, São Paulo, and Santa Catarina	
NBSAP Target 2: By 2020, at the latest, biodiversity values, geo-diversity values, and socio-diversity values have been integrated into national and local development and poverty reduction strategies, and are being incorporated into national accounting, as appropriate, and into planning procedures and reporting systems.	ROAM in Brazil provides a methodology with results which can generate biodiversity related values feeding directly into NBSAP target 2. Analysis of restoration interventions and the benefits they produce for biodiversity, livelihoods, and ecosystem service provision can be incorporated into related national strategies. ROAM in Brazil also incorporates indicator A2.1, making use of Ecological-Economic Zoning in the spatial analysis process. Through applying existing instruments, ROAM is able to be integrated back into the related national strategies.
Mozambique: Subnational ROAM assessment in Zambézia and Nampula provinces	
NBSAP Target 2.1: Promote research oriented to understand the state, value, causes of loss and measures for biodiversity conservation. NBSAP Target 2.4: Develop and implement tools for the economic valorisation of the main ecosystem services and goods.	ROAM aims to support the government of Mozambique's land-use planning and decision-making for Integrated Management of Agriculture and Natural Resources Initiative. The ROAM report contains all the tools needed to support NBSAP Targets 2.1 and 2.4 through the use of stakeholder consultations, spatial analysis, and economic analysis of different restoration interventions identified.
Colombia: Subnational ROAM assessment in the Antioquia region	
NBSAP Target 1.2: By, 2020 the ecological structure will have been identified in 100% of the cities with more than 100,000 inhabitants (and for 50% of the cities with less than 100,000 inhabitants by 2025). It will have been identified how to incorporate the ecological structure in the different instruments of territorial management and planning. NBSAP Target 1.5: By 2020, the country will have 210,000 ha in the	ROAM supported the planning processes through spatial data of biological, social and territorial aspects according to the scale of the area to be planned. In areas with a multiplicity of smallholders, a multi-scale analysis may be required which includes a refined planning of the different areas. The planning includes, in addition to proposed land uses spatially defined, alternative ways that guarantee the balance between the natural and productive systems. In this context, CORNARE links the planning of the ROAM process to the implementation of Bosques de Paz in 1,200 hectares of nine municipalities in the south-east of Antioquia. It

process of restoration in susceptible areas defined by the National Plan for Ecological Restoration for the Rehabilitation and Recovery of Disturbed Areas (and 500,000 ha by 2025). NBSAP Target 1.3: By 2030, the resilience of ecosystems and the gains of biodiversity will have been assessed in connection to the increase in connectivity and the representativeness of ecosystems in landscapes / territories occupied / transformed and in transformation.	also develops a green growth agenda to install and market environmentally friendly production systems.

By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

How FLR contributes to this Target

FLR uses areas of degraded land to shift resource consumption patterns to areas designated and planned for natural resource use. Using livelihood-based restoration approaches, FLR can relieve pressures on natural ecosystems. FLR includes actions that provide necessary resources for people such that the unsustainable use of native ecosystems and species is halted or reduced as part of potential land-sparing strategies.

Rationale:

Forest landscape restoration places a lot of emphasis on identifying and addressing the drivers of degradation. The assessment of restoration opportunities is a platform for the discussion of restoration objectives and most, if not all, of the objectives of FLR are steeped in mitigating either the unsustainable use of natural resources or the consequences of unsustainable use. While FLR can include a broader treatment of ecological productivity than is included in Aichi Target 5, this treatment certainly includes losses in ecological productivity that result from the loss, degradation and fragmentation of natural and novel habitats.

The contributions of FLR to Aichi Target 5 can be understood in two primary ways. First, through restoration of degraded land in support of increased ecological productivity and human livelihoods, pressures on natural habitats can be reduced. This is a large reason for the inclusion of FLR interventions like woodlots in the canon of available restoration solutions. Utilising degraded land to plant trees for use as fuel or fibre can relieve collection pressures within natural forest habitats. Not only do woodlots provide the natural resource that people require, when implemented on degraded lands in proximity to people, it can reduce the collection burden for fuelwood (a task that disproportionately falls on women) and other wood resources. Reducing the need to collect natural resources from natural habitats reduces the probability of the loss of these habitats and can even eliminate many of the most pressing degradation drivers in these systems.

Across landscapes, multiple FLR interventions can respond to natural resource requirements in similar ways to how woodlots are employed – part of the suite of restoration strategies that is the hallmark of a responsible FLR strategy. Where degraded land exists it can be restored with multiple functions in mind and used to satisfy the current and future needs of people. In this regard, forest landscape restoration makes a direct contribution to Aichi Target 5, which is by definition an indirect target based on addressing the motivations surrounding the loss of natural habitat, which are complicated and require cross-sectoral commitments and solutions – exactly the type of nature-based solutions provided through the implementation of FLR strategies devised through the implementation of ROAM.

Secondly, while it's clear that these activities are intended to reduce or halt degradation, when strategically employed, FLR can also reduce fragmentation. Several ROAM assessments invoke conservation or biodiversity corridors as key landscape features that are to be supported by

FLR strategies (e.g. Colombia, Costa Rica, Viet Nam). These strategies are intended not only to use landscape planning to maintain and conserve existing conservation corridors, but also to use FLR interventions to effectively restore natural or semi-natural habitat in human-dominated landscapes in support of reducing habitat fragmentation.

Table 7: Sample FLR alignments for Aichi Target 5 in National Biodiversity Strategy and Action Plans

Rwanda National ROAM assessment	
NBSAP Target 5: By 2020, at least 50 percent of natural ecosystems are safeguarded, their degradation and fragmentation significantly reduced.	Rwanda's ROAM provides an evaluation of the need for restoration across the country and then provides restoration interventions and the potential scale of implementation, mirroring the required action to complete Target 5 in the NBSAP. All five restoration interventions – agroforestry, woodlot management, timber plantation management, forest restoration, protective forests - proposed in Rwanda's ROAM will contribute towards Target 5, with the ROAM spatial analysis providing opportunity areas for implementation for each intervention. Protective forest interventions reduce pressures on natural forest habitats related to resource extraction and use and are an excellent example of how ROAM can contribute towards ABT5.
Kenya National ROAM assessment	
NBSAP Target 5 proposed national goals: • Increase the forest cover to 10% by 2020 • By 2020, 20% of degraded and fragmented habitats are restored/rehabilitated • By 2020, the rate of loss of natural forest is brought close to zero	ROAM in Kenya proposes five broad restoration interventions for FLR. Related to increasing forest cover are reforestation and rehabilitation of degraded lands; commercial tree and bamboo plantations; and tree-based buffers along waterways, wetlands and roads. Interventions relating to restoring degraded and fragmented habitats include agroforestry and woodlots on cropland; and silvopastoral and rangeland restoration, along with reforestation and rehabilitation of degraded lands already mentioned. The ROAM report provides opportunity maps for each restoration intervention, providing the information on where to implement FLR. All interventions are aligned to the NBSAP national goals relating to target 5 of the Aichi Biodiversity Targets, for example reforestation and rehabilitation of degraded lands was estimated to have an opportunity area of 4.8 million hectares. ROAM outputs make FLR possible within Kenya and provide a pathway to restoration, which will feed into the relevant NBSAP national goals.
Malawi National ROAM assessment	

NBSAP Target 6: By 2025 at least 50% of the degraded terrestrial habitats are restored and protected Relevant actions to Target 6: • Identify degraded habitats • Develop, review and implement strategies and programs for restoring habitats	ROAM in Malawi can be utilized to achieve Target 6 of its NBSAP through its provision of a framework to address land degradation and deforestation. Restoration interventions in Malawi aimed at restoring degraded habitats include agricultural technologies, soil and water conservation, and river- and stream-bank restoration. Interventions more suited to protection of habitats include forest management, and community forests and woodlots. Interventions such as community forests and woodlots are designed to reduce pressure on existing forest resources, reducing the rate of habitat loss in the process. The identification of degraded land was completed in a 'Multi-Criteria Analysis' which prioritized degraded land most in need of restoration. Restoration interventions were then developed based on opportunity areas calculated in a spatial analysis and stakeholder consultation to ensure that interventions were best suited to the local situation.

By 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

How FLR contributes to this Target

One of the key concerns in FLR is the selection of appropriate restoration interventions across different land uses to increase ecological productivity (including the yields of agriculture, aquaculture, and forestry) and conserving areas important for biodiversity. One of the key outputs of FLR processes are strategies and action plans that demonstrate the landscape-scale impacts of sustainable land management.

Rationale:

In many places, agriculture, aquaculture and forestry are not managed sustainably for the conservation of biodiversity is a reasonable assumption. Even within countries that have healthy budgets and administrative support, the management of natural living resources often bends towards economic productivity, sometimes at the expense of ecological productivity. For agricultural ecosystems, or those destined for production at some point in their lifespans, land managers must first assess the conservation status of biodiversity in these areas and then take management actions to support, at least the maintenance of current biodiversity values. In this respect, a landscape approach that utilises protected areas and activities that do no further harm are important for biodiversity conservation.

However, in many areas, biodiversity has suffered from the expansion of agriculture or aquaculture. While the intent of Aichi Biodiversity Target 7 is to promote the sustainable use of resources in production landscapes for the benefit of biodiversity, in many places this Aichi Target has significantly failed to meet expectations in its implementation. However, where conservation of biodiversity has not been possible, the restoration of biodiversity may be an option.

It is often difficult to tell at which exact point a landscape becomes degraded, but when it is clear that biodiversity has suffered as a result of unsustainable agriculture, aquaculture or forestry, it is possible to use forest landscape restoration to define the incremental gains that might be made for biodiversity from the restoration of degraded areas. Additionally, the landscape-scale strategies for FLR should account for the role of protected areas within wider production oriented landscapes. Through the landscape approach of FLR, the sustainable management of production landscapes to increase ecological productivity should both reduce pressures on native ecosystems, and provide incremental biodiversity gains within agriculture, aquaculture, and forestry systems.

Table 8: *Sample FLR alignments for Aichi Target 7 in National Biodiversity Strategy and Action Plans*

Ethiopia: Subnational ROAM assessment in Amhara National Regional State (ANRS)	
NBSAP Target 5: By 2020, unsustainable utilisation of biodiversity and ecosystem services are reduced. Relevant indicators: • Number of ecosystems restored Relevant actions: • 5.4: Promote afforestation and use of non-wood forest products	The restoration interventions proposed in the ANRS ROAM provide a sustainable method of utilising biodiversity and ecosystem services. The ROAM report makes use of an ecosystem services assessment for each intervention, assessing the benefits of each intervention with biodiversity, for example, as one of the ecosystem services that FLR can generate. ROAM provides FLR solutions to NBSAP Target 5, with restoration interventions providing pathways to reversing land degradation. Feeding into the relevant indicator to Target 5, ROAM restoration interventions can provide a pathway to restoring ecosystems. Interventions, especially afforestation/reforestation, will also directly contribute towards action 5.4 in the NBSAP. ROAM contributes to this action through assessing the area of opportunity for interventions and then providing further analysis on ecosystem services and finance requirements.
Cambodia: Subnational ROAM assessment in Kampong Thom, Preah Vihear, and Siem Reap	
NBSAP Target 5: By 2020, the majority of areas under agriculture, animal production, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity, sustainable development, poverty eradication and improved well-being. Relevant actions: • 5.1: Assess the main areas in the country used for agriculture…and forestry • 5.3: Encourage successful measures and scale them up as needed • 5.5: Carry out research to describe the opportunities and constraints to enhancing sustainable management of agriculture…and forestry	Using local consultations, a geospatial analysis, and a cost-benefit analysis, restoration interventions were assessed for their potential for ecological improvements and financial benefits. Through the ROAM methodology, restoration interventions proposed can contribute to sustainable management of forests and agricultural land. Key interventions for forests focus on native forest restoration which places emphasis on planting native tree species as well as regeneration of existing natural forests. Sustainable management through restoration will help to conserve and increase biodiversity levels, especially compared to existing timber plantations in Cambodia, linking directly to Target 5. ROAM results directly apply to the relevant actions stated. A geospatial analysis identifies opportunity areas for restoration, identifying land uses across the country. ROAM provides a blueprint on how to successfully incorporate FLR interventions into the landscape. And, ROAM provides a thorough analysis of enabling factors and constraints to implementing restoration in Cambodia, feeding into Action 5.5.
Mozambique: Subnational ROAM assessment in Zambézia and Nampula provinces	
NBSAP Target 7: By 2020, catalogue/systemise, disseminate and promote sustainable management practices in	Restoration interventions proposed by ROAM in Mozambique aim to promote agricultural and forestry value chains while strengthening the resilience of natural resources. Interventions such as agroforestry systems, and woodlot establishment are examples of how ROAM recommends sustainable agriculture

agriculture, livestock, aquaculture, mining, forestry and wildlife.	and forestry. The ROAM also recommends native species in its restoration proposals, thus ensuring the status of biodiversity is maintained or improved following implementation.

By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

How FLR contributes to this Target

Many of the protected areas in the world are degraded and over-harvested for natural resources. Forest landscape restoration processes can help quantify the ecosystem services that protected areas generate for wider landscapes and they can provide a window into the drivers of protected area degradation, leading to FLR interventions that help mitigate these drivers. As a concept, FLR often requires that functional landscapes that provide the benefits and services upon which people rely socially, economically, and ecologically include some form of conservation. In practice this is typically utilising FLR to support corridors and systems of well-connected protected areas to support the biodiversity and function of landscapes.

Rationale:

The implementation of this biodiversity target has generally looked to the conservation and protection of areas for their biodiversity and ecosystem service value within protected area systems, especially through the addition of protected areas. Within forest landscape restoration, these protected areas are critical components within landscapes that provide the goods and services upon which people and nature rely. Through the FLR assessment process, these areas set baselines for the maximum levels of desired ecosystem services like carbon sequestration or sediment retention and also often are characteristic 'reference ecosystems' for ecological restoration.

Within an FLR assessment process, the areas indicated in Aichi Biodiversity Target 11 provide seed sources that allow for natural regeneration and in many cases have provided refugia for species that may have existed across the broader landscape in the past, but for whom degradation and habitat fragmentation has reduced their available habitat.

Nearly every FLR assessment uses ecologically representative and well-connected systems of protected areas to guide the selection of FLR interventions and their placement within a landscape to support the biodiversity components that this biodiversity target is intending to support. The assessments not only include these areas for their biophysical or ecological value, but also typically recognise the critical role that protected areas play in local economies and livelihoods.

As a result, restoration that is implemented according to the principles of FLR should not only support efforts to strengthen protected area networks, but can provide the physical, social, and economic justifications for why stakeholders and landowners would be interested in supporting the maintenance and/or expansion of protected area systems.

Table 9: *Sample FLR alignments for Aichi Target 11 in National Biodiversity Strategy and Action Plans*

Indonesia: Subnational ROAM assessment in Tanjung Panjang, Gorantolo	
NBSAP Target 11: Realisation of sustainable maintenance and improvement of conservation areas Related activities: • Sustainable management of protected forest • Essential ecosystem technical assistance	The ROAM pilot in Tanjung Panjang assesses an area within two protected areas; Tanjung Panjang Nature Reserve and the Pohuwato District Protected Forest, focusing on restoration of mangroves. One of the key outputs from the ROAM report is the recommendation to remove aquaculture from Tanjung Panjang, to enable mangrove restoration through planting and natural regeneration – key to improving the status of biodiversity in degraded protected areas. If realised, this output would directly contribute towards Target 11, improving the status of the two protected areas as natural regeneration of the mangrove ecosystem would be enabled. The ROAM pilot also provides ecosystem valuation of future restoration which can serve as a blueprint relative to improvement of the protected area ecosystem of Tanjung Panjang.
India: Rajasthan and Uttrakhand subnational ROAM assessments	
NBSAP Target 6: Ecologically representative areas under terrestrial and inland water, and also coastal and marine zones, especially those of particular importance for species, biodiversity and ecosystem services, are conserved effectively and equitably, based on protected area designation and management, and other area-based conservation measures and are integrated into the wider landscapes and seascapes, covering over 20%. Relevant indicators: • Trend in PA coverage • Trends in forest cover	The ROAM pilot in Rajasthan provides detailed analysis on the extent, and potential extent, of Rajasthan's protected area network; highlighting its importance to biodiversity conservation. FLR interventions highlighted in the report focus mainly on plantation strategies, increasing access to natural resources and so decreasing degradation pressures on the protected area network, contributing to the conservation of biodiversity in these networks. Spatial analysis within the assessment also provides detailed mapping on forest cover, on a district level within Rajasthan, which can feed directly into the relevant indicator for Target 6 providing a baseline for measurement against as well as a methodology for mapping out forest cover.
Brazil: Subnational ROAM assessments across five states: Pernambuco, Federal District, Espirito Santo, Sao Paulo, and Santa Catarina	
NBSAP Target 11: By 2020, at least 30% of the Amazon, 17% of each of the other terrestrial biomes, and 10% of the marine and coastal areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through protected areas	ROAM in Pernambuco, the Federal District, and Espirito Santo make explicit use of Permanent Protection Areas (PPAs) in their restoration strategies. In Pernambuco, ROAM uses PPAs for its restoration strategies, also using PPAs to prioritise watersheds for restoration as well as providing data from a spatial analysis detailing the area available within PPAs for restoration. ROAM also provides

ensuring and respecting the demarcation, regularisation, and effective and equitable management, so as to ensure ecological interconnection, integration and representation in broader landscapes and seascapes.	an economic analysis into restoration of PPAs which also involves an estimation of ecosystem services benefits following ROAM recommended restoration of PPAs through agroforestry and restoration of native forest species. Implementing restoration using ROAM results will contribute towards Target 11, providing a blueprint on how to effectively restore networks of PPAs in Pernambuco, and other states assessed.

By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

How FLR contributes to this Target

Forest landscape restoration has the potential to restore critical degraded habitat as a component of diversified, landscape-based restoration strategies, improving the conservation status of many threatened species. FLR will also address many of the drivers of species decline and halt them through different FLR interventions relieving many species threats. Additionally, restoration interventions can employ planting of threatened plant species, where appropriate.

Rationale:

Section 2.3 of this document provides detail on how forest landscape restoration processes and the implementation of FLR strategies may have positive impacts on threatened species. As biodiversity is explicitly included in the FLR opportunities assessment process, the practitioners implementing FLR strategies will have the knowledge and institutional relationships to help ensure that the landscape strategies inherent in FLR contribute to biodiversity conservation and restoration in many different ways.

The reduction in pressures faced by all species, but especially those of conservation concern, will be a significant outcome of large scale FLR and the broad restoration strategies that are deployed to halt degradation.

Importantly, the monitoring of improvements in conservation status through FLR can work outside of the current CBD metric, the IUCN Red List Index. Although the Red List Index is an extremely rigorous and a globally trusted metric for the change in conservation status of taxonomic groups, it can only be measured by periodic reassessment of comprehensively assessed taxonomic groups (e.g. birds, mammals, amphibians, cycads, freshwater crabs, etc.). This comprehensive process will continue to provide a sound metric for Aichi Biodiversity Target 12, but additional monitoring through FLR on the changes in threat to species can provide an additional metric.

FLR, as implemented through the strategies developed from ROAM assessments can help address many of the landscape threats to many of the world's threatened species. Of the threatened species listed in the IUCN Red List (Vulnerable, Endangered, and Critically Endangered species) 16,805 (64%) species are listed as suffering from either threats due to agriculture/aquaculture, biological resource use or natural system modifications (IUCN Red List, accessed October 19,2018). Many of these threats are addressed through FLR at scales that will have positive and measurable impacts on reductions in the threats that lead to poor conservation status for many threatened species on the IUCN Red List and many of the species whose conservation status has not yet been assessed.

Table 10: *Sample FLR alignments for Aichi Target 12 in National Biodiversity Strategy and Action Plans*

Viet Nam: Subnational ROAM assessment of Quang Tri Province	
NBSAP Target 2: To improve the quality and populations of endangered, rare and precious species, ensuring that no new case of species extinction is reported, and significantly improve the status of endangered, rare and threatened species. Task 2: Conservation of wild and domestic endangered, rare and precious species of plants and animals.	Viet Nam's subnational ROAM assessment is targeted towards increasing forest biodiversity and quality. Key restoration interventions proposed relating to this include enrichment planting/assisted natural regeneration to increase the diversity of tree species, and native species introduction within plantations. Implementation of these interventions will contribute towards improving the status of natural species, reducing the pressures on their populations while generating valuable ecosystem services such as erosion reduction and water retention, key contributions to both Target 2 and Task 2.
Laos: Subnational ROAM assessment of Sangthong district	
NBSAP Target 1.5.3: The extinction of at least 5 priority species (to be determined from the Laos Red lists) are effectively prevented through better law enforcement and *in situ* and *ex situ* conservation.	Laos' subnational ROAM proposes four restoration interventions for implementation. One of which is natural regeneration, proposed as an effective restoration approach to enhance biodiversity and provide other ecosystem services as a result. Natural regeneration will strongly contribute towards in situ conservation of priority species identified, increasing the quality of forest and providing habitat for these species.
Colombia: Subnational ROAM assessment in the Antioquia region	
NBSAP Target 1.8: By 2025, the country will have advanced in the implementation of at least 50% of the action plans for the conservation of endemic species at increased risk of extinction due to climate change, illegal trafficking or other anthropogenic causes (and 100% of the action plans by 2030).	The conservation of the natural ecosystems depends on the sustainability of the productive systems. In this ROAM assessment an additional element to the GIS analysis includes a prioritisation of landscape connectivity (through habitat patches) and the identification of potential corridors, especially for the jaguar (*Panthera onca*) and the puma (*Puma concolor*) as species of special importance for conservation in eastern Antioquia, but with increasing conflict as a clear problem to address. A combination of good agricultural production practices, restoration actions, and clear definitions of protected areas and buffer zones are a prerequisite for the corridor to be a success. In addition to identifying options for increased connectivity between landscapes, ecosystems and habitats, the ROAM process has provided valuable insight into the importance of FLR in post-conflict Colombia, and is especially relevant to restore ecological integrity, avoid degradation, and provide alternative livelihoods for displaced people.

By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals, and wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimising genetic erosion and safeguarding their genetic diversity.

How FLR contributes to this Target

In the diversified approaches inherent in FLR strategies, the promotion, research, and use of genetically diverse agricultural and wild relative species in agricultural-based restoration interventions (e.g. agroforestry, conservation agriculture, successional planting strategies) is a key component of long-term restoration success. Not only is genetic diversity important for minimising genetic erosion, it is a critical component of local strategies for food security and climate change resilience – two common objectives for FLR initiatives.

Rationale:

Agroforestry, silviculture, and rangeland management often feature heavily in assessments of forest landscape restoration opportunity. In fact, the majority of opportunity areas identified for interventions occur in mixed-use, human-dominated landscapes. These landscapes are primarily used for agriculture and livestock. While many of the FLR actions within a landscape will focus on the conservation of biodiversity and ecosystem services, especially those that directly support human livelihoods, a significant focus of FLR investment is in increasing the ecological productivity of degraded agricultural land.

Furthermore, the inherent risks of genetically identical or similar crop and livestock varieties across large areas features prominently in assessments of food security and disaster risk. Less genetically diverse agricultural and livestock species are more susceptible to disease and have a lower evolutionary capacity to adjust to changes in climate. This is exemplified by the fact that local varieties of crop species tend to be more adaptable to a wider range of climate variability than mass-produced, genetically identical varieties and are often preferred by smallholders (e.g. Lunduka et al., 2012).

ROAM assessments both assess the current agricultural and livestock practices within the assessment area and often identify the conditions that have precipitated landscape degradation, especially as it relates to unsustainable practices. Within the diversity of FLR interventions selected in most ROAMs are a series of actions focused on improved agricultural techniques and improvements or diversification of agricultural practices and products. Central to these strategies are the expansion of genetic diversity of cultivated plants and domesticated animals. This also includes the genetic diversity of plant species used in active restoration activities, such as tree planting. Ongoing efforts to both diversify the number of species used in planting and enrichment activities and the genetic diversity and provenance of these materials, in addition to agricultural and livestock diversification, strongly support the improvement and/or maintenance of genetic diversity over millions of hectares of FLR opportunity.

Table 11: *Sample FLR alignments for Aichi Target 13 in National Biodiversity Strategy and Action Plans*

Malawi National ROAM assessment	
NBSAP Target 13: By 2025, the genetic diversity of wild domesticated plants, and animals is maintained and safeguarded. Relevant actions: • Promote cultivation of indigenous plant species such as fruits and vegetables to enhance their preservation	ROAM identified three agricultural technologies which could be implemented at a national-level across Malawi; agroforestry, conservation agriculture and farmer-managed natural regeneration. These technologies make use of native species in restoring degraded agricultural land, increasing yields and food security as a result. For example, agroforestry promotes the use of native tree species on farms to boost soil fertility as well as providing NTFPs such as fruit. Such interventions will make significant contributions to Target 13, increasing the genetic diversity of plants on farmland. Malawi's ROAM also provides information on where opportunity areas for agricultural technologies and other interventions are, further enabling implementation.
Rwanda National ROAM assessment	
NBSAP Target 11: By 2020, the genetic diversity of priority cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	ROAM in Rwanda highlights agroforestry as one of the restoration interventions to implement on a national scale. Agroforestry in Rwanda focuses on incorporating trees into agricultural landscapes, increasing the biodiversity on agricultural land. The focus on native species results in biodiversity benefits, contributing to NBSAP Target 11. ROAM also provides opportunity areas for implementation of agroforestry at the national scale to facilitate implementation, providing a pathway to target 11. In fact, 1.1 million hectares were found to have potential for implementation of agroforestry.
Uganda National ROAM assessment	
NBSAP National Target 3.4: By 2020, the genetic diversity of cultivated plants and domesticated animals including their wild relatives and other socio-economically valuable species conserved. Relevant actions: • Identify, collect and conserve indigenous species and varieties	Agroforestry is one of the restoration interventions proposed in Uganda's ROAM and can contribute towards Uganda's national target on conserving the genetic diversity of cultivated plants by introducing a wider variety of plants onto farmland. The ROAM report provides a pathway towards implementation of agroforestry, among other interventions, providing opportunity areas per intervention as well assessing costs and benefits for each intervention in an economic analysis. This analysis will work towards conserving indigenous species and varieties by contributing to the knowledge pool for sustainable farming practices in Uganda.

By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

How FLR contributes to this Target

Forest landscape restoration relies on enhancing the ecological productivity that species provide to support human health, livelihoods, and well-being. Explicit in IUCN's approach to forest landscape restoration assessments and strategies is a rights-based process that takes stock of the needs of women, IPLCs, and minority groups. This helps to ensure that FLR interventions and strategies are gender responsive and serve to provide equitable and fair access to the benefits that flow from investments in FLR.

Rationale:

IUCN maintains one of the strongest positions on gender-responsive approaches to forest landscape restoration. Specific guidelines for evaluating the role of gender within ROAM assessments are published (IUCN, 2017) and include accounting for the needs of women, indigenous peoples and local communities, and other vulnerable groups in the assessment of restoration opportunities. These considerations are considered both in the inclusion of stakeholder groups in the assessment process and in the analytical portions of ROAM as part of the cost-benefit analysis, stakeholder consultation process, policy review and spatial analysis.

To this end, the information generated is directly included and considered in the development of restoration strategies and the assessment of who bears the costs of restoration and who receives the benefits of restoration, especially as they relate to women.

Additionally, many ROAM assessments have a significant ecosystem services assessment component. These analyses provide quantitative baselines of commonly modelled ecosystem services related to water, sediment, carbon sequestration, pollination, and many more and generate restoration scenarios that seek to improve the provision of these services to support human health, livelihoods and well-being.

As a part of the development of ROAM, IUCN and The Natural Capital Project developed a unique ecosystem services optimisation tool specifically to connect the needs of beneficiaries to the provision of ecosystem services through FLR strategies. The Restoration Opportunities Optimization Tool (ROOT) provides a quantitative evidence base and decision support within ROAM assessments that directly measures the potential of FLR to contribute to Aichi Biodiversity Target 14, and provides the quantitative evidence base to measure future progress on this biodiversity target as restoration is implemented across landscapes. For additional information on ROOT and its applicability to this target see Beatty et al., 2018b.

More broadly, the restoration of landscapes in support of FLR has direct impacts on ecosystem services and the monitoring of the implementation of FLR strategies can seamlessly contribute to the measurement of this biodiversity target.

Table 12: Sample FLR alignments for Aichi Target 14 in National Biodiversity Strategy and Action Plans

Mozambique: Subnational ROAM assessment of Zambezia and Nampula provinces	
NBSAP Target 14: By 2030, create and integrate the national accounts a payment mechanism for environmental goods and services to promote fair, equitable and sustainable use of biological diversity. Relevant indicators: 14.1.2 Value of the main ecosystem goods and services defined as well as their contribution to the national accounting system.	For each restoration intervention proposed in Mozambique's subnational ROAM two key ecosystem services were explicitly modelled - sediment export to water features and carbon. By modelling the potential for restoration interventions in preventing sediment export, a value can be assigned to each intervention for water quality. This can feed into the relevant indicator for Target 14, contributing to the knowledge base needed in valuing ecosystem services. An extensive carbon analysis is also undertaken in the ROAM report which, while also contributing towards Aichi Biodiversity Target 15, feeds into valuing restoration interventions and the ecosystem services they can generate.
Kenya: National ROAM assessment	
NBSAP ROAM-related Proposed National Goals: By 2020, 50% of our major ecosystems will be mapped and the extent of degradation established. By 2020, 5% of the degraded ecosystem restored. Relevant assessment of progress towards Aichi Biodiversity Target 14: Restoration activities in degraded catchment areas ongoing.	The spatial analysis of restoration potential for interventions in Kenya will contribute towards the knowledge base required for restoring degraded ecosystems as it provides data on where within Kenya specific restoration interventions have the potential for implementation. ROAM highlights 38.8 million hectares of land in Kenya which has the potential to implement at least one of five restoration interventions proposed. All restoration interventions proposed in the report generate ecosystem services, however tree-based buffers have been highlighted as being especially effective at generating a large proportion of ecosystem services for a relatively small intervention area. Tree-based buffers can be applied to restore degraded water catchment areas and ROAM provides potential areas for implementation of this restoration intervention, a direct contribution to implementing restoration activities.
Brazil: Subnational ROAM assessments across five states: Pernambuco, Federal District, Espirito Santo, Sao Paulo, and Santa Catarina	
NBSAP Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, traditional peoples and communities, indigenous peoples and local communities and the poor and vulnerable.	Using Espirito Santo as an example, ROAM is focused on combatting water shortages within the state through identifying priority areas to implement FLR interventions which provide essential ecosystem services such as sediment retention, improving water quality and quantity in watersheds within the state. Agroforestry is recommended by Espirito Santo's ROAM assessment as the main restoration intervention, with a potential benefit of around BRL 195 million with full restoration of the 80,000 hectare target, showcasing how restoration identified through ROAM can benefit local communities with income generating activities.

By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15% of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

How FLR contributes to this Target

While the specific contributions of biodiversity to carbon stocks is not a specific priority in the principles of FLR, Target 15's focus on the restoration of 15% of degraded ecosystems as a climate change and desertification mitigation strategy is central to many explorations of FLR.

Rationale:

The contributions of forest landscape restoration to Target 15 may be one of the strongest, due to the explicit mention of "restoration of at least 15% of degraded ecosystems", which FLR and the CBD Short-term action plan on ecological restoration are designed to address. Despite its clarity, this target has suffered from a lack of consensus about what constitutes a "degraded ecosystem" making the assessment and monitoring of progress on this target difficult.

However, at a national or subnational scale, ROAM is designed explicitly to define and map the opportunities for FLR, which necessitates an assessment of degraded and deforested areas. Furthermore, as a climate change mitigation strategy, FLR and the Bonn Challenge were created to address this Target. Though the potential of restoration to contribute to carbon stocks is context dependent (e.g. Ferreira et al.,2018), the restoration of degraded and deforested landscapes will increase ecosystem resilience and contribute to the biodiversity components of restoration focused on supporting increases in carbon sequestration, including as part of Nationally Determined Contributions (NDCs) to the UN Framework Convention on Climate Change's (UNFCCC) 2015 Paris Agreement.

In fact, the Bonn Challenge, and commitments to FLR form a validated and reliable metric of progress on Target 15. The implementation of the restoration strategies resulting from ROAM assessments, especially as they relate to carbon intensive restoration interventions, provide countries with direct results to report on national targets related to Aichi Biodiversity Target 15 and their NDCs under the UNFCCC. Additionally, FLR strategies consistently include activities and interventions that support climate adaptation and reduce further desertification where it is identified as an issue.

Finally, as an approach that uses a diversity of restoration interventions to support a functional landscape context, FLR (and ROAM assessments in particular) bridge gaps in landscape planning between conservation objectives and the restoration of agriculturally productive landscapes. This helps ensure that protected areas continue to support landscape resilience, and that biodiversity improvements in degraded agricultural areas also have measurable carbon benefits.

Table 13: *Sample FLR alignments for Aichi Target 15 in National Biodiversity Strategy and Action Plans*

Ethiopia: Subnational ROAM assessment of Amhara National Regional State (ANRS)	
NBSAP Target 10: By 2020, the contributions of biodiversity and ecosystem services, including climate change adaptation and mitigation, is improved through increasing forest cover from 15% to 20% of the country…and doubling the area of restored degraded lands. Relevant indicators: • Percent increase in forest cover • Percent increase in restored degraded areas	Restoration interventions proposed in Ethiopia's ROAM are centred on restoring forest cover and degraded land. Each restoration intervention has its carbon benefits modelled over a 20-year time horizon indicating how FLR can contribute to Ethiopia's relevant NBSAP target. ROAM provides data on vegetation cover within Amhara, in its analysis of restoration intervention opportunities. This data is useful in assessing the percentage increase in forest cover and can be applied as a baseline. Degraded land was also identified within the ROAM assessment which could act as a potential baseline along with restoration interventions for implementation to restore degraded areas.
Viet Nam: Subnational ROAM assessment in Quảng Trị Province	
NBSAP Task 5: Biodiversity conservation in the context of climate change Relevant solutions: • Implement forest regeneration programmes using methods and approaches such as biodiversity conservation, enhance carbon storage, and climate change adaptation and mitigation	FLR interventions proposed in Quảng Trị have a strong biodiversity element associated with them especially enrichment planting, assisted natural regeneration, and native species introduction. The ROAM assessment provides carbon sequestration analysis of restoration in Quảng Trị, highlighting how restoration of forests and restoration of degraded land can achieve net carbon sequestration from the atmosphere. Quảng Trị's ROAM therefore supports NBSAP Task 5, providing a blueprint for forest regeneration programs, with opportunity areas for implementation provided in the analysis, which will contribute to biodiversity conservation and carbon storage enhancement.
Cambodia: Subnational ROAM assessment in Kampong Thom, Preah Vihear, and Siem Reap	
NBSAP Target 11: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced, through the conservation and restoration of degraded ecosystems, focusing in particular on degraded forests, protected areas and conservation areas, thereby contributing to climate change mitigation and adaptation and to combating desertification.	ROAM in Cambodia correlates strongly with required actions for Target 11, identifying and assessing the status of degraded land in the subnational assessment area, as well as the drivers of degradation. Spatial analysis within the ROAM also supports implementation of forest landscape restoration providing data on opportunity areas and identifying and prioritising degraded land within the study area. Forest restoration interventions proposed, such as assisted natural regeneration, can also provide the potential to remove and store carbon from the atmosphere especially when comparing to degraded forest plantation which ROAM identified in Cambodia as one of the land uses which could benefit from FLR.

4. Conclusions and recommendations

As it is now, forest landscape restoration is moving from a process of discovery to action. The assessment of restoration opportunities using ROAM across over 450 million hectares of territory, in many cases Bonn Challenge countries, has led to the accumulation and interpretation of vast amounts of knowledge that have been integrated into restoration strategies all over the world. The majority of these restoration opportunity assessments concluded only in the past 12 months, and so the effective implementation of these strategies is an ongoing process. That said, there is a great deal of reason to be optimistic, not least of which are the substantive contributions that FLR implementation can make to international conventions and goals.

This document outlines the specific ways that FLR is contributing to the Aichi Biodiversity Targets, but, more broadly it demonstrates how intricately linked the concepts of FLR and biodiversity conservation are. While the objectives of FLR often focus on the benefits that people receive from healthy, resilient, and ecologically diverse landscapes, the underlying contributions that restoration makes to biodiversity are real and significant.

It is important to remember that the majority of these assessments have not yet moved to large-scale implementation and there is a difference between the intent to restore for a certain objective, the associated biodiversity benefits it may produce, and the reality of restoration itself. This analysis shows that for many Aichi Biodiversity Targets, FLR assessments using ROAM have helped to mainstream biodiversity and create the enabling conditions for biodiversity conservation that may have eluded a strict biodiversity-centric approach.

Suggestions for accelerating action:

- Consider the significant contributions that forest landscape restoration can make to the Aichi Biodiversity Targets and utilise FLR as an implementation vehicle for countries' commitments, as pre-2020 ambition needs to be accelerated.

- Connect with FLR focal points at the country level—often different from the CBD focal points—to access the wealth of information generated by the ROAM assessments which can support the reporting process of the national biodiversity targets.

- Where FLR policies, plans and strategies have been created, ensure coordination with national CBD focal points regarding the implementation of FLR at national and subnational scales, since biodiversity is embedded in landscape restoration actions.

- If your country has a completed or has ongoing FLR assessments and strategies, consider coordinating with biodiversity focal points from the government to ensure that FLR implementation considers and is aligned with policies and procedures intended to support commitments under the CBD.

- Consider the data available in FLR assessments as a baseline against which biodiversity gains can be made through large-scale FLR interventions.

- Work with the CBD Secretariat and IUCN to upload and share knowledge, data, and approaches on the integration of biodiversity into FLR implementation in the Clearing-House Mechanism of the CBD and the Bonn Challenge Barometer.

- Introduce the Bonn Challenge voluntary commitments in the discussions of the post-2020 biodiversity framework, as an example of quantitative and attainable large-scale restoration target for the benefit of livelihoods and ecosystems.

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