

Monitoring and reporting suggestions for
Target 2 of the post-2020 Global
Biodiversity Framework –
A contribution of the Task Force on
Monitoring of the UN Decade on
Ecosystem Restoration



Table of Contents

Abbreviations and Acronyms	3
1. Summary	4
2. Introduction	4
3. Relevant initiatives supporting restoration monitoring	5
3.1. UN Decade on Ecosystem Restoration	5
3.2. The Framework for Ecosystem Restoration Monitoring	5
3.3. Global Forest Resources Assessment and Restoration Monitoring	6
3.4. UNCCD Land Degradation Neutrality Targets and National Reporting Process	6
3.5. Group on Earth Observation Land Degradation Neutrality initiative	7
3.6. Group on Earth Observation Biodiversity Observation Network	7
3.7. The G20 Global Initiative on Reducing Land Degradation and Enhancing Conservation of Terrestrial Habitats	8
3.8. Ramsar Strategic Plan 2016 – 2024	8
4. Methodological aspects of monitoring progress towards CBD Target 2	9
4.1. Definitions	10
4.2. Time period for monitoring	11
4.3. Country reporting on SDG and Ramsar indicators	12
4.3.1. Monitoring restoration of land-based ecosystems	13
4.3.2. Monitoring restoration of aquatic and transitional ecosystems	14
4.3.3. Monitoring ecological connectivity	15
4.4. Proposed technical options for generating, compiling and validating restoration indicators	15
5. References	17
Annex	18

Abbreviations and Acronyms

ABT	Aichi Biodiversity Target
BIP	Biodiversity Indicators Partnership
CBD	Convention on Biological Diversity
COFO	Committee on Forestry
DaRT	Data Reporting Tool for MEAs
FAO	Food and Agriculture Organization of the United Nations
FERM	Framework for Ecosystem Restoration Monitoring
GBF	Global Biodiversity Framework
GPG	Good Practice Guidance
GPI	Global Peatlands Initiative
GRO	Global Restoration Observatory
IUCN	International Union for Conservation of Nature
NBSAP	National Biodiversity Strategy and Action Plan
Ramsar	Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
SDG	Sustainable Development Goal
SEEA	System of Environmental Economic Accounting
SEPAL	System for Earth Observation Data Access, Processing and Analysis for Land Monitoring
SER	Society for Ecological Restoration
UNCCD	United Nations Convention to Combat Desertification
UNEA	United Nations Environment Assembly
UNEP	United Nations Environment Programme
WCMC	World Conservation Monitoring Centre

1. Summary

This Information Document has been prepared by the Food and Agriculture Organization of the United Nations as part of the UN Decade on Ecosystem Restoration Task Force on Monitoring, in collaboration with BIP, CBD, GRO, IUCN, Ramsar, SER, UNCCD and UNEP-WCMC. This document provides methodological guidance for monitoring Target 2 of the post-2020 global biodiversity framework, based on selected headline SDG indicators strongly related to restoration (FAO and UNEP, 2022), not excluding the selection of other indicators under negotiation at the CBD meetings. The document also builds on the work done by the third meeting of the Open-Ended Working Group (OEWG-3), in particular, the CBD/WG2020/3/L.2¹ and CBD/SBSTTA/REC/24/2². The document also suggests other approaches or potential improvements where gaps are detected.

2. Introduction

At the fifteenth meeting of the Conference of the Parties (COP) to the CBD, Parties are expected to adopt a post-2020 global biodiversity framework³ as a roadmap towards the 2050 Vision of "Living in harmony with nature". In its decision 14/34⁴, the COP adopted a comprehensive and participatory process for the preparation of the post-2020 global biodiversity framework. As part of that process, documents relating to the development of the post-2020 global biodiversity framework have been shared with and negotiated by Parties and stakeholders.

The short, negotiated formulation in the first GBF draft (full latest formulation in Annex I) of Target 2 of the post-2020 global biodiversity framework is to:

CBD Target 2:

Ensure that at least 20 per cent of degraded freshwater, marine and terrestrial ecosystems are under restoration, ensuring connectivity among them and focusing on priority ecosystems

- *Headline Indicator 2.0.1: [Percentage][Area] of degraded [and] [or] converted ecosystems that are under [ecological] restoration*
- *Component indicator 2.2.1: Maintenance and restoration of connectivity of natural ecosystems*

The Twenty-fourth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to the CBD⁵ was held in Geneva from 14 to 29 March 2022 to discuss a proposed list of indicators, including for Target 2, for consideration in developing the monitoring framework for the post-2020 global

¹ <https://www.cbd.int/doc/c/c949/b2cc/a311c0c411d3a81134e2c7f3/wg2020-03-l-02-en.pdf>

² <https://www.cbd.int/doc/recommendations/sbstta-24/sbstta-24-rec-02-en.pdf>

³ <https://www.cbd.int/doc/c/914a/eca3/24ad42235033f031badf61b1/wg2020-03-03-en.pdf>

⁴ <https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-34-en.pdf>

⁵ <https://www.cbd.int/doc/c/f191/8db7/17c0a45b42a5a4fcd0bbbb8c/sbstta-24-l-10-en.pdf>

biodiversity framework. SBSTTA-24 recommended to establish an ad hoc technical working group to advise on further operationalization of the monitoring framework for the post-2020 global biodiversity framework⁶.

The Secretariat of CBD has requested FAO, under the mandate of the UN Decade on Ecosystem Restoration Task Force on Monitoring, to prepare this Information Document with methodological guidance for monitoring Target 2.

3. Relevant initiatives supporting restoration monitoring

The Strategic Plan for Biodiversity 2011-2020, composed of 5 strategic goals and 20 targets (collectively known as the Aichi Biodiversity Targets), was adopted during CBD COP10 in 2010. It served as a flexible and overarching framework guiding the previous UN Decade on Biodiversity (2011-2020). In its mission, the Strategic Plan pointed out that “pressures on biodiversity are reduced, ecosystems are restored, biological resources are sustainably used”. Parties have been actively developing National Biodiversity Strategies and Action Plans (NBSAPs) and strengthening capacities to address the biodiversity targets. The following sections present several ongoing initiatives supporting restoration monitoring, starting from the UN Decade on Ecosystem Restoration.

3.1. UN Decade on Ecosystem Restoration

On the 1st of March 2019, under Resolution 73/284, the United Nations General Assembly (UNGA) proclaimed 2021–2030 to be the United Nations Decade on Ecosystem Restoration (hereafter ‘the UN Decade’), with the primary aim being to prevent, halt and reverse the degradation of ecosystems worldwide. To support implementation and scaling up, the UN Decade has established 10 principles serving to underpin restoration efforts⁷. Principle 9 ‘Monitoring and Management’ highlights the importance of effective monitoring and reporting and is also essential to all three of the pathways described within the UN Decade Strategy, namely, building a global movement, generating political support, and building technical capacity (United Nations, 2021).

Monitoring the UN Decade’s progress has the overall objective of contributing to the implementation of the UN Decade as well as to the UN Secretary-General’s reporting to the UNGA at its eighty-first session (A/RES/73/284) in 2025.

3.2. The Framework for Ecosystem Restoration Monitoring

In March 2020, the UN Decade on Ecosystem Restoration Task Force on Monitoring (hereafter the Monitoring Task Force) was launched. Structured as a core Monitoring Task Force and with three sub-Task Forces (Terrestrial; Aquatic and Transitional; and Socio-Economic), it brings together hundreds of technical experts from over 100 organizations tasked with collaboratively developing a monitoring framework for the UN Decade. The monitoring framework for the UN Decade intends to support monitoring and reporting of the progress and achievements of ecosystem restoration for the UN

⁶ <https://www.cbd.int/doc/recommendations/sbstta-24/sbstta-24-rec-02-en.pdf>

⁷ <https://www.decadeonrestoration.org/publications/principles-ecosystem-restoration-guide-united-nations-decade-2021-2030>

Decade (2021–2030). The framework was subsequently created and named the Framework for Ecosystem Restoration Monitoring (FERM). A description of the Task Force can be found here: [TF link](#).

Through an extensive consultative and analytical process, a set of 20 headline indicators were identified from existing formal country data collection processes. The report on headline indicators (FAO and UNEP, 2022), was launched at the XV World Forestry Congress in May 2022. Headline indicators will allow monitoring of the progress of the decade using existing country statistical data collected through SDG reporting processes and will be reassessed on an annual basis by the Monitoring Task Force for relevant updates. Additionally, the FERM registry was launched at the XV World Forestry Congress to harmonize and collect information on ecosystem restoration projects and programs (<https://ferm.fao.org/>). The FERM data visualization geoportal has been developed to visualize progress and provide indicators and data to help practitioners to monitor ecosystem restoration (<https://data.apps.fao.org/ferm/>).

3.3. Global Forest Resources Assessment and Restoration Monitoring

FAO Global Forest Resources Assessment (FRA) is a well-established country-driven process of collection and compilation of and reporting on global forest resources, their management and uses. The FRA is based on official statistical data reported by the countries through a global network of FRA National Correspondents. The full FRA reporting cycle is five years, but FAO has been requested to develop a more flexible reporting process that would allow countries to provide more frequent voluntary updates on the key indicators.

FAO is the UN custodian agency for 21 SDG indicators. FRA is directly responsible for compiling the data for and reporting on the indicators 15.1.1 and 15.2.1 and leads the data production and reporting for the indicator 15.4.2.

At the 25th session of COFO in 2020, countries requested that “FAO in cooperation with Country Programming Framework (CPF) members and other restoration initiatives, prepare an information note for the 26th session of COFO that analyzes if and how reporting on restoration-related indicators to future FRA reports can streamline reporting for countries between multiple restoration initiatives”. It aims at assessing the potential value of using the FRA process to collect data on restoration potential, pledges, and implementation. Such reporting through the FRA could contribute to the improved monitoring and reporting mechanism of ecosystem restoration, an overall objective of the UN Decade and more specifically to the FERM.

3.4. UNCCD Land Degradation Neutrality Targets and National Reporting Process

The UNCCD 2018-2030 Strategic Framework⁸ contributes to the 2030 Agenda for Sustainable Development, in particular to SDG 15 and target 15.3: “by 2030, combat desertification, restore degraded land, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world”. Land degradation neutrality is defined as a “state whereby the amount and quality of land resources necessary to support ecosystem functions and services and enhance food security remain stable or increase within specified temporal and spatial scales and

⁸ UNCCD decision 7/COP.13

(https://www.unccd.int/sites/default/files/sessions/documents/2019-08/7COP13_0.pdf)

ecosystems”⁹. It promotes a dual-pronged approach of measures to avoid or reduce degradation of land, combined with measures to reverse past degradation. As of December 2021, 129 countries had committed to set their voluntary targets for achieving land degradation neutrality, and in 106 countries, governments had already officially endorsed these targets.

Through the UNCCD national reporting process, country Parties regularly report information on the proportion of land that is degraded over total land area (i.e. SDG Indicator 15.3.1), beginning in 2018 and every four years thereafter. In addition, starting from the 2022 reporting process, country Parties will be urged to report geospatial information on the location and extent of their voluntary land degradation neutrality targets and related implementation actions, thereby ensuring that they are quantifiable, spatially explicit and time-bound. National reporting is facilitated through the Performance Review and Assessment of the Implementation System, now at its fourth edition (PRAIS 4).

3.5. Group on Earth Observation Land Degradation Neutrality initiative

The Group on Earth Observation (GEO), with its over 100 national governments and over 100 Participating Organizations, is supporting country efforts to monitor land degradation through the Group on Earth Observation Land Degradation Neutrality (GEO LDN) Initiative. Launched at the GEO Week in 2018, the GEO LDN Initiative promotes collaborative development, and supports provision and use of Earth Observation datasets, quality standards, analytical tools and capacity building to avoid, reduce, and reverse land degradation with the aim of achieving LDN in all countries by 2030. With the GEO LDN Initiative, they have taken on one of the most difficult challenges countries face: harmonizing the myriad of data options and analytical tools into a work stream that is open to all, and capable of meeting the needs for international comparability while ensuring national ownership.

Tools such as Trends.Earth - an open-source GIS plugin which supports the computation of SDG Indicator 15.3.1 and its sub-indicators - help countries adhere to global standards while taking end-to-end ownership of the monitoring process, even when local capacity for analysis may be limited. Through the working groups of the GEO LDN Initiative, additional support tools that are inter-operational with Trends.Earth are being developed, such as the System for Earth observations, data access, Processing and Analysis for Land monitoring (SEPAL) module for SDG indicator 15.3.1. These aim to broaden the utility of SDG Indicator 15.3.1 and its sub-indicators for environmental analysis and decision support at the global, national and sub-national levels.

3.6. Group on Earth Observation Biodiversity Observation Network

In addition to GEO LDN, the Biodiversity Observation Network within the GEO family (GEO BON) represents biodiversity and is recognized as a partner by the CBD. One of its goals for 2025 is to foster and make functional a strong, balanced and sustained biodiversity observation community, based on shared resources and increased capacity.

Together with its scientific partners, GEO BON has introduced a set of global indicators integrating biodiversity observations, remote sensing data, and models to address important gaps in the

⁹ UNCCD decision 3/COP.12 (https://www.unccd.int/sites/default/files/sessions/documents/2019-08/3COP12_0.pdf)

understanding of biodiversity change across local, national and global spatial scales. One such indicator that directly addresses restoration is the Global Ecosystem Restoration Index (GERI). It is a composite index that integrates structural and functional aspects of the ecosystem restoration process. It was created to monitor and assess Aichi Biodiversity Target 15: Restoration of 15 percent of degraded ecosystems.

Currently, GEO BON is focusing its efforts on the implementation and adoption of the Essential Biodiversity Variables (EBVs) and related monitoring guidelines and interoperable data management systems and through targeted capacity building efforts at the national and regional level. By 2025, GEO BON aims to facilitate the development or enhancement of at least 25 national biodiversity observation systems that can contribute to regional and global biodiversity assessments.

3.7. The G20 Global Initiative on Reducing Land Degradation and Enhancing Conservation of Terrestrial Habitats

Launched at the G20 Leadership Summit in November 2020, the initiative sets a collective ambition of 50% reduction in degraded land by 2040¹⁰. The communiqué summarizing the agreed focus of the Initiative explains that it aims to support existing efforts to prevent, halt, and reverse land degradation and habitat loss through sharing of knowledge and best practices on protecting, conserving, sustainably managing, restoring, and rehabilitating degraded land, and by showcasing and disseminating publicly available data and information on degraded lands and conservation/restoration efforts¹¹. The initiative will also contribute to capacity building and encourage greater private sector support and public engagement in land restoration efforts. The initiative focuses on complementing and supporting existing efforts while striving to avoid any duplication of efforts. The Initiative will seek synergies with existing relevant initiatives including the UN Decade on Ecosystem Restoration and the implementation of the post-2020 Global Biodiversity Framework.

This vision has been supported by a decision taken by the UNCCD Conference of the Parties, at its fifteenth session (COP15) in May 2022, which requests the UNCCD secretariat to collaborate with appropriate secretariats and other initiatives, as well as relevant scientific and technical partners, to produce an interactive report on the total global ambition for land restoration, including all measures to avoid, reduce and/or reverse land degradation, aggregated from the array of area-based commitments (quantifiable in hectares and spatially explicit with a clear reference year, or in a percentage that is translatable into hectares) countries have made under different conventions, goals and targets¹².

3.8. Ramsar Strategic Plan 2016 – 2024

¹⁰ See para 30 in the G20 Leaders Declaration: <http://www.g20.utoronto.ca/2020/2020-g20-leaders-declaration-1121.html>

¹¹ See para 9 in the G20 Environmental Ministers Communiqué: <http://www.g20.utoronto.ca/2020/2020-g20-environment-1122.html>

¹² For the advance limited distribution version of this decision, see para 9 in ICCD/COP(15)/CST/L.3: https://www.unccd.int/sites/default/files/2022-03/ICCD_COP%2815%29_CST_3-2202480E.pdf

In 2016 the 4th Ramsar Strategic Plan¹³ was launched after countries agreed, in 2015, for the first time a set of coherent policies, frameworks, and commitments across the international community. The aim of the 4th strategic plan is to be congruent both with all the SDG goals, particularly SDG targets 14.2 and 15.1 and with the Aichi Biodiversity Target 15 (many of which have in turn been incorporated into the SDGs) (Ramsar Convention Secretariat, 2016).

Among the different Ramsar Strategic Plan Targets, Target 12 specifically contributes to the restoration of the wetland ecosystems with the following definition:

“Restoration is in progress in degraded wetlands, with priority to wetlands that are relevant for biodiversity conservation, disaster risk reduction, livelihoods and/or climate change mitigation and adaptation.”

Ramsar provides baselines in terms of a) 68% of Parties that have identified priority sites for restoration and b) 70% of Parties have implemented restoration programmes, both as informed through national reports to COP12. The convention suggests using indicators to monitor the progress of wetland restoration by measuring a) % of Parties that have established restoration plans or activities in the priority sites or b) % of Parties that have implemented effective restoration projects. It is also suggested further development on indicators that can measure the extent of wetland restoration possibly using remote sensing techniques (Ramsar Convention Secretariat, 2016).

4. Methodological aspects of monitoring progress towards CBD Target 2

The CBD acknowledged the challenges of measuring ecosystem restoration, specifically for Aichi Biodiversity Targets (ABTs) 5 and 15¹⁴. Expanding from the information document [Updated Assessment of Progress Towards Aichi Biodiversity Targets 5 and 15](#), relevant practical challenges and lessons learned are highlighted:

- Many different metrics (very eco-specific) exist to measure degradation and restoration, but baselines and targets are needed.
- Restoration cannot be achieved without addressing the underlying drivers.
- Separate targets might be needed for the reduction of ecosystem loss and degradation and for the restoration of ecosystems.
- A successor target to ABT 15 could focus on benefits for biodiversity and other benefits expected from ecosystem restoration, rather than area alone.
- A successor target to ABT 15 could include sub-targets for the restoration of a variety of ecosystems, avoid the transformation of natural ecosystems or to the notion of representativeness of a variety of ecosystems in the restoration process.
- A successor target to ABT 15 could use several rather than one single metric to set the bar of global ecosystem restoration efforts.

¹³ https://www.ramsar.org/sites/default/files/documents/library/hb2_5ed_strategic_plan_2016_24_e.pdf

¹⁴ <https://www.cbd.int/doc/c/fcd6/bfba/38ebc826221543e322173507/post2020-ws-2019-11-03-en.pdf>

- Large-scale, quantitative, spatially-explicit conservation planning exercises help to evaluate where conservation activities can achieve the greatest benefits and identify scenarios with different alternatives.

Observing these limitations and recommendations, although not responding to all the needs, this section proposes a methodological approach with the use of indicators that can respond to some of the needs to report on restoration in all ecosystems.

4.1. Definitions

It will be necessary to use a common definition at least of the following concepts to allow for a joint and manageable monitoring and reporting process, and comparable results.

a) Ecosystem definition¹⁵:

Within the article 2 of the CBD, ecosystem is defined as:

“Dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.”

b) Degraded ecosystem definition:

No definition was found from the CBD or other conventions, it is defined by (Dunster and Dunster (1996) as:

“An ecosystem where, due to any process or activity, the viability of ecosystem functions and processes, and hence biodiversity, have been removed or lessened.”

c) Ecosystem restoration definition:

Within the UN Decade, ecosystem restoration is defined as:

“The process of halting and reversing degradation, resulting in improved ecosystem services and recovered biodiversity. Ecosystem restoration encompasses a wide continuum of practices, depending on local conditions and societal choice (UNEP, 2021).”

Within the CBD post-2020 process, ecosystem restoration is described as follows¹⁶:

“Restoration may include: (a) restoring converted areas back to natural states; (b) improving the ecological integrity of degraded natural areas; and (c) rehabilitating converted and degraded areas (e.g. degraded agricultural lands) to improve both productivity and integrity.”

A similar and frequently interchangeably-used term is ecological restoration. According to CBD, it is defined as¹⁷:

¹⁵ https://www.cbd.int/kb/record/article/6872?RecordType=article_p

¹⁶ <https://www.cbd.int/doc/c/e823/b80c/8b0e8a08470a476865e9b203/sbstta-24-03-add2-rev1-en.pdf>

¹⁷ <https://www.cbd.int/doc/decisions/cop-13/cop-13-dec-05-en.pdf>

“The process of managing or assisting the recovery of an ecosystem that has been degraded, damaged or destroyed as a means of sustaining ecosystem resilience and conserving biodiversity.”

The Society for Ecological Restoration (SER) defines ecological restoration as **“the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.”** (Gann, 2019).

The CBD Secretariat and SER have provided a glossary to help distinguish different versions of restoration and explain how they intersect (CBD Secretariat and SER, 2019).

d) Ecological connectivity is defined as¹⁸:

“The unimpeded movement of species and the flow of natural processes that sustain life on Earth”.

e) Ecosystem integrity definition¹⁹:

“An ecosystem is generally understood to have integrity when its dominant ecological characteristics (e.g. elements of composition, structure, function, and ecological processes) occur within their natural ranges of variation and can withstand and recover from most perturbations.”

Ecosystem integrity is an essential element in Goal A. Discussion is going on regarding whether to have it in the final negotiated version of Target 2. Parties to the CBD are also working to adopt a consistent and accurate method to define, measure and operationalize it.

4.2. Time period for monitoring

Through the UN Decade on Ecosystem restoration, freshwater, marine and terrestrial ecosystems under restoration from 2021 onwards will be monitored, using 2000-2015 (in accordance with SDG 15.3.1) as baseline year [or other period to be defined]. The UN Decade on Ecosystem Restoration takes place between 2021 and 2030, and monitoring and reporting efforts will focus on monitoring conservation, restoration and e.g. related financial contributions during this period. The Monitoring Task Force is mandated to contribute to regular reporting back to the United Nations Environment Assembly (UNEA) on the progress. As the post-2020 GBF is still under negotiation, its timelines and baselines are still to be determined.

During the same period, at the project level, monitoring efforts are recommended to carry on throughout the implementation and also after restoration projects have ended to allow for adaptive management. Project staff and other stakeholders involved in restoration can monitor and report their own restoration progress through the FERM registry maintained by FAO. Guidelines for registering project data and quality assurance/quality control are being developed.

¹⁸ https://www.cms.int/sites/default/files/document/cms_cop13_res.12.26_rev.cop13_e.pdf

¹⁹ <https://www.cbd.int/doc/c/e823/b80c/8b0e8a08470a476865e9b203/sbstta-24-03-add2-rev1-en.pdf>

4.3. Country reporting on SDG and Ramsar indicators

The post-2020 global biodiversity framework does not stand alone in its need for improved information on status and trends in terrestrial, marine and coastal biodiversity and its management. There are clear linkages to the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs) and other international conventions and agreements, such as Ramsar.

Based on the CBD Target 2 linkages with SDG goals, the following “biophysical” indicators (Table 1) have been identified as relevant for monitoring ecosystem restoration. Countries, through their dedicated national reporting agencies, submit regular reports, as indicated in the table below. The SDG indicators are classified by Tiers, where Tier I indicators are conceptually clear, have an internationally established methodology and standards are available, and data are regularly produced by countries for at least 50 per cent of countries and of the population in every region where the indicator is relevant and Tier II indicators, similarly are conceptually clear, have an internationally established methodology and standards are available, however, data are not regularly produced by countries. It should be noted that following the current CBD target formulation, only biophysical aspects are requested to be monitored, therefore excluding socio-economic indicators’ use for reporting. Progress is being made on how to summarize indicator information into one statistic for reporting on Target 2.

Table 1. Tentative selection of biophysical SDG indicators to contribute to CBD target 2.

SDG indicator	Responsible for global monitoring	Contributes to target 2 component	Tier classification ²⁰
SDG 6: Ensure availability and sustainable management of water and sanitation for all.			
6.3.2: Proportion of bodies of water with good ambient water quality (metadata)	UNEP	Ecosystem restoration	II
6.4.1: Change in water-use efficiency over time (metadata)	FAO	Ecosystem restoration	I
6.4.2: Level of water stress: freshwater withdrawal as a proportion of available freshwater resources (metadata)	FAO	Ecosystem restoration	I
6.6.1: Change in the extent of water-related ecosystems over time (metadata a) & (metadata b)	UNEP	Ecosystem restoration	I
	Ramsar	Ecosystem restoration, connectivity	I
SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.			
14.1.1: (a) Index of coastal eutrophication; and (b) plastic debris density (metadata)	UNEP	Ecosystem restoration	II

²⁰ Tier classification of Global SDG Indicators as of 6 April 2022. Source: United Nations Statistics Division.

14.5.1: Coverage of protected areas in relation to marine areas (metadata)	UNEP-WCMC, BLI & IUCN	Ecosystem restoration, connectivity	I
<i>SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.</i>			
15.1.1: Forest area as a proportion of total land area (metadata)	FAO	Ecosystem restoration, connectivity	I
15.1.2: Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type (metadata)	UNEP-WCMC, BLI & IUCN	Ecosystem restoration, connectivity	I
15.2.1: Progress towards sustainable forest management (metadata)	FAO	Ecosystem restoration	I
15.3.1: Proportion of land that is degraded over total land area (metadata)	UNCCD	Ecosystem restoration, connectivity	I
15.4.1: Coverage by protected areas of important sites for mountain biodiversity (metadata)	UNEP-WCMC, BLI & IUCN	Ecosystem restoration, connectivity	I
15.4.2: Mountain Green Cover Index (metadata)	FAO	Ecosystem restoration	I
15.5.1: Red List Index (metadata)	IUCN, BLI	Ecosystem restoration, connectivity	I

4.3.1. Monitoring restoration of land-based ecosystems

Land degradation is one of the priority indicators being considered for ecosystem restoration monitoring under the UN Decade. National land degradation information can be obtained from (1) country-validated national datasets prepared for land degradation monitoring and reporting in the context of the UNCCD national reporting process and SDG Indicator 15.3.1 reporting, (2) default datasets derived from global data sources from FAO (e.g. Coppus, 2020), Conservation International (CI) estimates for terrestrial ecosystems. Examples of available tools include SEPAL, Trends.Earth and others. The Good Practice Guidance version 2 provides recommendations on the calculation of this indicator²¹.

The sub-indicators for SDG 15.3.1 were created to represent the quantity and quality of land-based natural capital and its associated ecosystem services (Sims et al., 2021). The three sub-indicators include, land cover change, land productivity and carbon stock, where the last one on soil organic carbon may be used as a proxy to report on the biodiversity outcome. Additional sub-indicators for biodiversity and/or ecosystem integrity will be needed to assess restoration effectiveness. Further understanding is also

²¹ https://www.unccd.int/sites/default/files/relevant-links/2021-03/Indicator_15.3.1_GPG_v2_29Mar_Advanced-version.pdf

needed on the gaps in using land degradation as a baseline for ecosystem degradation and what other indicators are needed to complement the existing proxies for land degradation.

Land degradation definition

"The reduction or loss of the biological or economic productivity and complexity of rain fed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from a combination of pressures, including land use and management practices" (SDG indicator 15.3.1 metadata).

In addition to SDG 15.3.1, other indicators can help monitor and evaluate ecosystem restoration, they are included as part of SDG 15 (Table 1): Changes in the forest area, green vegetation in mountain areas, coverage of protected areas for terrestrial and freshwater ecosystems and mountains and changes in the Red list Index as a proxy to evaluate biodiversity. Whereas most of them are more appropriate to measure the extent of restoration, directly or indirectly, there are still gaps in consistently capturing the biodiversity component together with connectivity and integrity.

4.3.2. Monitoring restoration of aquatic and transitional ecosystems

Methods, platforms and other monitoring tools and approaches for tracking the status of freshwater, marine and coastal ecosystems and seascapes are lagging behind those for land-based systems. This research gap is well acknowledged and reflected in the ongoing development of methods and approaches as well as compiling data and information on the restoration of aquatic and transitional ecosystems. There are, however, significant funding needs to support further efforts to address the data gaps in monitoring restoration of aquatic and transitional ecosystems.

At least the following processes will support the Monitoring Task Force of the UN Decade:

- the United Nations Decade of Ocean Science for Sustainable Development,
- The System of Environmental Economic Accounting (SEEA) process,
- Global Peatlands Initiative with its 46 members,
- Global Mangrove Alliance and its Global Mangrove Watch,
- UN Water input on freshwater-biodiversity linkages²².

In relation to inland water degradation at national level, recent reports provide world maps for SDG indicator 6.4.2 by major river basins or country boundaries (FAO and UN, 2021).

In the framework of AQUASTAT several tools can provide insightful information for monitoring at the global level, but they are mainly limited to the use of inland water for irrigation and agriculture.

A global map of irrigated areas has been created in cooperation with the Centre for Environmental Systems Research of the University of Kassel, Germany, showing the percentage of areas equipped for irrigation with a resolution of 5 minutes (about 10 km around the equator).

²² <https://www.unwater.org/publications/un-water-input-on-freshwater-biodiversity-linkages-response-to-the-zero-draft-document-from-the-open-ended-working-group-on-the-post-2020-global-biodiversity-framework/>

AQUAMAPS – An online geospatial platform which gives access to internationally recognized regional and global spatial datasets on water resources and agriculture water management, including hydrological basins, rivers, dams, irrigation areas, precipitation, aridity, evapotranspiration, soil moisture.

Climate Information Tool – A web-based tool to fetch climate data on a geographical basis, allowing for calculation of soil water balance and crop irrigation water requirements.

Water Productivity Open-access Portal (WaPOR) - A FAO portal to monitor water productivity and other key data about water and agriculture, using free satellite imagery.

Essential and very complete step-by-step methodological guidelines are available for the monitoring of SDG indicators 14.1.1 and 14.5.1 for oceans, including several relevant datasets and methodological approaches (UNEP, 2020).

4.3.3. Monitoring ecological connectivity

After the Twenty-fourth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) held in Geneva in March 2022, an expert workshop (Ecological connectivity –Insights for application and measurement from 20 to 21 of April 2022) was held to discuss indicators for ecological connectivity. The indicators proposed were divided into component and complementary.

- Component: 2.2.1 Maintenance and restoration of connectivity of natural ecosystems
- Complementary indicators:
 - T2.5 Forest Landscape Integrity Index
 - T2.9 Connectivity Status Indicator for the World's Rivers
 - T2.11 Bioclimatic Ecosystem Resilience Index

4.4. Proposed technical options for generating, compiling and validating restoration indicators

- To the extent possible, restoration monitoring workflow should build on existing and well-established reporting processes, practices and principles. Methodological guidance, training materials and integration into existing reporting procedures, e.g., NBSAPs, FRA, SDGs, Data Reporting Tool for MEAs (DaRT) and PRAIS will facilitate linkages between existing reporting processes. The reporting should be country-driven and based on best available data. The indicators should have reasonably good global and regional coverage and they should be reported using standard quality flags of the SDG reporting.
- To support [spatially explicit] country reporting, FAO could centrally collect country-validated data through the existing reporting procedures (PRAIS, FRA, SDG, DaRT) and make available relevant geospatial and other data. These data could include:
 1. Degraded areas (baseline 2000–2015) produced using 15.3.1 methodology for terrestrial ecosystem degradation. Similar workflow exists using SDG 14.1.1, SDG 14.2.1 and SDG 14.5.1 methodology for monitoring marine ecosystems (UNEP, 2020). Regarding aquatic, transitional and freshwater ecosystems, methodological guidance is needed.

2. Extent of restoration initiatives in all ecosystems evaluated based on compilation of spatially explicit data available in the FERM registry (e.g. flagship initiatives, formally submitted by countries), and in coordination with other restoration platforms ensuring interoperability.
 3. Connectivity metrics calculated for restoration areas as identified in step 2.
- FAO and the Joint Research Center of the European Union have developed metrics for measuring connectivity ([Vogt et al, 2022](#)). Tools for deriving connectivity metrics for spatial datasets are available through FAO's SEPAL platform and can be applied to the areas of restoration initiatives. A methodological note and guidance could be developed to support countries in estimating the connectivity of their restoration efforts.
 - Reporting of restoration results is recommended to be centralized through the FERM registry, which aligns with other restoration platforms and inter-governmental processes under MEAs aiming to remove duplicity. A flowchart showing the recommended reporting procedure is under development.
 - Interim to the formal 5-yearly reporting, a dashboard of progress will be used to show annual progress using existing country data (20 headline indicators) and voluntary information on restoration initiatives, such as the Restoration Flagships submitted by countries and regional, governmental entities through the FERM Registry.
 - FAO and partners will provide assistance to activate the necessary capacity building actions, platforms and methodologies to support the reporting of target 2 and the communication of results.

5. References

- CBD Secretariat and Society for Ecological Restoration. 2019. A companion to the Short-Term Action Plan on Ecosystem Restoration - Resources, cases studies, and biodiversity considerations in the context of restoration science and practice. Montreal, Canada.
- Coppus, R. forthcoming. Global distribution of land degradation. Thematic background report for SOLAW 2021. Rome, FAO. (also available at <https://www.fao.org/land-water>).
- Dunster J. and Dunster K. 1996. Dictionary of natural resources management. University of British Columbia University Press Vancouver, BC, 363 pp. + xv.
- FAO and UNEP. 2022. Global indicators for monitoring ecosystem restoration – A contribution to the UN Decade on Ecosystem Restoration. Rome, FAO. <https://doi.org/10.4060/cb9982en>
- FAO and UN Water. 2021. Progress on Level of Water Stress. Global status and acceleration needs for SDG Indicator 6.4.2, 2021. Rome. <https://doi.org/10.4060/cb6241en>
- Gann GD, McDonald T, Walder B, Aronson J, Nelson CR, Jonson J, Hallett JG, Eisenberg C, Guariguata MR, Liu J, Hua F, Echeverría C, Gonzales E, Shaw N, Decler K, Dixon KW. 2019. International principles and standards for the practice of ecological restoration. Second edition. Restoration Ecology. 27(S1): S1–S46.
- Ramsar Convention Secretariat, 2016. The Fourth Ramsar Strategic Plan 2016–2024. Ramsar handbooks for the wise use of wetlands, 5th edition, vol. 2. Ramsar Convention Secretariat, Gland, Switzerland.
- Sims, N.C., Newnham, G.J., England, J.R., Guerschman, J., Cox, S.J.D., Roxburgh, S.H., Viscarra Rossel, R.A., Fritz, S. and Wheeler, I. 2021. Good Practice Guidance. SDG Indicator 15.3.1, Proportion of Land That Is Degraded Over Total Land Area. Version 2.0. United Nations Convention to Combat Desertification, Bonn, Germany.
- United Nations Environment Programme. 2020. Understanding the State of the Ocean: A Global Manual on Measuring SDG 14.1.1, SDG 14.2.1 and SDG 14.5.1. UNEP, Nairobi, Kenya.
- United Nations Environment Programme. 2021. Becoming #GenerationRestoration: Ecosystem restoration for people, nature and climate. Nairobi.
- Vogt, P., Riitters, K., Rambaud, P., d'Annunzio, R., Lindquist, E., & Pekkarinen, A. 2022. GuidosToolbox Workbench: spatial analysis of raster maps for ecological applications. Ecography, 2022(3), e05864.

Annex

1. Draft text of elements for Target 2 of the post-2020 global biodiversity framework as an outcome of part II of the third meeting of the Open-Ended Working Group on the Post-2020 Global Biodiversity Framework²³

TARGET 2

Ensure that [at least [20][30] per cent [globally] of]/[at least 1 billion hectares of] [degraded] [[and]/[with a focus on] threatened] [freshwater, [coastal], marine and] terrestrial [and marine] ecosystems[, including agricultural soils] [and X billion hectares of degraded marine and coastal ecosystems] are under [active][effective][ecological] restoration [measures] [at the national level][at the landscape- and seascapescale], [including a focus on restoration [including land and landscape restoration,] into natural and [seminatural] ecosystems, and to support [climate change adaptation and mitigation]/[nature's contributions][, achieving land-degradation neutrality] and ecosystem connectivity [and integrity] / [enhancing biodiversity and ecosystem [functions and] services], [improving]/[ensuring]/[enhancing] [ecosystem integrity and] connectivity] [[among them and focusing]/[with a focus] on priority ecosystems [through providing an atmosphere for fair mobilization of international resources and transfer of necessary technologies, among others]/[enhancing the ecological integrity of priority ecosystems] [and [bio-cultural] ecosystems managed by IPLCs], [[improving]/[ensuring]/[enhancing] [ecosystem integrity and] connectivity] [, taking into account their natural state as a baseline][, with the full and effective participation of IPLCs].

Alternative 1

[Increase the ecological integrity of at least [20]% of degraded terrestrial, freshwater and marine areas globally from [2020/2022] through effective ecological restoration, focusing on areas of particular importance for biodiversity]

Alternative 2

[Bring under restoration at least 20% each of degraded freshwater, , marine, and terrestrial ecosystems, improving ecosystem integrity and focusing on priority ecosystems]

²³ <https://www.cbd.int/doc/c/c949/b2cc/a311c0c411d3a81134e2c7f3/wg2020-03-l-02-en.pdf>

2. Modalities for data compilation and validation in the context of SDG reporting

Two modalities are used for compiling and validating data in SDG reporting, depending on whether the data are generated by countries or by the custodian agencies.

The first modality is in use with a vast majority of the indicators and is based on country-reported values. These data are reported as such to the UN Statistical Division through the relevant custodian agencies. In case country reported data are completely missing, the indicator values are reported as “No Data”.

The second modality, where values are generated by custodian agencies, is used for regional and global aggregates as well as for countries and territories for which desk studies were produced in the absence of reports submitted by the countries. In that latter case, the indicator values are generated by the custodian agencies and sent for validation to the countries. The validation can result in five outputs: 1) replacement of custodian agencies’ estimates by country data, 2) validation of custodian agencies’ estimates as country data, 3) approval of publishing the data as custodian agencies’ estimates or 4) rejection of publishing the custodian agencies’ estimates 5) no reply. In the case of no reply, the data are reported as custodian agencies’ estimates.

In both modalities, the final indicator values will be flagged as “Country data”, “No Data” or “Estimated data” accordingly.