ANNEX C

Supplementary materials

30 countries with the greatest absolute areas of deforestation

Annex Table 1. 30 countries with the greatest absolute areas of deforestation in 2023 in million hectares (Mha)

Country	Baseline deforestation (Mha)	Deforestation target for 2023 (Mha)	Deforestation in 2023 (Mha)	Change from Baseline (%)	Deviation from 2023 target (%)
Brazil	2.14	1.5	1.94	-9%	+29%
Indonesia	0.92	0.65	1.18	+28%	+82%
Bolivia	0.48	0.34	0.66	+38%	+98%
Democratic Republic of the Congo	0.48	0.34	0.53	+10%	+56%
Malaysia	0.28	0.19	0.24	-16%	+21%
Peru	0.17	0.12	0.16	-6%	+34%
Paraguay	0.23	0.16	0.16	-32%	-2%
Laos	0.1	0.07	0.14	+44%	+105%
Argentina	0.1	0.07	0.14	+34%	+92%
Cameroon	0.07	0.05	0.1	+43%	+105%
Mexico	0.11	0.08	0.1	-6%	+34%
Cambodia	0.09	0.06	0.08	-3%	+38%
United States	0.1	0.07	0.08	-16%	+19%
Madagascar	0.07	0.05	0.08	+20%	+71%
Colombia	0.17	0.12	0.08	-55%	-35%
Nicaragua	0.05	0.03	0.07	+39%	+98%
Myanmar	0.05	0.03	0.05	+14%	+63%
Honduras	0.04	0.03	0.05	+20%	+71%
Papua New Guinea	0.05	0.04	0.04	-21%	+13%
Thailand	0.03	0.02	0.04	+15%	+65%
Venezuela	0.07	0.05	0.04	-45%	-21%
Vietnam	0.07	0.05	0.04	-51%	-30%
Liberia	0.03	0.02	0.03	+19%	+70%
Guatemala	0.04	0.02	0.03	-15%	+21%
Republic of Congo	0.03	0.02	0.02	-12%	+26%
Guyana	0.01	0.01	0.02	+73%	+147%
Suriname	0.01	0.01	0.02	+38%	+98%
Nigeria	0.02	0.02	0.02	-18%	+17%
Angola	0.01	0.01	0.02	+68%	+141%
Ghana	0.01	0.01	0.02	+16%	+66%

Note: Global spatial data on forest change (Hansen et al. 2013, updated through 2023) and primary forests (Turubanova et al. 2018) differ in their definitions and methods from official national forest statistics. Moreover, the deforestation statistics used in this Assessment are derived from a map of drivers of tree cover loss (Curtis et al. 2018, updated through 2023) that attributes all tree cover loss to the same driver over the entire assessment period, even if changes in drivers do occur over time in regions or countries. In places where commodity-driven deforestation has declined significantly in recent years, current deforestation rates may be overestimated due to the large amounts of commodity-driven deforestation earlier in the period. Primary forest loss statistics may likewise be different from official national statistics.

Case study: The Brazilian Restoration and Reforestation Observatory (BRRO)

By: Tainah Godoy (BRRO)

The Brazilian Restoration and Reforestation Observatory (BRRO) is an independent, multi-stakeholder platform, hosted by the Brazilian Coalition on Climate, Forests, and Agriculture, established in 2021. The objective is to compile and enhance the quality of Brazilian restoration data while monitoring the progress of the climate agreements Brazil has signed (including international agreements such as the Bonn Challenge, Paris Agreement, NBSAP, NDC, and national agreements such as PLANAVEG and CAR) ensuring that all different interest groups that work with restoration are acknowledged for their efforts

Towards our goal to accurately report the number of restoration initiatives in Brazil, since 2021 we've been focusing on establishing multiscale data governance, enhance data quality and building a central database with all six Brazilian biome-level networks, which will allow, in the near future, that the BRRO has most of its data updated automatically. Biome organizations are strong partners in data collection due to their extensive territorial reach and access to the actors who are actually implementing restoration efforts on the ground.

Brazilian Coalition on Climate Forests and Agriculture

The BRRO is hosted by the Brazilian Coalition on Climate, Forests, and Agriculture, a multisectoral movement with over 390 representatives advocating for Brazil's leadership in a low-carbon economy. Established in 2015, the Coalition aligns with the Paris Agreement and promotes sustainable land use through dialogue, proposals, advocacy, and transparent communication. It operates via 12 task forces focused on various themes, including the Restoration Task Force, which hosts the Observatory.

The Observatory was established by the Forest Restoration Task Force, comprising numerous restoration experts who identified the need for systematic restoration data in Brazil. The BRRO emerged from a collective initiative during a 2019 workshop organized by the Coalition, with diverse organizational participation, leading to the platform's launch in 2021.

In 2024, the Brazilian Coalition achieved significant advocacy milestones, including an invitation to join CONAVEG as an observer and participate in its Thematic Chambers. Two leaders of the Restoration Task Force are representatives in these chambers, and the Observatory co-leads the Monitoring Chamber with the Ministry of Environment.

The platform is financially supported by its founding organizations, known as the management group, through donations. These funds cover platform hosting and maintenance, staffing costs (including a recently hired executive secretary and data analyst), and technological updates.

How the BRRO works

Currently, the BRRO operates with two dedicated personnel: the Executive Secretary, who has held the position since 2022, and the Data Analyst, who was hired in May 2024. The Executive Secretary is responsible for daily coordination activities and strategic vision, while the Data Analyst, who reports to the Executive Secretary, is in charge of coordinating the data task force and managing the work of outsourced software companies (currently two companies provide services to the BRRO - one to host and maintenance and the other one to develop the integrated database) with the Executive Secretary supervision.

Since its launch, the platform has not been updated. However, since the establishment of the Executive Secretariat, the Observatory has been actively working on elaborating and signing data transfer agreements (making data transfers legally binding, according to the Creative Common License BY-NC-AS), establishing minimum parameters (with participation from the biome level organizations active at the time (2022 and 2023): Pacto pela Restauração da Mata Atlântica, Aliança pela Restauração da Amazônia, and Rede pela Restauração do Cerrado - Araticum / Restor and SOBRE - Brazilian Ecological Restoration Society), and reviewing the existing data in the platform's database to ensure they comply with the new standardized attributes.

Data Flow

The Observatory uses data from two main sources. Firstly, restoration polygons are self-reported by institutions involved in restoration activities. Each polygon includes details like start date, responsible organization, total area, funding source, and restoration methods, totaling 20 descriptive fields. These polygons are reviewed by a Data Analyst before integration into the platform.

Secondly, reforestation and secondary vegetation data come from annual land cover and land use maps of Brazil, using Landsat satellite images from MapBiomas. This data includes native and exotic silviculture areas and native vegetation regrowth. The BRRO team filters this data to ensure quality and consistency, focusing on vegetation growing from 2008 onwards, per the Native Vegetation Protection Law (LPVN), 12.651/2012. Restoration and reforestation polygons are excluded from mapped secondary vegetation to avoid overlaps.

For secondary vegetation, the technical group established criteria to identify areas undergoing natural regeneration:

1. Temporality: Ensures a minimum age of six years for restoration or secondary vegetation, one year more than fallow areas per the LPVN, starting from June 2008.
2. Legally Protected Areas: Assesses persistence likelihood based on location within zones like Conservation Units, Indigenous Lands, Permanent Preservation Areas, and Legal Reserves, using data from agencies like MMA, SNUC, FUNAI, FBDS, SICAR, and state-level CAR systems.

This approach ensures data accuracy and reliability, enabling effective monitoring and informed decision-making for restoration efforts.

The primary users of the Brazilian Restoration Observatory (BRRO) include biome-level organizations, federal and state governments, NGOs, journalists, researchers, the private sector, and the general public. Biome-level organizations use BRRO data to plan, monitor, and evaluate restoration projects, while government agencies rely on this data to shape policy, allocate resources, and track progress towards restoration goals. NGOs utilize the data for project planning and reporting, helping to secure funding and demonstrate project impact. Journalists use the data to report on environmental issues and hold stakeholders accountable, while researchers leverage it for studies on ecosystem restoration and climate change mitigation. The private sector uses the data to inform sustainability strategies and enhance reporting, and the general public accesses it to stay informed about restoration efforts.

BRRO data serves multiple purposes: it aids in project planning and implementation, supports continuous monitoring and evaluation, informs policy development, facilitates transparent reporting and accountability, and fuels research and innovation. This data-driven approach ensures that restoration efforts are effective, resources are optimally allocated, and progress towards Brazil's environmental goals is achieved, fostering collaboration among all stakeholders involved.

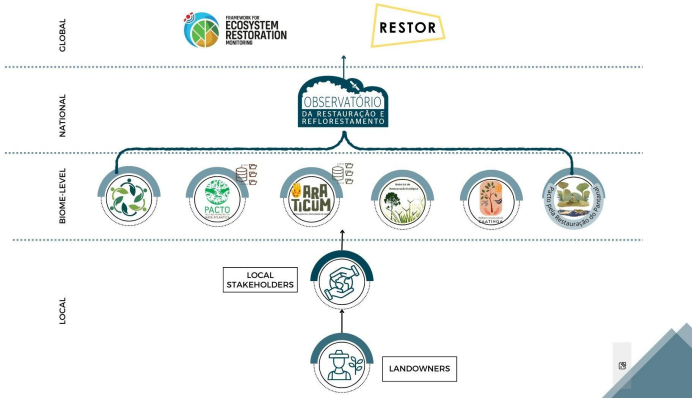
The BRRO's governance structure comprises three groups:

1. Management Group: This highest decision-making level handles strategic orientation, aligning with the Brazilian Coalition Strategic Group. It includes TNC, WWF, WRI, Imazon, and Restoration Task Force representatives, also managing BRRO's financial sustainability.

2. Technical Group: This group designs data flows, provides technical solutions, and ensures data quality and consistency, meeting user and data provider needs. Led by the Data Analyst and Executive Secretariat, it analyzes all received data for reliability and accuracy, collaborating with partners for system interoperability.

3. Articulation Group: Facilitating communication and collaboration between biome-level organizations and the Observatory, this group helps networks express monitoring requirements and exchange ideas. It initiated the integrated database concept and developed the minimum attributes table and data-sharing terms. The group also ensures biome-level organizations have the support and resources needed to report data effectively, aligning data collection practices and protocols.

Annex Figure 1. Organization mapping



The importance of the Biome-level Organizations

Biome-level networks (Annex Table 2) are composed by different institutions and stakeholders involved in restoration, taking into account the specificity and particularity of each one of the biomes. These are movements that bring together a diverse range of actors representing many sectors of society (governments, private companies, NGOs, academia, communities, individuals) that promote and support restoration. Each network has its specific goals and a modus operandi, but they are all articulated within the scope of restoration monitoring in order to support Brazil's restoration goals and understand how and who is implementing restoration on the ground. The biome level networks also have the role of defining best practices, disseminating knowledge and tools, developing field monitoring protocols, building capacity of their members, and ensuring engagement of key stakeholders in their biomes.

The biome-level organizations are users and reporters to the Observatory.

Annex Table 2. List of biome-level networks in Brazil and their current status:

Biome	*Name*	*Website*	*Status*
Atlantic Forest	Pact for the Restoration of the Atlantic Forest	Pacto	Created in 2009. Well established.
Caatinga	Caatinga Restoration Network	Recaa	Created in 2024. Growing.
Cerrado	Articulation for the Restoration in Cerrado	Araticum	Created in 2020.
Pampa	Rede Sul	N/A	Created in 2021. Still in establishment phase
Pantanal	Pact for the Restoration of the Pantanal	N/A	Created in 2021. Still in establishment phase
Amazon	Alliance for the Restoration of the Amazon	Aliança	Created in 2012. Well established.

BRRO in the Global Scenario

Step by step the Observatory is obtaining recognition on the global stage, highlighting the recognition of BRRO by the FAO as a restoration monitoring non-state platform. BRRO was invited to participate in a workshop on interoperability at the FAO headquarters in Rome. This event has paved the way for the BRRO to engage more effectively on the global stage. Currently, we are developing partnerships and enhancing interoperability with FAO, particularly within the scope of FERM (Framework for Ecosystem Restoration Monitoring) to monitor the Brazilian KMGBF target 2 advances. We are also working on potential data integration with RESTOR to avoid duplication for those posting both RESTOR and BRRO restoration polygons. These international partnerships are crucial in strengthening our ability to drive meaningful change and support global efforts aimed at restoring ecosystems.

Restoration Context in Brazil

Restoration in Brazil has gained prominence due to various private sector interests, such as carbon credits, land concessions for restoration, and private investments driven by the carbon market. The government is also emphasizing restoration, as seen in public announcements at Climate COPs and other major events.

Before the carbon boom, Brazil's restoration agenda was already active due to the CAR, NDC, and PLANAVEG, which set the direction for the country's

restoration efforts. The Brazilian government has implemented several policies, including PLANAVEG and PROVEG (National Plan for the Recovery of Native Vegetation). PROVEG is the overarching policy that promotes and supports restoration efforts, while PLANAVEG serves as its implementation tool, providing a framework for coordinated activities and establishing guidelines for monitoring and reporting progress.

This year, PLANAVEG is undergoing its first review since its 2017 launch, led by the Ministry of Environment with participation from civil society, the private sector, and academia through the Deliberative Council, where the Brazilian Coalition is an invited observer (CONAVEG). The Coalition also holds seats in all Thematic Chamber Committees (CCTs).

Brazilian states are also taking the lead, with Pará launching its Native Vegetation Recovery Plan in 2023, Mato Grosso starting its process in October, and Espirito Santo and São Paulo making significant advances. The Brazilian Coalition has been actively engaged in these processes, supporting the broader government consideration of restoration in policies and initiatives.

Main Challenges and Enabling Conditions for the Establishment of the BRRO

One of the primary challenges currently faced by the Observatory is engaging stakeholders in reporting their data. The lack of immediate, obvious benefits from data reporting makes this task particularly difficult. The mobilization and engagement process for reporting is long and complex, depending on various factors that differ for each institution. Key issues include the struggle to comprehend the platform's objectives, distrust regarding how the data will ultimately be used, and a lack of skilled personnel to prepare the required information in the format requested by the BRRO. Even when skilled personnel are available, dedicating their time to this task is often not a priority for the institution. Additionally, institutions typically do not have a routine for collecting geospatial data with aggregated information, which requires a significant cultural shift within the organization. Addressing these challenges requires clear communication of the platform's benefits, building trust through transparent data use policies, providing training and resources to institutions, and fostering a culture that values the collection and sharing of geospatial data.

Data Analysis

After reviewing and acquiring new data, the Brazilian Restoration and Reforestation Observatory (BRRO) presents updated figures (see Annex Figure 2-8). From an initial 79,000 hectares of restoration, the current data now shows 150,000 hectares, representing an increase of over 50% in the database over three years. This new data includes contributions from institutions that had not previously reported to the BRRO, as well as increased restoration areas from partner institutions since 2019. Highlighting the participation of institutions that aggregate large amounts of data (which have been qualified by the BRRO), such as Reflorestar, Renova, Black Jaguar, Sare, etc.

In analyzing the reported data, the most commonly employed restoration technique is the planting of seedlings, covering approximately 45,000 hectares. This is followed by isolation, which promotes natural regeneration, and densification, which involves enriching and stimulating natural regeneration (see Annex A for definitions). It is important to note that a significant portion of the data lacks detailed information on restoration techniques due to older polygons that did not capture this information at the time of initial reporting.

Additionally, the type of areas used for restoration sites is noteworthy. Brazil's environmental law, including the Forest Code, emphasize the preservation of Areas of Permanent Preservation (APPs), which are crucial for hydrological recharge and the protection of riparian vegetation and water flows. The data shows that a significant amount of restoration work is being conducted in these APPs, indicating compliance with the legislation and the effectiveness of the Forest Code in guiding restoration efforts.

This updated data not only highlights the expansion of restoration activities but also provides insights into the techniques employed and the areas prioritized for restoration, reflecting a growing commitment to large-scale ecological restoration in Brazil.

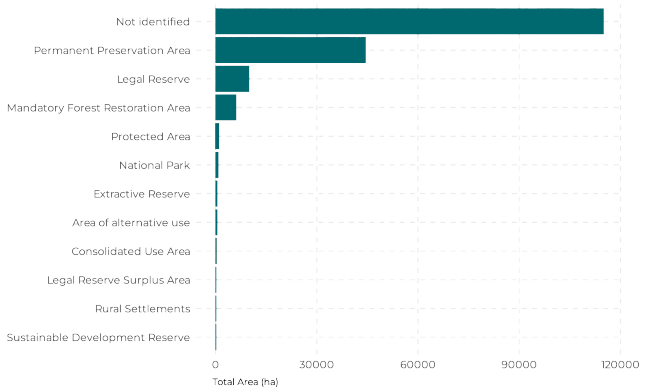
The Restoration Areas map provides a comprehensive overview of restoration efforts in Brazil, highlighting restored areas and those still needing restoration. Updated in 2024, it shows significant progress, with restored lands increasing from 79,000 hectares in 2021 to 150,000 hectares in 2024, reflecting BRRO's enhanced capacity to gather restoration data. BRRO is always pursuing new data, so these numbers are dynamics, and increases with time.

The Atlantic Forest, a biodiversity hotspot, has been a major focus of restoration efforts, largely due to the Atlantic Forest Pact's work over the past 15 years. However, restoration efforts are heavily concentrated in the Atlantic Forest and Amazon, leaving other biomes like the Cerrado, Caatinga, Pampa, and Pantanal relatively neglected. This is partly due to the global restoration narrative's forest focus, despite these non-forest biomes' significant ecological importance.

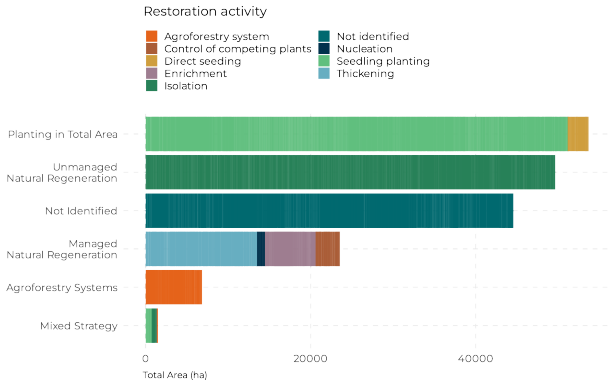
The Cerrado, the most biodiverse savanna, and the Caatinga, a unique semi-arid biome, face severe neglect in restoration, leading to biodiversity loss, disrupted ecosystem services, and increased climate change vulnerability. The Southeast region of Brazil sees concentrated restoration efforts due to higher deforestation levels, a stronger economic base, and greater environmental awareness, but this focus has been criticized for neglecting other biomes and perpetuating regional inequalities.

To meet Brazil's restoration goals and ensure sustainable ecosystems, a national strategy is needed, equitably allocating resources across all biomes. Supporting local restoration initiatives with tailored training, funding, and technical assistance is also crucial. By addressing these disparities, Brazil can protect its biodiversity, ecosystem services, and ensure a sustainable future.

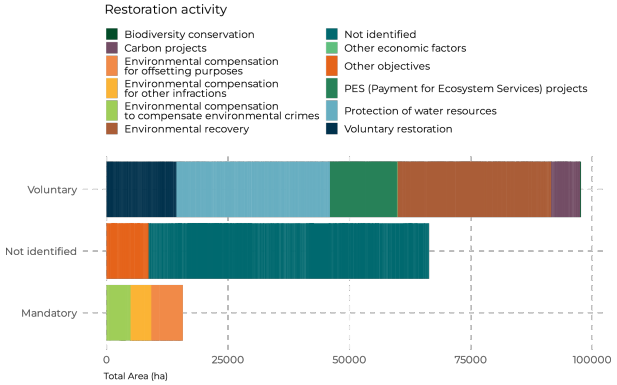
Annex Figure 2. Type of areas used for restoration in hectares (ha)



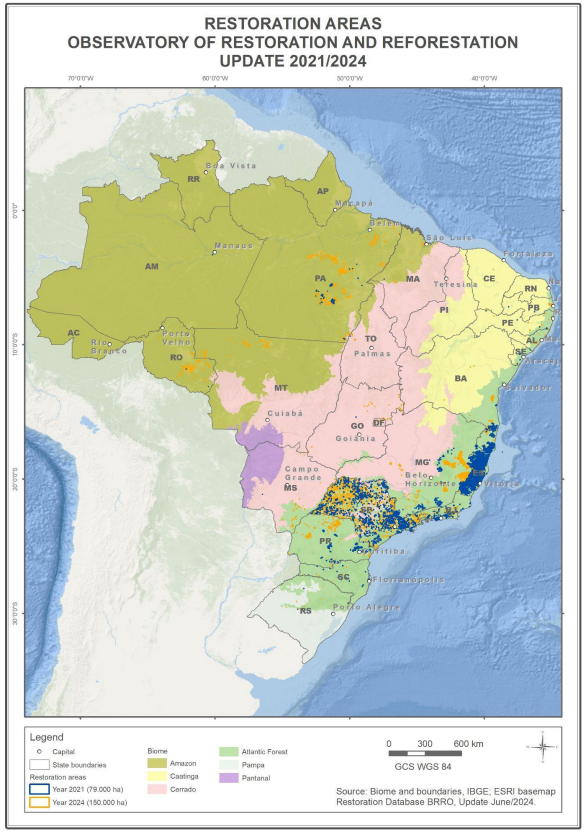
Annex Figure 3. Area of restoration projects aggregated by stated motivation for the project to take place, in hectares (ha)



Annex Figure 4. Area of restoration projects aggregated by stated motivation for the project to take place, in hectares (ha)



Annex Figure 5. Map of restoration areas as of June 2024



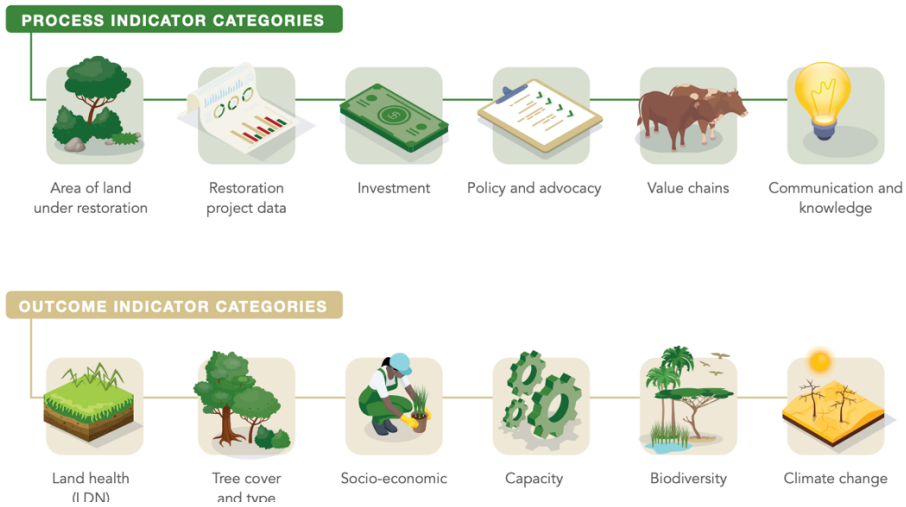
Annex Figure 6. Map of main restoration method as of June 2024

Kenya Landscape Restoration Monitoring technical working group and Restoration Monitoring Framework - funded UK PACT Project – led by ICRAF.

By: Khalil Walji (CIFOR-ICRAF)

The Kenya forest and landscape (FLR) monitoring framework was developed to harmonize and coordinate reporting on landscape restoration efforts in the country and to bolster support to the government in reporting of its national, regional, and global restoration commitments. The framework was developed through a multi stakeholder consultative process led by the members of the Restoration Monitoring Technical Working Group with feedback drawn through a series of meetings, workshops, at subnational level (county) engagement forums and a national validation event (Annex Figure 8). The Technical Working Group on Monitoring chaired by the Ministry of Environment, Climate Change and Forests, engaged a number of other ministries and NGO actors in support of achieving its Terms of reference. The resultant framework outlines 30 indicators and 45 sub-indicators for effective restoration monitoring, considering both action and impact indicators, exploring relevant tools and next steps to operationalize the framework (Figure 7). The framework has been endorsed and included in Kenya's new National Ecosystem and Landscape Restoration Strategy, 2024 and is being operationalized for use at local (county) through a series of county level engagement workshops, cross walking county forest and landscape restoration plans with the national framework to map indicator selection, alignment and data flows for a more coherent and effective monitoring of restoration efforts. The TWG emerged as a temporary coordination and integration body between various ministries in a time of need, looking to link various policy and stakeholder engagement process around ecosystem restoration and to harmonize coherent planning across sectors and levels of government. As of August, 2024, Kenya launched the National Biodiversity Coordination Mechanism (NBCM) for the effective coordination of biodiversity conservation and restoration efforts and in support of the updated NBSAP, acting as a mechanism to align goals, practices at national county and community levels and for the successful implementation of the KM-GBF and Target 2 on ecosystem restoration.

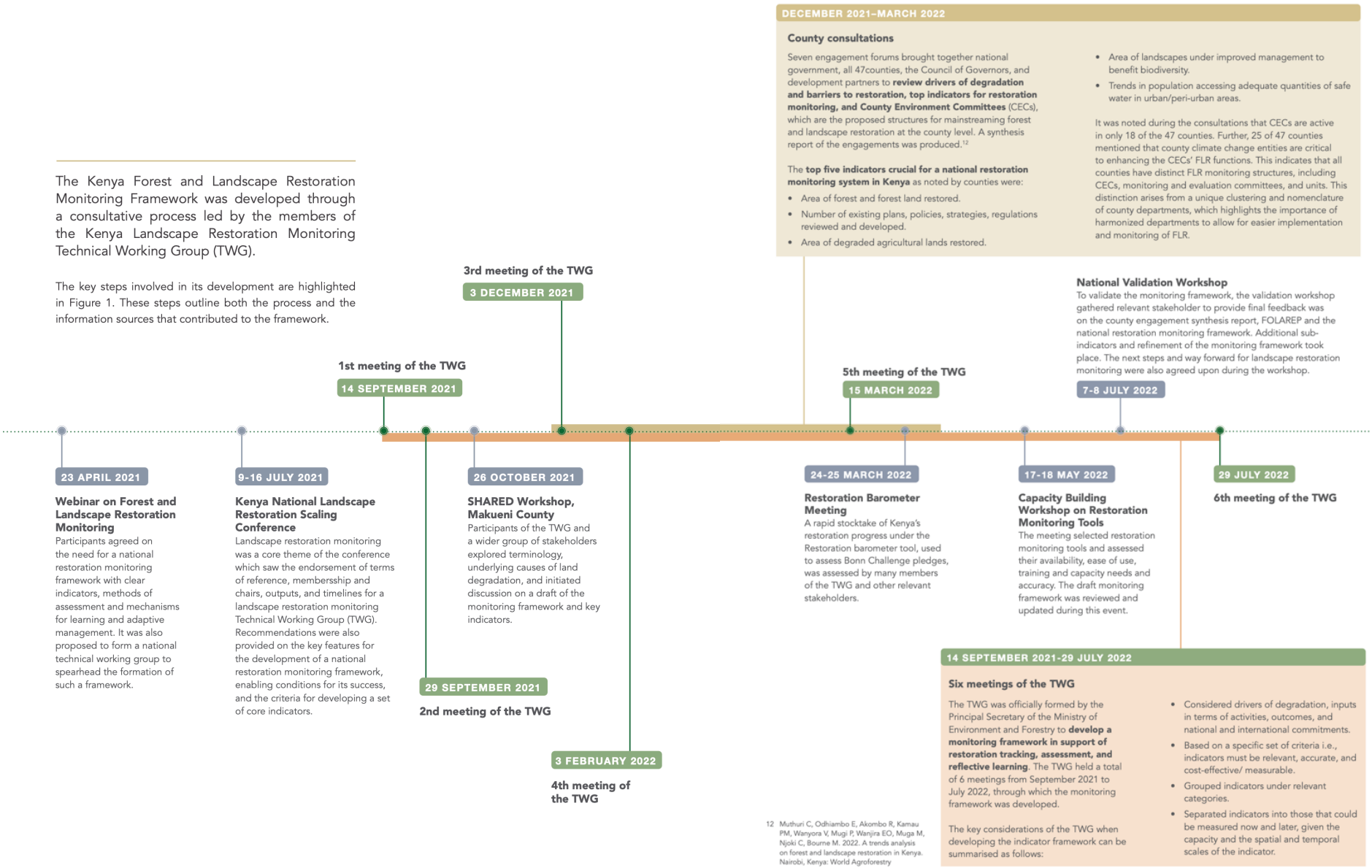
Annex Figure 7. Indicators categories included in the indicator framework



Annex Figure 8. Timeline of the major steps in the process of developing the Kenya Landscape Restoration Monitoring Framework.

The Kenya Forest and Landscape Restoration Monitoring Framework was developed through a consultative process led by the members of the Kenya Landscape Restoration Monitoring Technical Working Group (TWG).

The key steps involved in its development are highlighted in Figure 1. These steps outline both the process and the information sources that contributed to the framework.



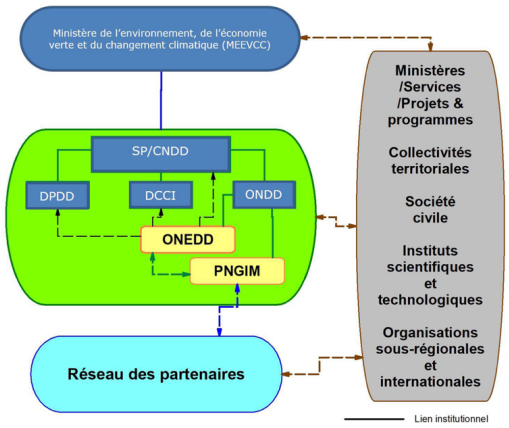
12 Muthuri C, Odhiambo E, Akombo R, Kamau PM, Wanyora V, Mugi P, Wanjira EO, Muga M, Njoki C, Bourne M. 2022. A trends analysis on forest and landscape restoration in Kenya. Nairobi, Kenya: World Agroforestry

Institutional arrangements and agreements for data sharing, monitoring biodiversity and land restoration in Burkina Faso

By: Mawa Karambiri (CIFOR-ICRAF), Khalil Walji (CIFOR-ICRAF)

Since its signature of the CBD convention in 1993, and the adoption of its first NBSAP in 1999, Burkina Faso has conducted multiple processes to align with international policy frameworks and fulfill its commitments. Through an inclusive dialogue process, the country has completed and validated its new NBSAP in August 2024. To tackle identified and persistent challenges with data and monitoring of restoration efforts, such as poor data collection, centralization and access to data reporting, scattered or variable systems and process of collection, the country has refrained from duplicating monitoring platforms and will rely on an existing structure chaired by the office of the Environment and Sustainable Development the existing ONEDD platform (Annex Figure 9). The ONEDD is located at the Permanent Secretary for the Environment and Sustainable Development – SP/CNDD, a technical and advisory body of the Ministry of Environment which has now signed agreements for data sharing with a network of partner organizations (PNGIM) including governmental and non-governmental (within the coalition called SPONG) for the collection, organization and dissemination of restoration data. Focal persons at various ministries, and at sub-national level will collect and convey restoration data at the national level to ONEED for gathering, quality assurance, validation and reporting to be used for both national level management and international reporting. ONEDD has signed a further protocol of collaboration with regional restoration initiatives such as the Great Green Wall, and the AFR-100 (in progress).

Annex Figure 9. Organizational setup for data sharing in Burkina Faso



Forest and Restoration monitoring in Vietnam

By: Khalil Walji (CIFOR-ICRAF)

Monitoring and data of forest status

By December 31, 2023, Vietnam has 14.86 million hectares of forestry land, with 53% being production forests, 32% protective forests, and 15% special-use forests, mostly managed by communal People's Committees, forest management boards, and individual households. Natural forests continue to face damage and degradation, with the damaged area averaging 2,648 hectares per year from 2011-2015, and 2,332 hectares per year from 2016-2020, reflecting an overall decrease. Primary degradation drivers in forests include illegal logging and forest fires, driven by severe heat, dry conditions, and prolonged droughts in the Northwest and Central regions. According to legal provisions, it is the responsibility of local governments to organize forest status monitoring, as outlined in the Forestry Law and various decrees and circulars. The FORMIS system, developed to monitor forest status nationwide and managed by the Forest Protection Department, includes a database of users to update monitoring data on forest health, but face challenges such as limited access to technology, and discrepancies between paper records and reality, and gaps in forest areas which are hard to reach. The system also faces challenges, with accessibility to data on FORMIS currently very limited. There are two types of accounts on FORMIS: authorized accounts and staff accounts (provincial or lower level) that are primarily used for reporting. Casual users can access the data, but there are certain limitations. In addition to forest status data, users can also access other types of information, such as forest regeneration area data.

Information system on ecosystem and biodiversity restoration data

The Ministry of Natural Resources and Environment (MONRE) is responsible for state management of biodiversity in Vietnam, including the management and development of natural ecosystems on wetlands. The Provincial and municipal People's Committees collaborate with MONRE to manage Ramsar sites and implement the Ramsar Convention activities. According to Decree 66/2019/NĐ-CP, the Nature and Biodiversity Conservation Agency (NBCA) under MONRE handles the management and sustainable use of natural ecosystems. Information and data on biodiversity are managed by various departments within MONRE, including the NBCA, the Department of Seas and Islands, and the National Remote Sensing Department. The data includes legal documents, national biodiversity conservation plans, information on natural ecosystems, species, and genetic resources, as well as inspection reports and international cooperation records. Information is managed in various formats, including paper documents, electronic files,

specialized databases, and websites. However, there are challenges such as incomplete and inconsistent data, limited sharing and standardization of databases, and insufficient local resources for biodiversity management. Efforts are underway to develop a national biodiversity database by 2030, to improve information systems, and establish mechanisms for data sharing and collaboration among various stakeholders to ensure continuous and comprehensive biodiversity monitoring and management.