Restoration Barometer

A guide for governments

IUCN

Contents

Introduction

The need for global ecosystem restoration to be urgently scaled up to meet the challenges of the climate crisis, biodiversity loss, and land degradation is evident to all.
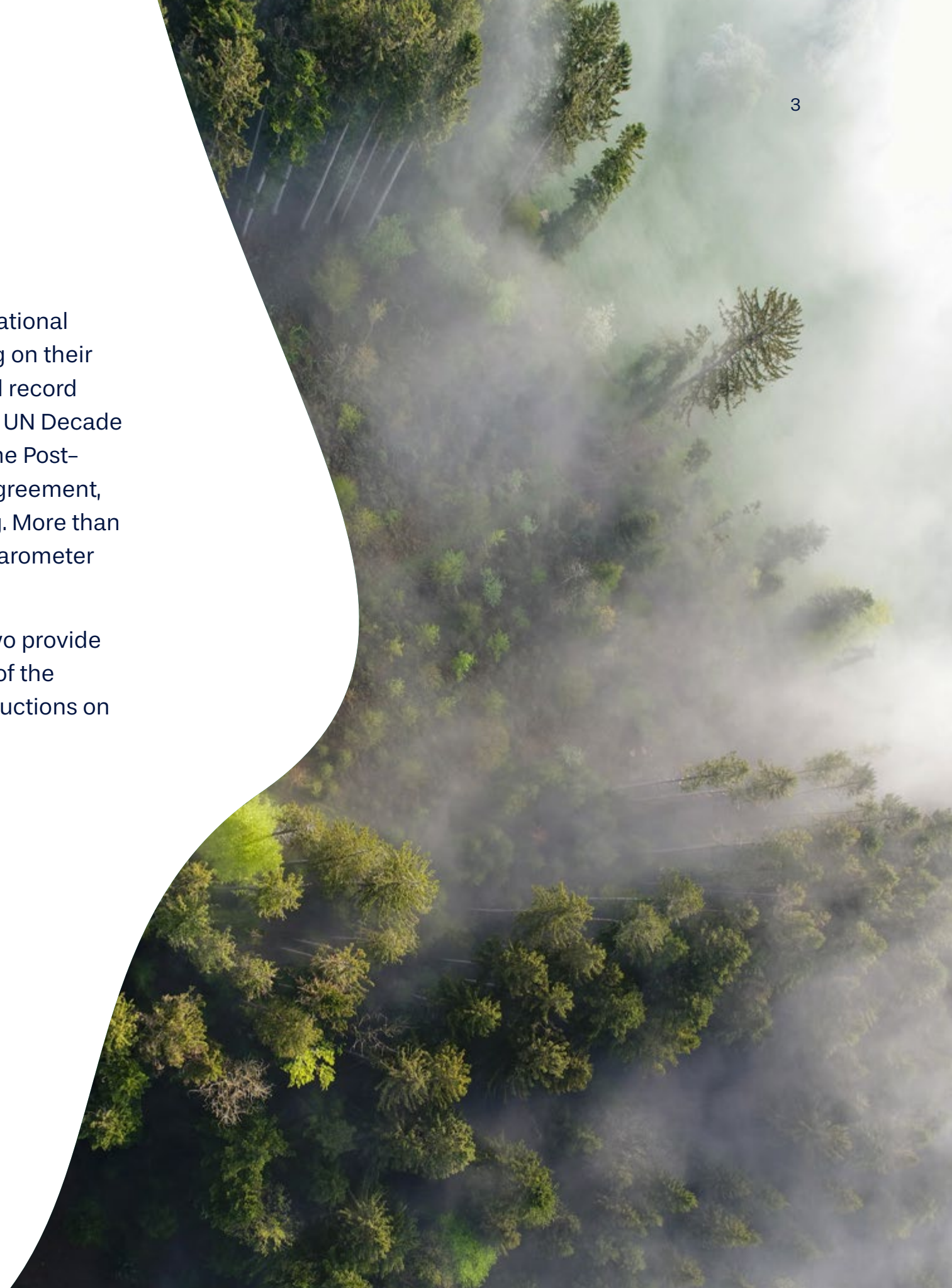
Existing restoration initiatives can be an excellent source of information to guide future, larger endeavours. The Restoration Barometer (launched in 2016 as the Bonn Challenge Barometer) is the only tool already used by governments to track the progress of restoration targets across all terrestrial ecosystems including coastal and inland waters. It records the size of the area being restored as well as the corresponding climate, biodiversity and socio-economic benefits, and also covers the enabling policies and funding structures at the heart of successful restoration. It is a vital tool to highlight what actions are working and why, reveal obstacles to further success, and provide a foundation for scaling up and increasing investments in restoration.

It provides an opportunity for national and sub-national governments to simplify and streamline reporting on their restoration commitments, and can help track and record progress towards global goals. These include the UN Decade on Ecosystem Restoration, the Bonn Challenge, the Post-2020 Global Biodiversity Framework, The Paris Agreement, the Land Degradation Neutrality Target and 1t.org. More than 40 countries now recognise the benefits of the Barometer and endorse its use.

There are three sections to this guide. The first two provide an overview of the concepts and characteristics of the Barometer, and the third gives step-by-step instructions on how to use it.

To go directly to section three, .

This Barometer was designed for countries that have committed to restore landscapes under international goals or agreements.

1 Overview of the Barometer

The ecosystems

The Barometer tracks restoration progress across terrestrial ecosystems including coastal and inland waters where use or management rights can be identified (i.e. not high seas).

Ecosystems are classified according to the **IUCN Global Ecosystem Typology 2.0** and categorisation by the **UN Decade on Ecosystem Restoration**, and include human–dominated landscapes like urban and mixed–use areas, which can provide untapped potential for restoration.[1]
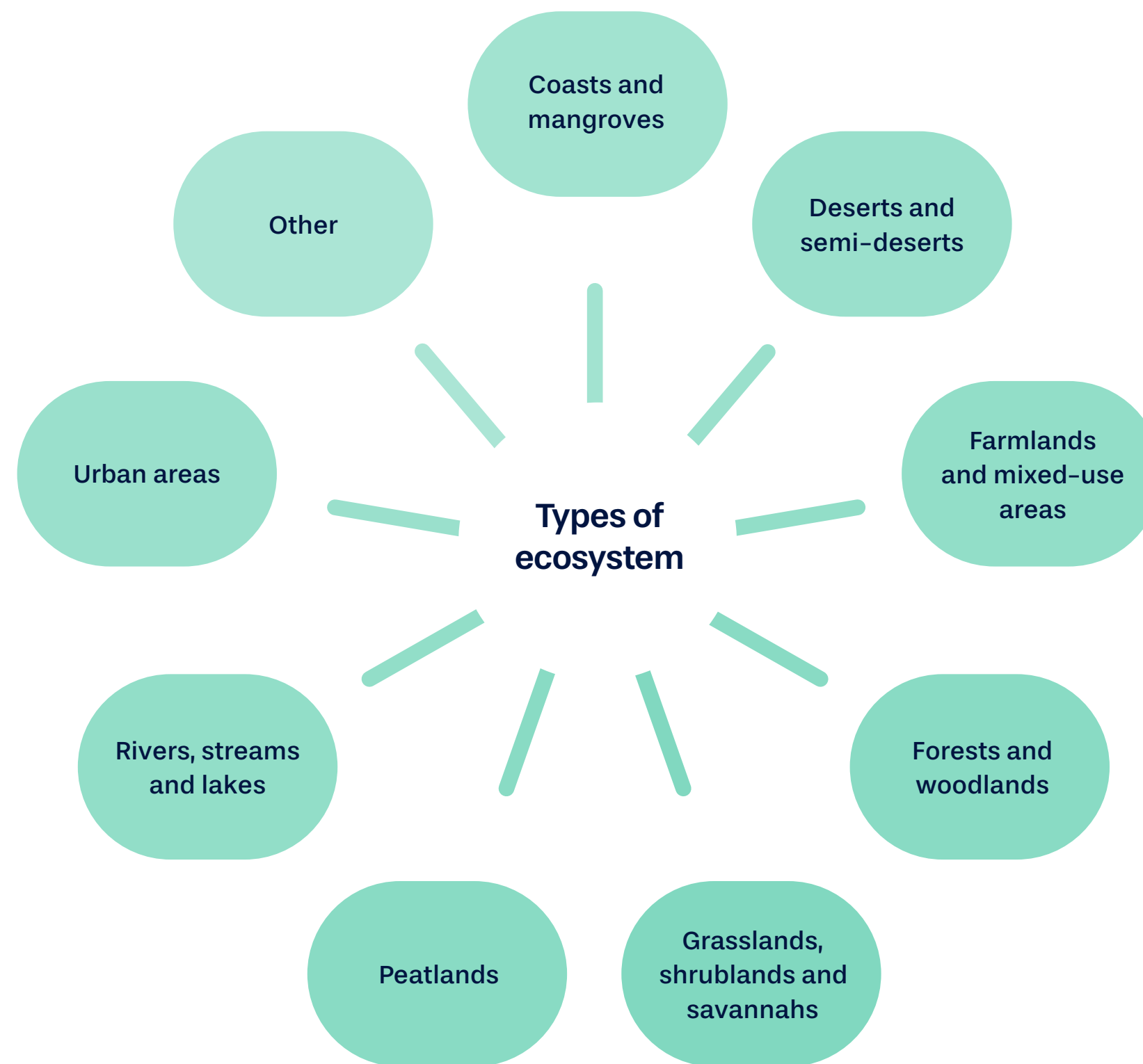
1. IUCN Global Ecosystem Typology 2.0. Coasts and Mangroves: FM1, MT2, MFT1. Deserts and Semi–Deserts: T5. Farmlands and mixed–use areas: T7. Forests and woodlands: T1, T2. Grasslands, shrublands and savannahs: T3, T4. Peatlands and wetlands: TF1. Rivers, streams, lakes: F1, F2. Urban areas: T7. Other: (Polar, Alpine, etc.) T6, F3, MT1, MT3

Figure 1: Source: IUCN/Yokedesign.studio

Coasts and mangroves

A coastal zone is where land and water interact. Trees or shrubs growing between coastal and terrestrial environments or in intertidal zones are known as **mangroves.** There are around 70 different mangrove species, mainly found along tropical and sub-tropical coastlines.

Deserts and semi-deserts

Deserts and semi-deserts are found in arid or semi-arid climates. They have low biomass ecosystems, and lack of water due to low rainfall limits productivity.


Farmlands and mixed-use areas

Land that's used intensively by humans for crops, pastoral activity, plantation farming and urbanisation. Continued human intervention is needed to maintain these areas, including altering vegetation and substrates (e.g. clearing and drainage), supplementing resources (e.g. with irrigation and fertilisers), and introducing and controlling biota.

Forests and woodlands

Forests are defined by the presence of trees and the lack of other land uses. They are larger than 0.5 hectares and have more than 10% tree canopy cover. **Woodlands** are forests with an open canopy, and can also have transitional areas like grasslands and true forests.
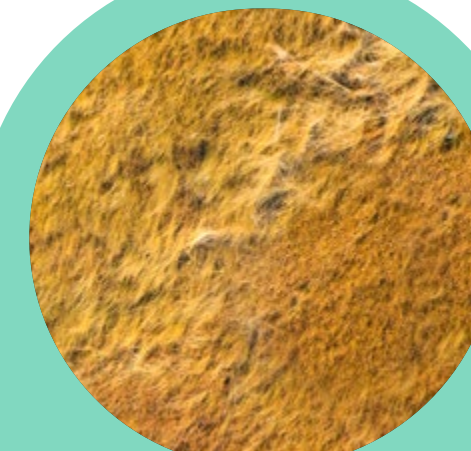
Grasslands, shrub-lands and savannahs

Grasslands are, as the name suggests, large open areas of grass where trees are found infrequently. There are two main types: savannahs (found in areas with a warm climate and rainy and dry seasons), and temperate grasslands (known for their rich soil and abundant grass growth). **Shrublands** usually get more rain (typically between 200 to 1,000 millimetres a year) than grasslands, but less than forested areas.

Peatlands

Land-based, waterlogged ecosystems found across every continent, where organic matter cannot fully decompose so peat is formed.

Rivers, streams and lakes

Rivers and streams are running water ecosystems that flow from uplands or underground springs to deltas, estuaries and lakes. Lakes are still, freshwater ecosystems of variable size, depth and links to other aquatic systems.

Urban areas

Urban areas are home to over half the world's population but cover less than 1% of its surface. Although they are densely populated and built up, they still form ecosystems that can support biodiversity, help clean air and water, cool urban heat islands and support human well-being.
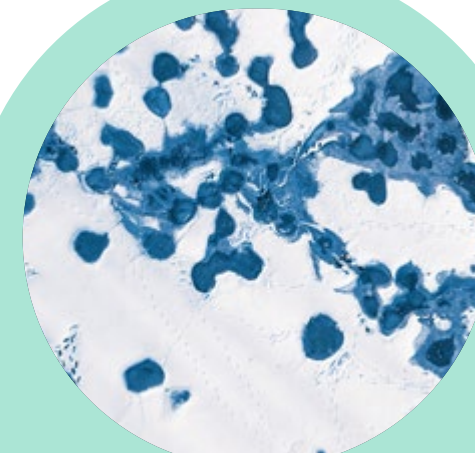
Other

Any restoration in an ecosystem not listed above can be reported under this section. This might include (but is not limited to) polar-alpine areas, artificial wetlands and anthropogenic shorelines.

A closer look at ecosystem restoration

Ecosystem restoration means preventing, halting and reversing the degradation of ecosystems worldwide to regain their ecological functionality and improve productivity and capacity to meet the needs of society. It is an umbrella term referring to a range of restorative actions that change the human footprint within and across ecosystems, rather than removing that footprint all together. Conservation and environmental protection (actions to reduce the degradation of land, water, and ecological support systems) are implicitly included in ecosystem restoration.

UN Decade ecosystem restoration experts have established that ecosystem restoration is underpinned by the **following principles:**

1 Contribute to the UN Sustainable Development Goals and the goals of the Rio Conventions.

2 Promote inclusive and participatory governance, social fairness and equity from the start and throughout the process and outcomes.

3 Include a continuum of restorative activities.

4 Aim to achieve the highest level of recovery for biodiversity, ecosystem health and integrity, and human well-being.

5 Address the direct and indirect causes of ecosystem degradation.

6 Incorporate all types of knowledge and promote their exchange and integration throughout the process.

7 Build on well-defined short-, medium- and long-term ecological, cultural and socio-economic objectives and goals.

8 Tailor to the local ecological, cultural and socioeconomic contexts, while considering the larger landscape or seascape.

9 Include monitoring, evaluation and adaptive management throughout and beyond the lifetime of the project or programme.

10 Build on policies and measures that promote its long-term progress, fostering replication and scaling-up.

The Barometer

Data validation

Information submitted to the Barometer should be accurate and clearly represent the breadth of restoration interventions underway in a country. This can be achieved by involving beneficiaries and stakeholders from implementing agencies to review and submit data. Sharing data sources helps confirm that the collection process was participatory, and can be done through approaches including validation workshops, review by expert panels and open calls for contributions.

Data can be validated by:

1   **Clearly stating sources**

2   **Providing rationales for estimates**

3   **Organising data into tiers based on how it was collected**

Tier three
HIGH confidence in accuracy

Tier two
MODERATE confidence in accuracy

Tier one
LOW confidence in accuracy

2 The indicators

Overview

The Barometer has **eight indicators** that build a comprehensive picture of a country's restoration progress. Based on the core principles of flexibility and inclusivity, it can still be used even if there isn't adequate data for all indicators.

Action

1

Policies and institutional arrangements put into place to advance, incentivise and trigger restoration.

2

Funding channelled into restoration by governments, companies, international donors and other entities.

3

Technical planning to determine where, how and with whom restoration should take place.

4

Monitoring systems already in place to track restoration progress.

Impact

5

Area of land where functionality (ability to provide ecosystem goods and services) has been improved by restoration (not only area of direct intervention).

6

Climate and the amount of carbon sequestered via restoration.

7

Biodiversity benefits and how the creation or improvement of habitats or corridors benefits wildlife.

8

Economy particularly the number of jobs created.

Indicator 1

Policies and institutional arrangements

Policies make restoration pledges happen, and this indicator highlights how committed a government is to actioning its promises. It also illustrates how integral restoration is within a country by assessing the priority it is given, and how it is mainstreamed within other sectors.

Up to ten relevant policies and institutional arrangements that support restoration can be submitted when using the Barometer. And, if applicable, it is also possible to report on the assigned budget for restoration, the defined target in terms of hectares, and the institution or department responsible for the restoration activities.

Policies that enable and incentivise restoration can include:

Incentive mechanisms (e.g. public subsidy schemes promoting restoration, tax incentives for private sector, schemes that incentivise species or habitat restoration)

National or sub-national policies

National or sub-national strategies relating to implementation of international commitments (e.g. National Biodiversity Strategies and Action Plans, nationally determined contributions and land degradation neutrality targets)

National wildlife policies with specific reference to restoration programmes

Land tenure reform

Regional government–supported restoration initiatives and partnerships

Regulatory mechanisms (e.g. requirements to offset environmentally detrimental development activities with restoration, public procurement requirements)

Sustainable agriculture and rural development policies that include restoration interventions

**Sustainable land management policies, strategies or programs.**

Funding

Indicator 2

Funding in this indicator refers to the amount (given in USD) actually spent on restoration, not the amount promised.

Different types of financial support for restoration include:

DOMESTIC PUBLIC EXPENDITURE

Government and public funds:

- Restoration–supportive extension services/capacity development

- Public procurement of restoration services (e.g. environmental management of local governments)

- Direct funding for restoration and/or monitoring

- Foregone revenue from taxes or subsidies (via incentive schemes for private investment in restoration)

- Public funding toward Payments for Ecosystem Services (PES) schemes dedicated to restoration activities

PRIVATE INVESTMENT

Financing from companies and the private sector:

- Agribusiness investment and local entrepreneurs or processers

- Investment of revenue from marketable products and services from restored areas (value chains)

- Impact investors and blended capital

- Credit cooperatives (e.g. village savings and loans associations, credit unions)

- Local lender and microfinance companies

- National commercial bank initiatives

- Private funding toward Payments for Ecosystem Services (PES) schemes that include incentives for restoration activities

- Funds from other climate– focused finance resources
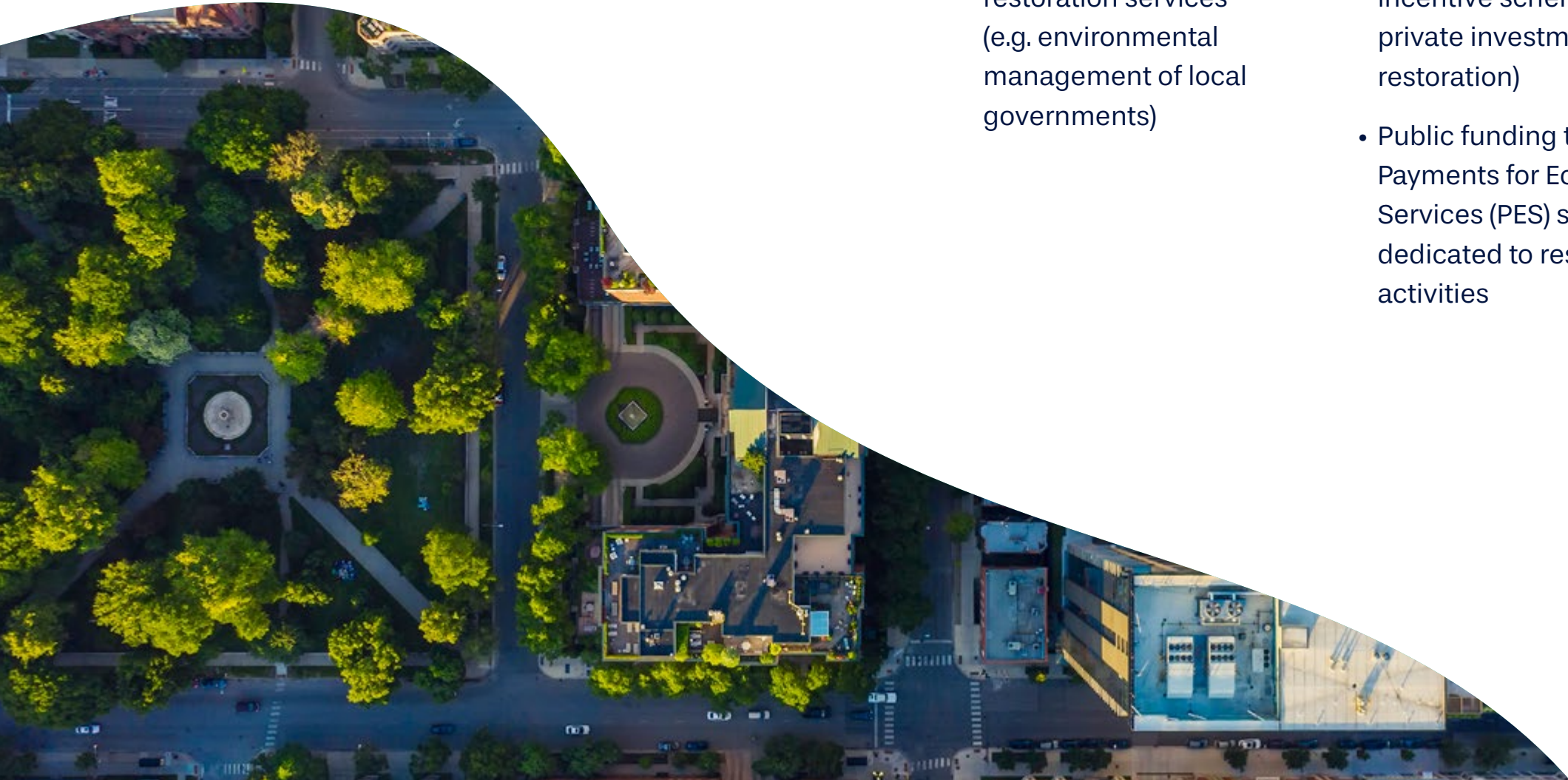
INTERNATIONAL DONOR SUPPORT

Financial support from multilateral and bilateral international donors:

- Climate finance money

- Land Degradation Neutrality Fund

- Bilateral support (e.g. USAID, GIZ, Norad, DFID)

- Multilateral support

- United Nations Framework Convention on Climate Change (UNFCCC), United Nations Convention to Combat Desertification (UNCCD) Global Mechanism, United Nations Environment Programme (UNEP), Microfinance for Ecosystem-based Adaptation (MEbA)

- Conservation NGOs (e.g. World Wide Fund for Nature, Wetlands International, International Union for Conservation of Nature, Conservation International, The Nature Conservancy)

- Humanitarian aid programmes (e.g. Mercy Corps, Oxfam)

- Reforestation-specific NGOs (e.g. Eden Reforestation Projects)

- Climate investment funds

- The Sustainable Trade Initiative

- FIP funding proposals for included countries

- Green Climate Fund

DOMESTIC PHILANTHROPIC AND NON-PROFIT

Financial support from domestic non-governmental organisations, philanthropists, and non-profits:

- Restoration and conservation NGOs

- Civil society organisations

- Fourth pillar development cooperation

Reporting accuracy

Given the diversity of sources and the proprietary nature of financial data, comprehensive reporting on this indicator may be challenging and estimates can be provided. The accuracy of these estimates can be determined using the chart below.
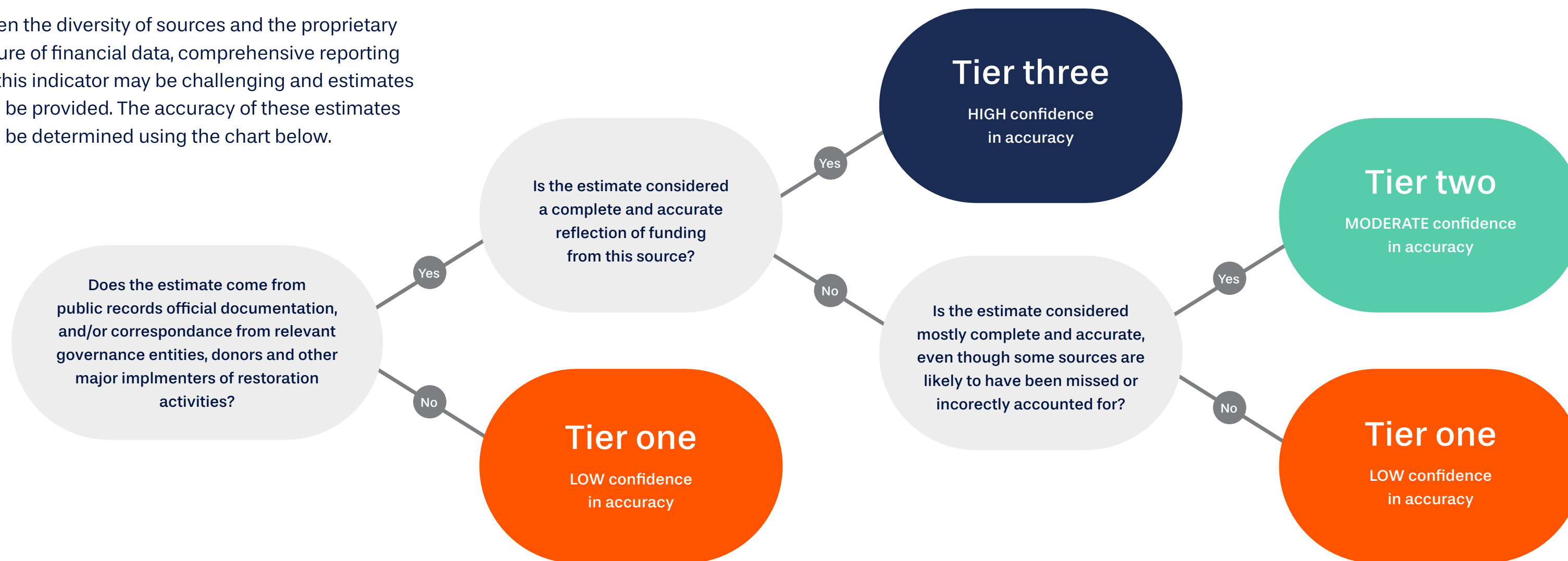

Tier three
HIGH confidence in accuracy

Tier two
MODERATE confidence in accuracy

Is the estimate considered a complete and accurate reflection of funding from this source?

Is the estimate considered mostly complete and accurate, even though some sources are likely to have been missed or incorectly accounted for?

Does the estimate come from public records official documentation, and/or correspondance from relevant governance entities, donors and other major implmenters of restoration activities?

Yes

No

Yes

No

Yes

No

Tier one
LOW confidence in accuracy

Tier one
LOW confidence in accuracy

Figure 2: Assessing the accuracy of funding estimates. Source: IUCN/Yokedesign.studio

When limited funding information is available, an assessment based on the area under restoration, along with expert estimates of the costs and investment structure of specific restoration activities can help obtain tier one values of financial flows.

If possible, crosschecks should be made with publicly available information on budgets of ministries, local governments and representatives from private and non–profit sectors.

Indicator 3

Technical planning

Effective planning to identify where, how and why restoration efforts will take place, and assess their potential benefits, is critical for ensuring long–term positive impacts and meaningful outcomes.

Many Barometer users have followed formal frameworks such as IUCN's **Restoration Opportunities Assessment Methodology (ROAM)** and the **Restoration Opportunities Optimisation Tool (ROOT)** to guide and plan restoration implementation. Formal planning may also have been undertaken as part of other separate but related land use policy efforts, including the United Nations Convention to Combat Desertification (UNCCD) and the Land Degradation Neutrality Target Setting Programme.

This indicator helps record the restoration planning approaches adopted including:

The geographic scale of planning, from site-specific to national level

The spatial resolution used while conducting the planning process

The initial condition and status of the landscape(s) covered

How the planning process and approach addressed and assessed the potential benefits of restoration actions on biodiversity, particularly in terms of endangered species and their habitats.

Indicator 4

Monitoring systems

This indicator supports the important process of systematically and consistently tracking ecosystem restoration including:

Whether proprietary monitoring systems are in place

How systems were developed and applied, and whether they are being used to report to multilateral environmental agreements or other international restoration initiatives

Whether monitoring systems and methodologies are part of a system to track and report emission reduction against national climate and development targets required under the Paris Agreement

The investment and efforts dedicated to establishing such systems, methodologies and/or frameworks.

Using this Barometer helps generate a picture of national or sub-national progress based on site-level data. Countries that don't have access to information on land cover use and change can use the following tools to gather data and estimate of the benefits of restoration:

Collect Earth

A set of free, open-source software tools by Open Foris that facilitates flexible and efficient data collection, analysis and reporting on factors including forest inventories, land use and land use change, socio-economic surveys and climate change reporting.

RESTOR

A unified platform that democratises ecological data. It best supports projects working on sustainable land use, ranging from conservation to agroforestry, sustainable forest management, regenerative agriculture and natural regeneration.

SEPAL

Another Open Foris tool that allows users to process satellite data, tailor products for local needs and produce complex, relevant geospatial analyses. SEPAL enables processing of historical satellite data as well as newer data from Landsat and higher-resolution data from European Union's Copernicus Programme.

SER Recovery Wheel

An online tool to help evaluate the extent of an ecosystem's recovery. It should be used to assess the effects of restoration on an ecosystem, not the restoration implementation in itself.

Trends.Earth

A free and open-source tool for assessing land change that focuses on productivity, land cover and soil organic carbon, and uses global datasets including land cover data from the European Space Agency. Because of the relatively coarse resolution data, it is most helpful for identifying transitions involving a large change in tree canopy cover rather than more subtle changes like local scale interventions.

Indicator 5

Area of land

By defining the amount of land under active restoration, this indicator supports evaluation of how effectively pledges are being met.

It is measured in hectares under restoration, and in collaboration with Professor Jeff Sayer, IUCN has defined this as **'the area (in hectares) where functionality (ability to provide ecosystem goods and services) has been improved by restoration (not only area of direct intervention)"**.

The **online tools** listed in indicator four can also be used to estimate this data. The Barometer has a baseline date of 2010, which means that restoration progress underway since 2010 can be reported, irrespective of when commitments were announced.

Coordinates and/or geographic information systems (GIS) files showing the extent of the degraded ecosystems under restoration should be provided using manual data collection or spatial data from satellite imagery. Data produced via spatial analyses or ground surveys may vary in accuracy and should be categorised using the tier structure below.
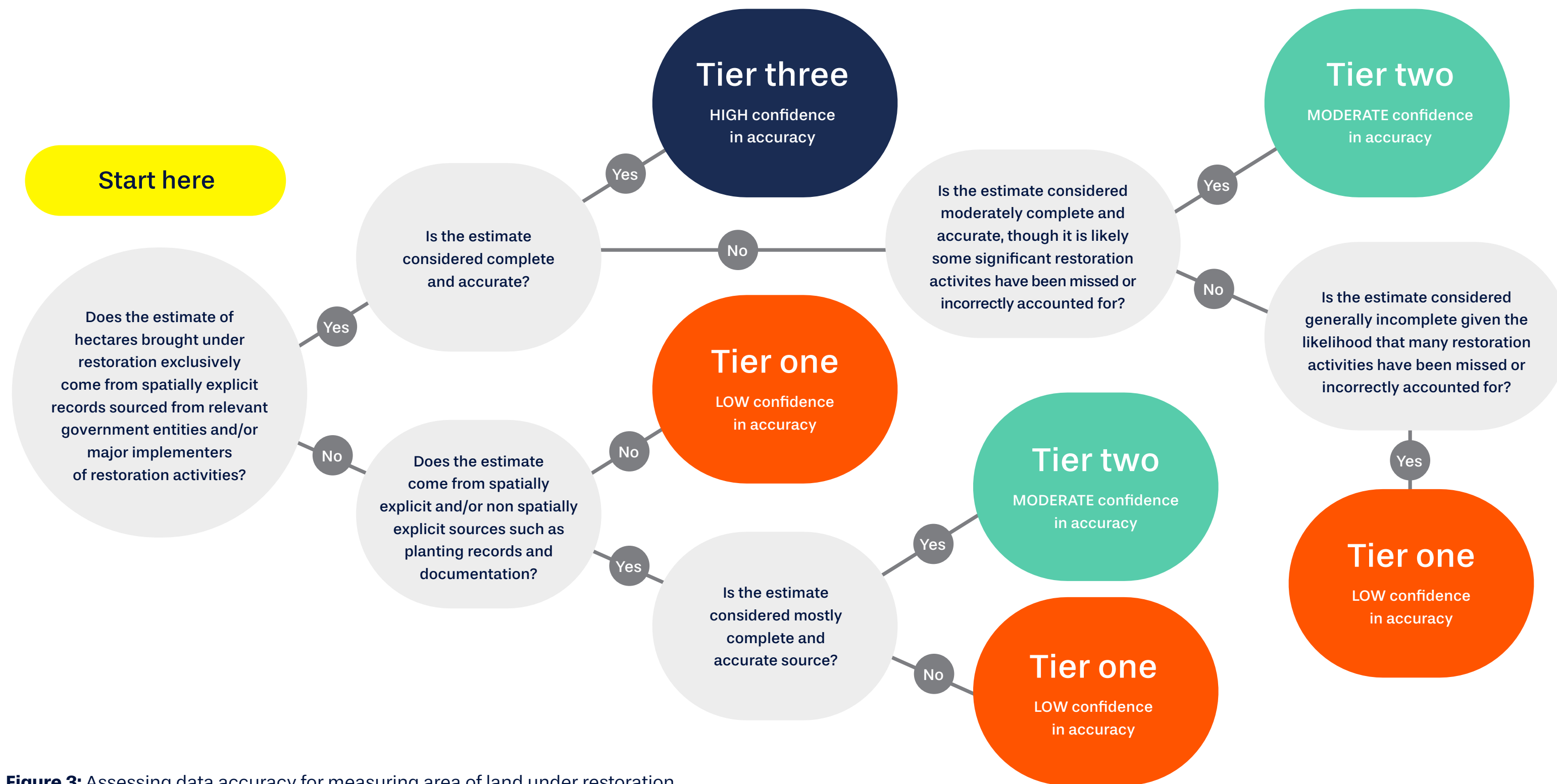
Figure 3: Assessing data accuracy for measuring area of land under restoration.
Source: IUCN/Yokedesign.studio

Indicator 6

Climate

It is clear that the benefits of ecosystem restoration extend beyond impacts on the land itself, and those who live on it. This indicator can be used to assess how ecosystem restoration can help mitigate the effects of the climate crisis though carbon sequestration. Estimating the amount of carbon sequestered needs to directly relate to the amount hectares under restoration, in accordance with standard IPCC accounting principles shown in figure four.

Under this method:

- activity data is the number of hectares under restoration (which should match indicator five)

- removal factor is the tonnes of carbon dioxide sequestered per hectare per year (tonnes of CO_2 per hectares per year)

- activity data and removal factors should be grouped by restoration type to improve estimate accuracy Estimates should reflect gross carbon sequestration (the total CO_2 actually sequestered from the atmosphere, rather than potential emissions associated with the restoration activities, such as emissions from vehicles or methane emissions from livestock in silvopastoral systems).

If estimates on the actual and anticipated climate impacts of restoration activities have already been made through greenhouse gas (GHG) inventory systems to meet national reporting commitments like the **United Nations Framework Convention on Climate Change** (UNFCCC)[2], then they should be used to ensure consistent reporting through this Barometer.

If estimates have not already been made, there are a number of free, open–source resources to support basic accounting of restoration impacts on carbon sequestration.
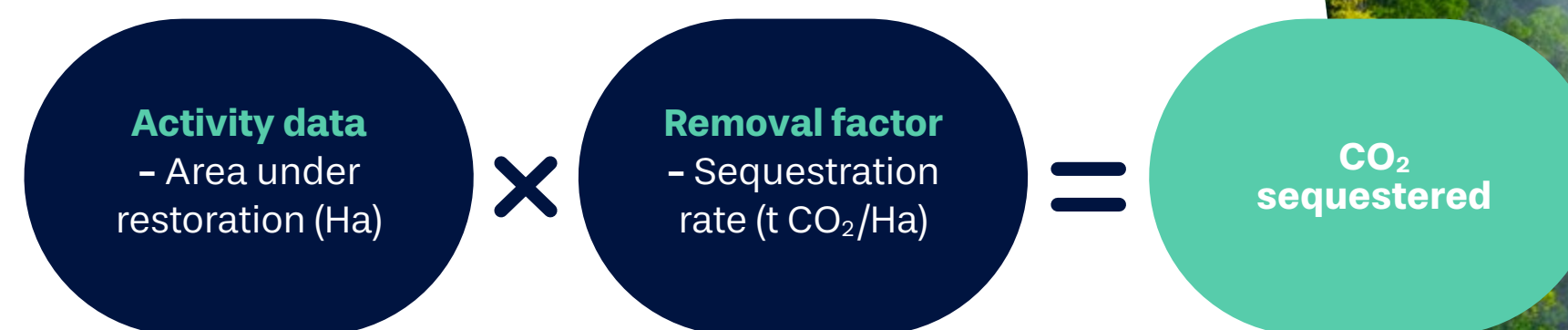
Activity data – Area under restoration (Ha) ✕ **Removal factor** – Sequestration rate (t CO_2/Ha) = CO_2 sequestered

Figure 4: How CO_2 sequestered from restoration activities is quantified. Source: IUCN/Yokedesign.studio

2. A section of this report is titled 'The importance of aligning with national and/or subnational processes', offering comprehensive guidance on how and why to ensure accounting for climate impacts of FLR and, more generally, restoration should leverage existing efforts to account for climate impacts from restoration and how this might align with NDC planning and reporting.

Resource	Description	Applicability	Limitations
2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Agriculture, Forestry and Other Land Use	• Official UN Intergovernmental Panel on Climate Change (IPCC) guidance on estimating emissions and removals from agriculture, forestry, and other land use (AFOLU) sectors.	• Tables 4.9 (natural forests) and 4.10 (plantations) offer tier one default values for above-ground net biomass growth estimates for different forest types in a range of ecological zones that could be applied as removal factors in lieu of tier two rates from more local or regional studies of CO_2 removals from restoration activities in question.	• Default removal rates from tables 4.9 and 4.10 are offered as tonnes of dry matter per hectare per year and would need to be converted into CO_2 per hectare per year. • Additional significant carbon pools (i.e. below-ground biomass) are not included in these removal rates and should be included by applying the appropriate ratio to above-ground biomass supplied in table 4.4. • The removal factors offered by IPCC tables should be considered tier one and represent broad, regional estimates and management practices. • Where site-specific or dedicated regional studies that account for important management and biophysical conditions which significantly impact CO_2 removal rates (i.e. former land use, topography, soil type and quality) exist, those should be applied.
Winrock–IUCN FLR Carbon Storage Calculator	• Estimates the amount of CO_2 stored (annually and cumulatively up to 20 years) by agroforestry, plantations and woodlots, natural regeneration and mangrove restoration. • Combines user-provided data on the number of hectares under restoration by type with geographically specific CO_2 removal rates from the **Global Emissions and Removals Databases** • The Excel-based FLR Climate Impact Tool applies the same data and approach as the online FLR Carbon Storage Calculator, but allows for more complicated estimations where the impact of restoration CO_2 sequestration across multiple geographies is needed.	• Provides a reliable estimate without requiring extensive user-supplied data. • No existing understanding of GHG accounting, specialised software or GIS skills required. • Automatically selects CO_2 removal rates based on user-provided information on restoration type and geography. • Bases applied CO_2 removal rates on credible scientific peer-reviewed analysis that also offers estimates of uncertainty. • Supplies annual and cumulative rates. • Offers estimates for both above- and below-ground biomass pools.	• The removal factors in the Global Removals Database that were applied to these tools represent broad regional estimates and have been grouped according to FLR-type definitions offered by ROAM. This includes hugely variable practices such as agroforestry. • Removal factors should mainly be considered tier one due to a lack of data from some regions, which resulted in few data points and causes high uncertainty for some restoration types and regions. • Where site-specific or dedicated regional studies that account for important management and biophysical conditions which significantly impact CO_2 removal rates (i.e. former land use, topography, soil type and quality) exist, those should be applied.

https://cbmjournal.biomedcentral.com/articles/10.1186/s13021-018-0110-8. Database of potential carbon dioxide (t CO_2 ha yr) removals from four FLR activities (agroforestry, plantations and woodlots, natural regeneration, and mangrove restoration). Rates based on modeled growth rates developed using data drawn from a comprehensive review of published and unpublished studies of tree growth worldwide.

Resource	Description	Applicability	Limitations
Estimating the mitigation potential of forest landscape restoration	• IUCN publication for estimating the climate change mitigation potential and CO_2 sequestration impacts of FLR activities.	• Targeted guidance for establishing a system for estimating CO_2 impacts from restoration activities and aligning with other complimentary national efforts.	
IPCC Inventory Software	• Implements tier one and tier two methods from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.	• Can be used to account for emissions and removals across all sectors, including AFOLU. Users can enter hectares and characteristics of remaining and converted land, based on IPCC defaults.	• Some training and understanding of GHG accounting principles and procedures is required. • May not offer the level of detail and customisation needed to allow for accurate accounting of different restoration activities across diverse landscapes.
Food and Agriculture Organization of the United Nations EX–Ante Carbon Balance Tool	• Excel–based software that estimates emissions and removals from land use and land use changes. • Compares project scenarios to inform management practices and quantifies GHG impacts across multiple sectoral activities (e.g. livestock emissions and CO_2 sequestration from tree planting for net impact).	• Although this Barometer requires an estimate of gross removals from restoration activities, this tool is useful when more in–depth accounting of GHG impacts from restoration activities that include both emissions and removals (e.g. silvopastoral systems that may increase livestock emissions) is needed. • Applies IPCC tier one and/or tier two data and can be adapted to various scales (project/landscape/ region).	• Mostly designed to be applied at project level, but if enough data is available, it can be scaled up. • Requires some technical skill to understand and operate.

When using these tools to estimate the CO_2 impacts of restoration, responses should be categorised according to accuracy using the prompts in figure five.
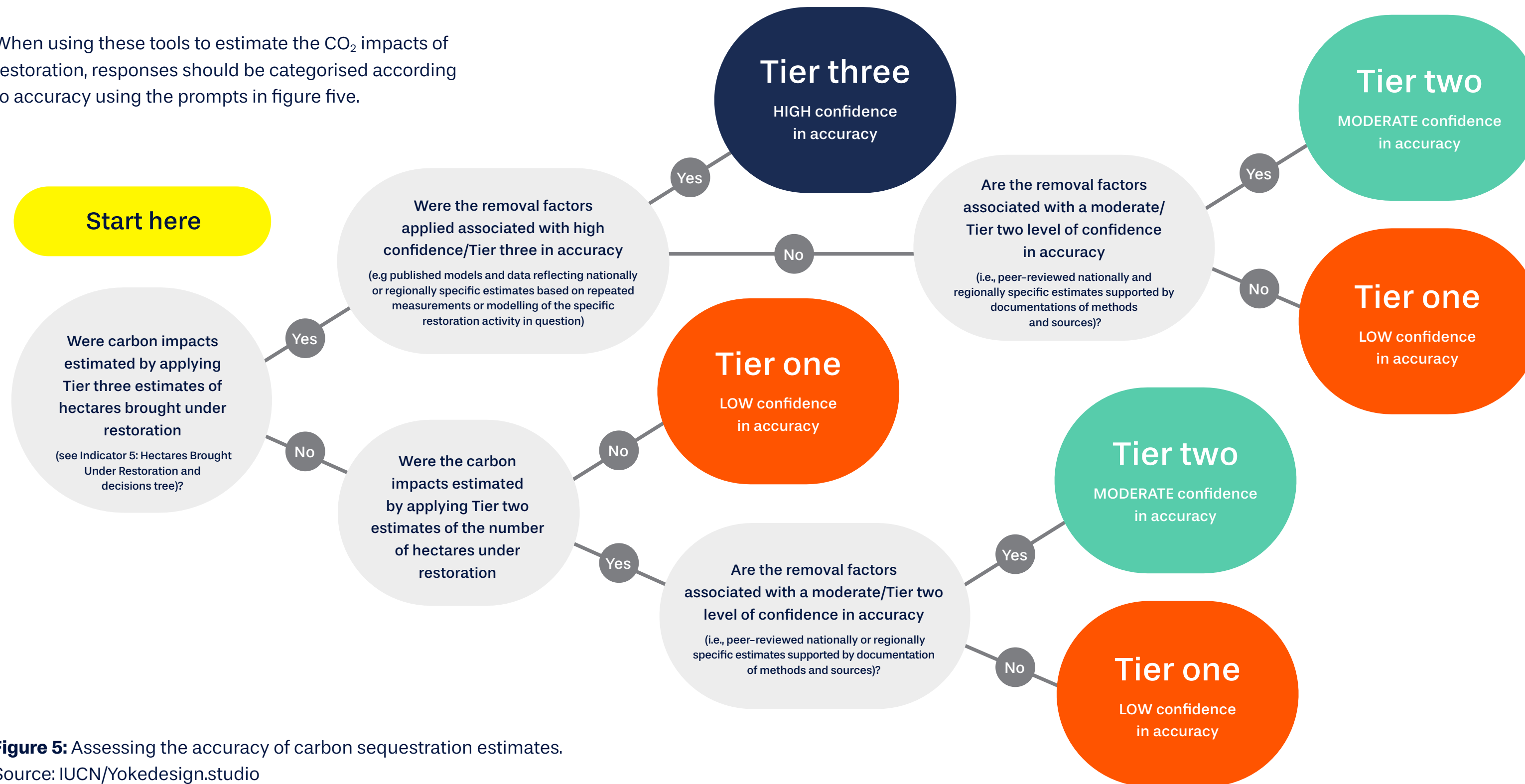
Start here

Were carbon impacts estimated by applying Tier three estimates of hectares brought under restoration

(see Indicator 5: Hectares Brought Under Restoration and decisions tree)?

Yes

Were the removal factors applied associated with high confidence/Tier three in accuracy

(e.g published models and data reflecting nationally or regionally specific estimates based on repeated measurements or modelling of the specific restoration activity in question)

Yes

Tier three

HIGH confidence in accuracy

No

Are the removal factors associated with a moderate/Tier two level of confidence in accuracy

(i.e., peer–reviewed nationally and regionally specific estimates supported by documentations of methods and sources)?

Yes

Tier two

MODERATE confidence in accuracy

No

Tier one

LOW confidence in accuracy

No

Were the carbon impacts estimated by applying Tier two estimates of the number of hectares under restoration

No

Tier one

LOW confidence in accuracy

Yes

Are the removal factors associated with a moderate/Tier two level of confidence in accuracy

(i.e., peer–reviewed nationally or regionally specific estimates supported by documentation of methods and sources)?

Yes

Tier two

MODERATE confidence in accuracy

No

Tier one

LOW confidence in accuracy

Figure 5: Assessing the accuracy of carbon sequestration estimates.
Source: IUCN/Yokedesign.studio

Indicator 7

Biodiversity

This indicator facilitates reporting on the benefits of ecosystem restoration on biodiversity, including:

The creation or enhancement of corridors for endangered species or species of functional importance, such as pollinators

The creation or enhancement of corridors across multiple-use landscapes to connect key habitats and allow for species dispersal

How restoration efforts have benefited areas that have received formal recognition as an area of particular importance for conservation and biodiversity (e.g. Key Biodiversity Areas (KBAs), protected areas, national parks) or in native, intact or primary forest

The creation or enhancement of existing habitats for Red List species

The reduction of dependence on wild species and/or their habitats in the buffer zones of protected areas

IUCN guidance is available to identify what constitutes an area of particular importance for conservation.

National governments that have committed to the Convention on Biological Diversity (CBD), already report on the progress of their National Biodiversity Strategies and Action Plans (NBSAPs). If NBSAPs are not already being reported, tools are available to help assess how restoration activities impact biodiversity:

Key Biodiversity Areas: an online database sharing KBAs in each country, and guidance on how to ensure they are covered by Protected Areas systems

Convention on Biological Diversity national reports

National reports from UN Department of Economic and Social Affairs Forests on Global Forest Goals 1, 2, 3 and 4 under Global Forest Goals and Targets of the United Nations Strategic Plan for Forests 2030

Forest landscape restoration: meeting national and international biodiversity commitments

Indicator 8
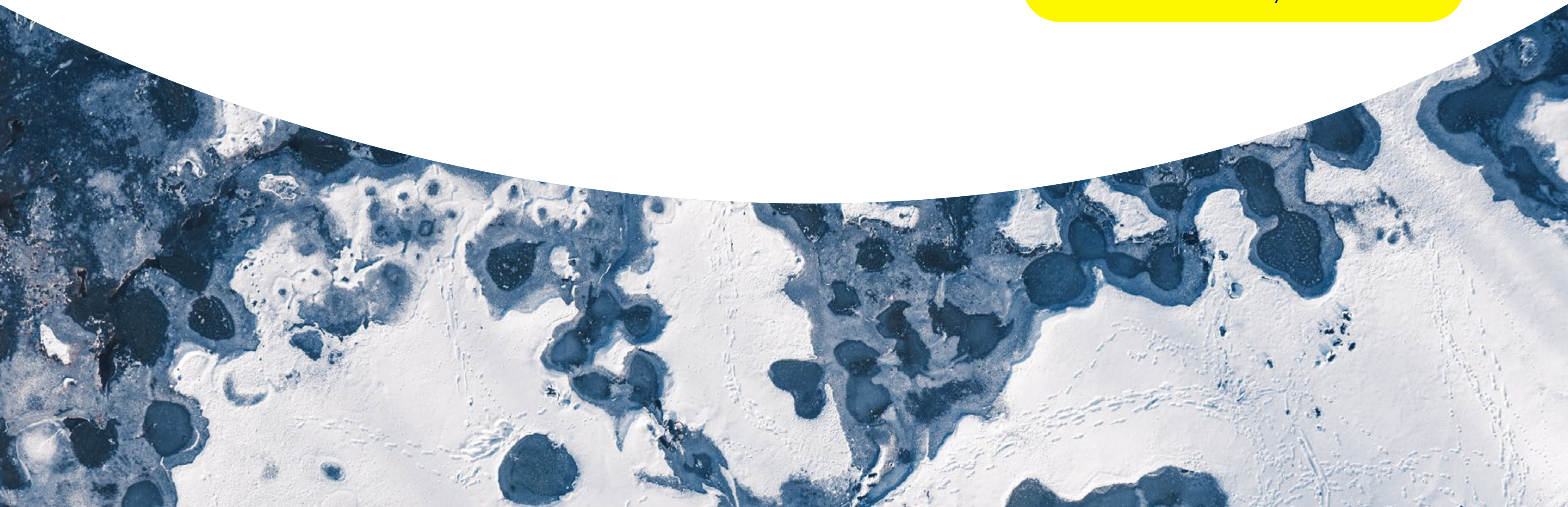
Economy

Indirect advantages of ecosystem restoration, like diversification of livelihoods and income sources for local communities, need to be monitored as well as the direct benefits on local and national economies. But because of the length of time it can take for these benefits to manifest, the fact that some are less tangible than others, and the diverse range of people impacted, quantifying these socio–economic impacts can be difficult.

To address these challenges, this indicator uses the number of jobs created (expressed in Full Time Equivalent (FTE[3]) or workdays) for people aged 15 and over through restoration as the single indicator for socio–economic impacts. It also gives flexibility to report additional information on job creation where relevant, and add details on further impacts (i.e. as reports by beneficiaries or results from other studies).

Types of jobs created by restoration include:

Casual, intermittent or occasional Includes seasonal work, zero–hours contracts and day-to-day hiring. Employees have no guarantee of employment for a set number of hours during a specified period but may have arrangements of an ongoing or recurring nature.

Short term Employees are guaranteed a minimum number of hours of work and are employed on a time–limited basis, usually for less than three months.

Long term Employees are contracted to work full– or part-time for three months or longer.

Additional details on job creation should be provided when available, such as:

• **Job type** (casual, short term, long term, or details about other types of employment)

• **Employee gender** (male/female/third gender/non–binary/other)

• **Headcount of people who have been employed** (which could be different to the number of jobs measured in FTE, for example with part-time employment)

The range of sources and private nature of this data can make reporting difficult for this indicator and estimating the number of jobs created may be necessary. This can be done through different approaches including:

• Official statistics and data from national and local authorities and government

• Expert estimates

• Field assessments and/or surveys

• Economic modelling (e.g. input/output model)

• National level restoration planning assessments and analyses (e.g. applying ROAM)

3. A full-time equivalent, abbreviated as FTE, is a unit to measure employed persons in a way that makes them comparable although they may work a different number of hours per week. The unit is obtained by comparing an employee's average number of hours worked to the average number of hours of a full-time worker. A full-time worker is therefore counted as one FTE, while a part-time worker gets a score in proportion to the hours he or she works. Source: ILO Statistical Glossary.pdf (ilo.org)

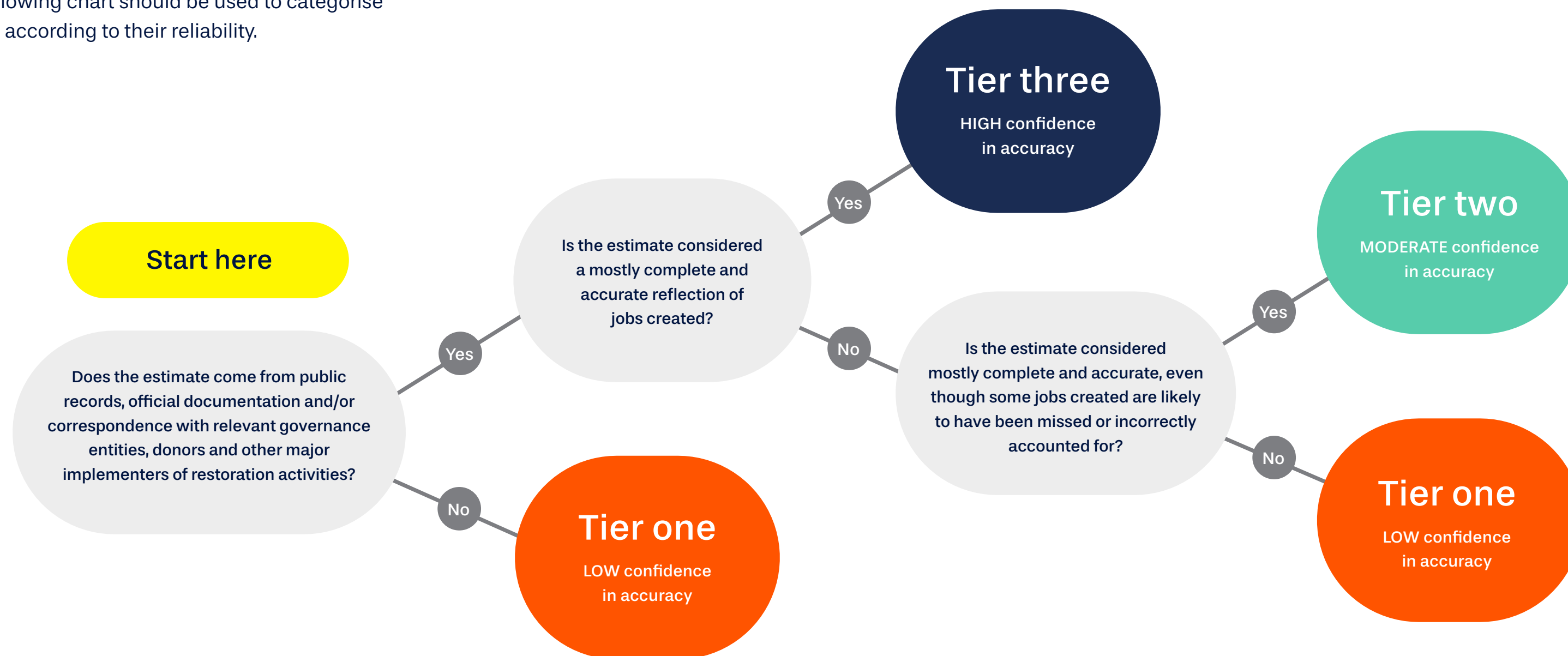The following chart should be used to categorise results according to their reliability.

Start here

Does the estimate come from public records, official documentation and/or correspondence with relevant governance entities, donors and other major implementers of restoration activities?

Yes → Is the estimate considered a mostly complete and accurate reflection of jobs created?

No → **Tier one** — LOW confidence in accuracy

Is the estimate considered a mostly complete and accurate reflection of jobs created?

Yes → **Tier three** — HIGH confidence in accuracy

No → Is the estimate considered mostly complete and accurate, even though some jobs created are likely to have been missed or incorrectly accounted for?

Is the estimate considered mostly complete and accurate, even though some jobs created are likely to have been missed or incorrectly accounted for?

Yes → **Tier two** — MODERATE confidence in accuracy

No → **Tier one** — LOW confidence in accuracy

Figure 6: Assessing the reliability of socio–economic estimates. Source: IUCN/Yokedesign.studio

3 How to use the Barometer

29 A step-by-step guide to using
The Restoration Barometer

Step one

REGISTER FOR THE BAROMETER ONLINE

Once we have received your information, we will send you an email confirming that your account has been created.

Step two

CHOOSE A BASELINE YEAR

In most cases, the year a restoration commitment was initially made is the baseline year. The Barometer has a baseline date of 2010, which means that restoration progress underway since 2010 can be reported, irrespective of when commitments were announced.

Once you have submitted this information, it will be reviewed to make sure there are no gaps.

Step three

SELECT AND MANAGE INDICATORS

Choose which indicators to use. While a comprehensive standard report with all eight indicators is optimal, it is possible to create a spotlight report with a minimum of three. Then, determine the accuracy of the data you are providing using the flow charts provided.

Tier three
HIGH confidence in accuracy

Tier two
MODERATE confidence in accuracy

Tier one
LOW confidence in accuracy

The number of indictors used will influence the level of data accuracy, and recommended tiers for using three or eight indicators are described in the table below.

	Standard Report (8 Indicators)	**Spotlight Report** (3 Indicators)
Indicators reported		
	All	1. One action factor (indicators one to four) 2. Area of land (indicator five) 3. One other impact factor (indicators six to eight)
Accuracy required		
INDICATOR ONE: POLICIES AND INSTITUTIONAL ARRANGEMENTS	Estimated through a participatory process.	Declared by the government, possibly with a group of stakeholders.
INDICATOR TWO: FUNDING	Tier two or higher	Tier one (information gaps should be reported and ideally accompanied by a rationale for calculation).
INDICATOR THREE: TECHNICAL PLANNING	Estimated through a participatory process.	Declared by the government, possibly with a group of stakeholders.
INDICATOR FOUR: MONITORING SYSTEMS	Estimated through a participatory process.	Declared by the government, possibly with a group of stakeholders.

Table one: Requirements for standard and spotlight reports

|		**Standard Report** (8 Indicators)	**Spotlight Report** (3 Indicators)
Accuracy required			
	INDICATOR FIVE: AREA OF LAND	Tier three (with spatially explicit data of intervention sites) or tier two with reliable documentation describing implementation and minimum location. Efforts should be made to avoid double counting.	Tier two with reliable documentation and minimum location information. Acknowledge potential double counting or any other inaccuracy where possible.
	INDICATOR SIX: CLIMATE	Tier two or higher	Provide estimate based on tier two hectares under restoration data to calculate carbon sequestered, using the more specific emission factors available. Disclose rationale behind the calculation.
	INDICATOR SEVEN: BIODIVERSITY	Provide information on total area under restoration inside protected areas, KBAs etc. with more accurate impact estimates if available (e.g. formation of biological corridors, matrix permeability to species, beneficial impacts to threatened species).	Provide the best estimates possible on total area under restoration inside protected areas and KBAs etc.
	INDICATOR EIGHT: ECONOMY AND JOBS	Tier two or higher	Tier one or higher, with rationale disclosed. Information gaps should be reported.
Validation			
		Participatory process	All data sources verified
Updates			
		Every two years	As often as possible

Step four

SELECT RELEVANT RESTORATION INTERVENTIONS

Using the **checklist of main intervention types** on the portal, select the type of ecosystem where restoration work took place and the type of activities implemented on the ground. If you cannot find your specific activity, select 'other' and provide more details.

Step five

SUBMIT DATA

Your data will be published once it has been submitted.
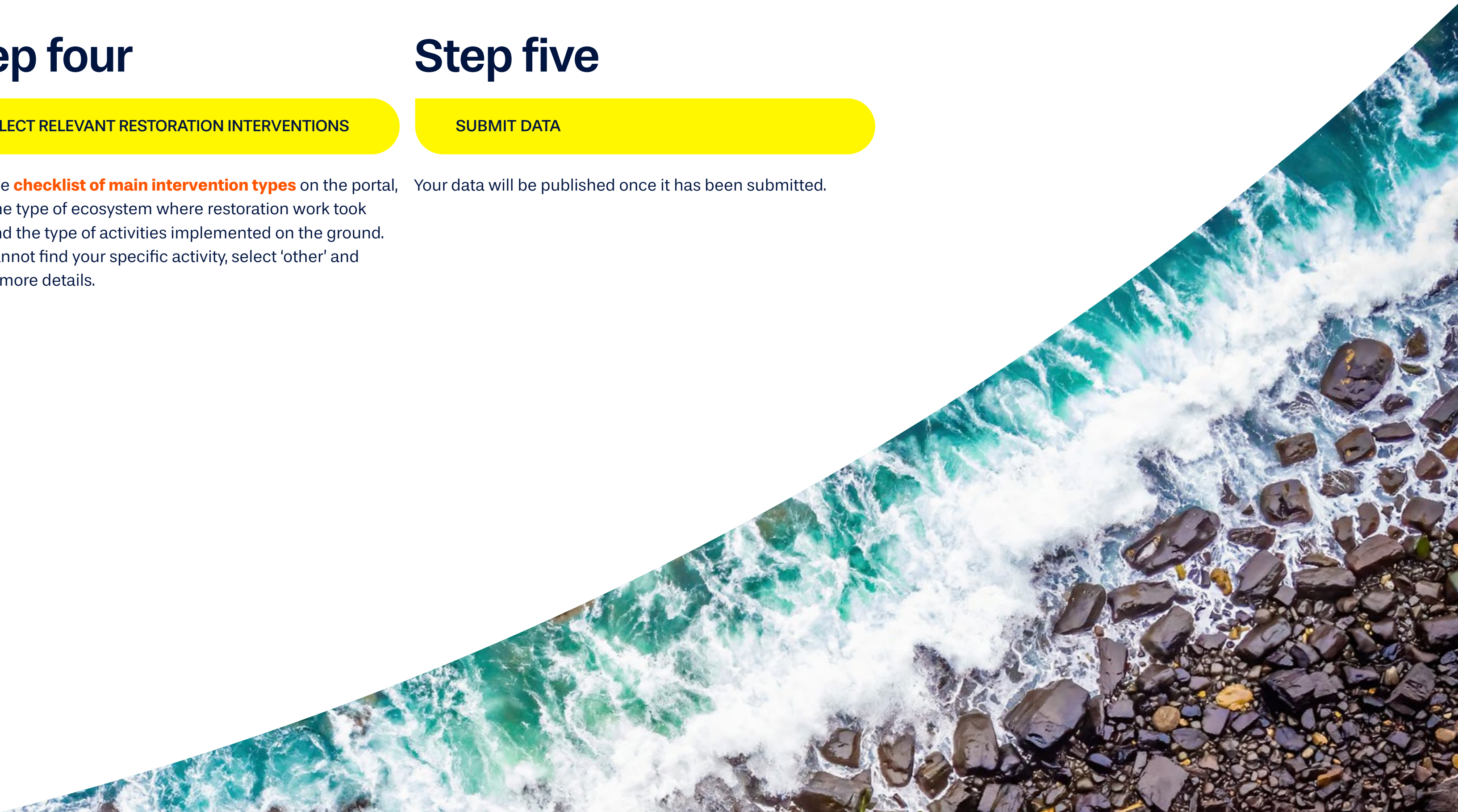
4 Annex

34   Restoration Intervention Typology
for Terrestrial Ecosystems (RITTE)

**Restoration Intervention Typology
for Terrestrial Ecosystems (RITTE)**

Deserts and semi-deserts

Users can choose to indicate top-level approaches such as artificial regeneration OR provide more detail by selecting specific intervention types under approaches.

- **Improving water access for native wildlife**

- **Natural regeneration**
  - Passive natural regeneration
    - Reducing or eliminating the sources of degradation and allowing recovery time (resting periods)
    - Other (option to provide more detail)
  - Assisted natural regeneration
    - Scarification
    - Grazing management
    - Vegetation management (incl. composition)
    - Fire management
    - Reintroduction of native species
    - Other (option to provide more detail)

- **Artificial regeneration**
  - Planting/seeding
  - Terracing/other forms of soil manipulation
  - Interventions targeted at water management and/or sustainable use including harvesting, catchment, reticulation, etc.
  - Other (option to provide more detail)

- **Land/water protection**
  - Site/area/habitat protection e.g. establishment of community conserved areas/protected areas
  - Other (option to provide more detail)

- **Invasive/problematic species control**

- **Management of invasive native species (incl. diseases)**

- **Other (option to provide more detail)**

Forests and woodlands

- **Land/water protection/conservation actions** ⓘ *establishing new forest areas, protecting and expanding existing forest remnants, buffers of protected areas/community conserved areas*
  - Site/area/habitat protection
  - Planting/seeding/natural regeneration of buffers (mixed stands of native species)
  - Planting steppingstones (cluster, nucleation)
  - Planting/seeding corridors of mixed stands of native species
  - Restoring cultural forest ecosystems
  - Reintroducing wildlife and bird species
  - Other (option to provide more detail)

- **Natural regeneration**
  - Passive natural regeneration (restoring degraded forests)
    - Reducing or eliminating the sources of degradation and allowing recovery time (removing disturbances)
    - Other (option to provide more detail)
  - Assisted natural regeneration ⓘ *restoring degraded forests, reclaiming severely degraded sites*
    - Farmer–assisted natural regeneration
    - Native recolononisation

- Restoring natural flooding regimes (remove dams or barriers, create wetlands)
- Site stabilisation
- Soil improvement (fertilizer, liming, biostimulants)
- Phytoremediation
- Re-establish hydrologic connectivity or physical processes for watersheds
- Other (option to provide more detail)

- **Artificial natural regeneration** ⓘ *establishing new forests, restoring degraded forests*
  - Artificial regeneration (through planting of seedlings or seeds in mixtures)
  - Reconnecting fragmented forests by planting mixed stands of native species
  - Planting on steep slopes and along waterways to avoid or recover from erosion
  - Other (option to provide more detail)

- **Silviculture** ⓘ *restoring degraded forests, sustainable forest management*
  - Replacing non–native species with native species to increase diversity

- Transformation (continuous cover, gap creation and natural regeneration or underplanting)
- Conversion (clearfell non–natives and plant mixtures of natives)
- Partial overstorey removal (gap creation, retention thinning), w/wo underplanting
- Thinning (cleaning, density reduction or gap creation) to alter structure
- Retaining legacy trees and deadwood or creating artificial cavities, wounding, fell and leave, etc., to create habitats
- Restoring natural fire regime (incl. re-introduction, fuel reduction, prescribed burning)
- Post–fire reforestation via erosion control, mulching, planting etc.
- Maintaining or closing and decommissioning roads
- Selective logging (manage/reduced impact logging)
- Watershed protection and erosion control
- Fire management (including controlled burning)
- Climate impact mitigation and adaptation (assisted migration, density reduction)
- Other (option to provide more detail)

- **Planted forests and woodlots** ⓘ *establishing new forests, restoring forests, establishing trees outside forests, reclaiming severely degraded sites*
  - Nucleation or cluster planting (planting of small patches of trees as focal area for recovery)
  - Planting or direct seeding with native spp. (interplanting w/nurse crop, taungya, planting group, framework species, or Miyawaki methods)
  - Windbreaks to mitigate wind impact while increasing crop yields
  - Reclamation of mined lands with native or non–native species
  - Enrichment planting or underplanting
  - Woodlot management (and controlled fuelwood gathering)
  - Other (option to provide more detail)

- **Agroforestry/Silvopastoral systems** ⓘ *establishing trees outside forests*
  - Streamside buffers (riparian zones)
  - Home gardens
  - Combining trees with crops and/or animals
  - Combining trees with grazing on pastures, rangelands, or on–farms
  - Planting native trees on private pastoral farmlands
  - Other (option to provide more detail)

- **Watershed protection and erosion control**

- **Invasive/problematic species control**

- **Management of invasive native species (incl. diseases)**

- **Other** (option to provide more detail)

Grasslands, shrublands and savannahs

Users can choose to indicate top-level approaches such as artificial regeneration OR provide more detail by selecting specific intervention types under approaches.

- **Natural regeneration**
  - Passive natural regeneration
    - Reducing or eliminating the sources of degradation and allowing recovery time (Rest (from grazing) and recovery)
    - Other (option to provide more detail)
  - Assisted natural regeneration
    - Reviving fire management regimes (controlled burns)
    - Intensive kralling/restriction of herd movement
    - Cloud seeding
    - Reviving herd movements (e.g. de-fragmentation)/traditional management systems
    - Reintroduction of native species
    - Other (option to provide more detail)

- **Artificial regeneration**
  - Reseeding with native species
  - Shrub planting
  - Terracing and other soil manipulation measures
  - Soil augmentation (e.g. biochar, large scale fertilisation)
  - Promoting water capture and infiltration to locally increase soil moisture e.g. irrigation, reticulation, terracing, stone boundaries)
  - Other (option to provide more detail)

- **Land/water protection**
  - Site/area/habitat protection e.g. .establishment of community conserved areas/protected areas
  - Corridor re-creation and/or establishment
  - Other (option to provide more detail)

- **Invasive/problematic species control**

- **Management of invasive native species (incl. diseases)**

- **Implementing participatory management systems with local land users**

- **Other** (option to provide more detail)
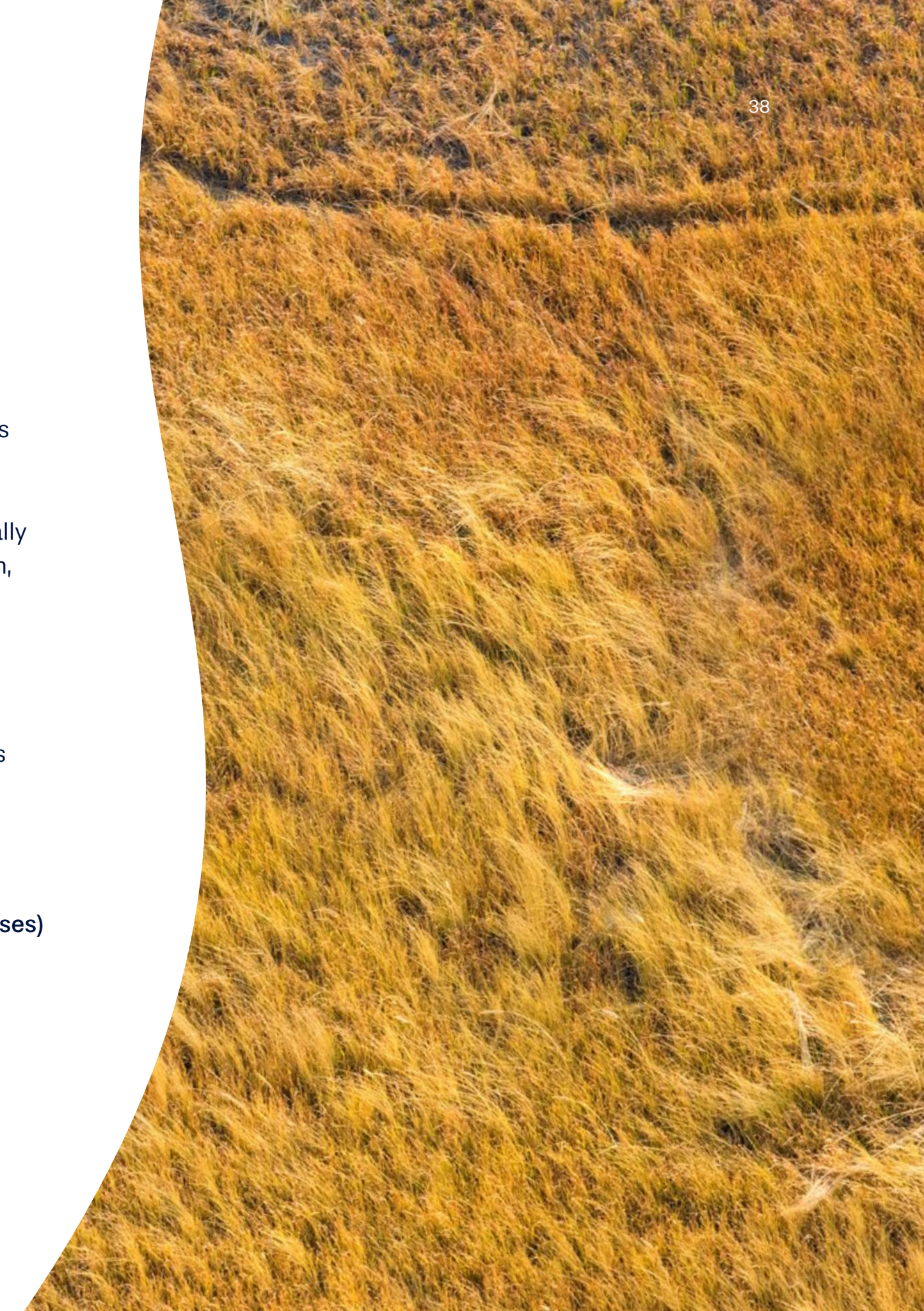
Rivers, streams and lakes (wetlands)

In recognition of how these wetlands are usually restored, we have separated intervention types into this that are conducted at point i.e. in the river/stream/lake and those conducted in the landscape i.e. at the diffuse level.

Users can choose to indicate top–level approaches such as artificial regeneration OR provide more detail by selecting specific intervention types under approaches.

Point

- **Natural regeneration**
  - Passive natural regeneration
    - Reducing or eliminating the sources of degradation and allowing recovery time
  - Assisted natural regeneration/Actions related to species management and conservation
    - Reintroduction of native species (e.g. stocking of fish)
    - Other (option to provide more detail)

- **Artificial regeneration/Actions to improve and/or enhance water quality and/or flow**
  - Removal of unused or disused dams
  - Management of dams to ensure dynamic E–flow releases, improve/ensure longitudinal and vertical connectivity

  - Improvement of water quality e.g. dredging, reducing industrial waste flow, improving wastewater treatment
  - Other (option to provide more detail)

- **Invasive/problematic species control**

- **Management of invasive native species (incl. diseases)**

- **Land/water protection**
  - Site/area/habitat protection e.g. .establishment of Community Conserved Areas/Protected Areas

- **Other** (option to provide more detail)

Diffuse

- **Natural regeneration**
  - Passive natural regeneration
    - Reducing or eliminating the sources of degradation and allowing recovery time
  - Assisted natural regeneration
    - Removal of non–native terrestrial vegetation within the landscape to improve river flow
    - Removal of overgrown (native) vegetation in flood plains
    - Other (option to provide more detail)

- **Artificial regeneration**
  - Catchment management e.g. prevention of soil loss through agricultural interventions
  - Channel management e.g. stabilisation through vegetation
  - Ensuring room for the river including connection between river and floodplain and improving channel structure e.g. creation of log jams
  - Groundwater management/aquifer recharge activities e.g. allowing natural flooding
  - Prevention of illegal mining/ensuring mining compliance
  - Other (option to provide more detail)

- **Invasive/problematic species control**

- **Management of invasive native species (incl. diseases)**

- **Land/water protection**
  - Site/area/habitat protection e.g. establishment of community conserved areas/protected areas

- **Other** (option to provide more detail)

Peatlands

- Natural regeneration
  - Passive natural regeneration
    - Reducing or eliminating the sources of degradation and allowing recovery time
  - Assisted natural regeneration:
    - Fire prevention change to management to account for wetlands where fire regimes may be beneficial e.g. prescribed burns for bogs
    - Reintroduction of native species
    - Other (option to provide more detail)

- Artificial regeneration
  - Re-wetting/raising water table
  - Re-vegetation by characteristic species
  - Reduction of erosion
  - Influencing water abstraction from supply aquifer
  - Reducing/halting nutrient input from catchment
  - Re-establishment of traditional mowing/grazing systems (only for Fen)

- Land/water protection
  - Site/area/habitat protection e.g. establishment of community conserved areas/protected areas
  - Other (option to provide more detail)

- **Invasive/problematic species control**

- **Management of invasive native species (incl. diseases)**

Coasts and mangroves

- Natural regeneration
  - Passive natural regeneration
    - Reducing or eliminating the sources of degradation and allowing recovery time
  - Assisted natural regeneration e.g. removal of pollutants

- Artificial regeneration
  - Capture or restore sediment flows (e.g. fence barriers)
  - Reduce wave energy (e.g. bamboo walls, offshore reefs)
  - Reprofiling and changing the elevation of the soil, relative to sea level
  - Planting of mangroves
  - Broadcasting of collected seeds/propagules onto an incoming tide and/or from a drone
  - Removal of encroaching vegetation (e.g. on sand dunes)

- Restore hydrology (channel creation, remove or breach aquaculture walls, clear channel blockages, dam removal)

- Site preparation – grazing exclusion, vegetation clearance and suppression

- Invasive/problematic species control

- Improving surface water quality to promote recolonization of native species (seagrasses)

- Artificial fencing to prevent sand loss/erosion (dunes)

- Land/water protection
  - Site/area/habitat protection e.g. establishment of community conserved areas/protected areas
- Other (option to provide more detail)

Urban areas

Users can choose to indicate top-level approaches such as artificial regeneration OR provide more detail by selecting specific intervention types under approaches.

- Conversion of gray infrastructure to green e.g. de paving roads, removing sea walls and restoring mangroves

- Restoration of urban waterways to semi-natural condition (measured in kilometres)

- Creation of blue spaces/semi-natural water reservoirs

- Improvement of water quality in urban waterways/ wetlands

- Restoration of catchment zones

- Increasing extent and complexity of tree canopy

- Creation/enhancement of habitat for native species of wildlife

- Creation of wild gardens/yards for native species

- Creation of green spaces/green belts (native flora) for cooling, air filtration and mental health

- Creation of green roofs

- Development of peri-urban food systems

- Invasive/problematic species control

- Management of invasive native species (incl. diseases)

- Utilisation of native species in specific areas such as roadways and islands for erosion control, stormwater runoff

- Rehabilitation of extractive areas, e.g. quarries within city boundaries

- Land/water protection
    - Site/area/habitat protection e.g. establishment of community conserved areas/protected areas
    - Creation of wildlife corridors, improving connectivity between protected areas, enlargement and/or enrichment of forest fragments
    - Other (option to provide more detail)

- Other (option to provide more detail)

Farmlands and mixed-use areas

For the purposes of tracking restoration progress, we have divided farmlands and mixed-use areas into three categories that better allow us to capture the type of interventions most suited for the way the land is being used and its associated restoration objectives.

Users can choose to indicate top-level approaches such as artificial regeneration OR provide more detail by selecting specific intervention types under approaches.

Farm fields/within farm boundaries

- **Improving land management**
  - Agroforestry
  - Permaculture
  - Organic farming
  - Other (option to provide more detail)

- **Artificial regeneration**
  - Growing perennial crops
  - Conservation tillage
  - Crop rotation
  - Integrated manure systems
  - Inclusion of cover and companion crops
  - Creating mobile animal shelters to promote regenerative agriculture

- Low external input agriculture (e.g. reduction of herbicides and pesticides) and livestock (good practices for biocides)
- Soil conservation techniques
- Grazing management including free range/ lower densities
- Implementation of nature positive agriculture e.g. ensuring % of forest cover on farms
- Nutrient balancing
- Crop diversification
- Mixed crop, intercropping and animal farming
- Mixed farming and forestry
- Other (option to provide more detail)

Along the boundaries of farms and fields

- **Assisted natural regeneration**
  - Facilitate and create habitat for pollinators (e.g. hedgerows, increasing availability of nesting spaces and materials)
  - Control of pests through habitat creation for natural predators
  - Other (option to provide more detail)

Farm landscapes – improve biodiversity

- **Establish/manage Woodlots**
- **Restore riparian zones**
- **Invasive/problematic species control**
- **Manage invasive native species (incl. diseases)**
- **Restore acequias and irrigation rafts**
- **Land/water protection**
- **Create corridors**
- **Other (option to provide more detail)**

Other (option to provide more detail)
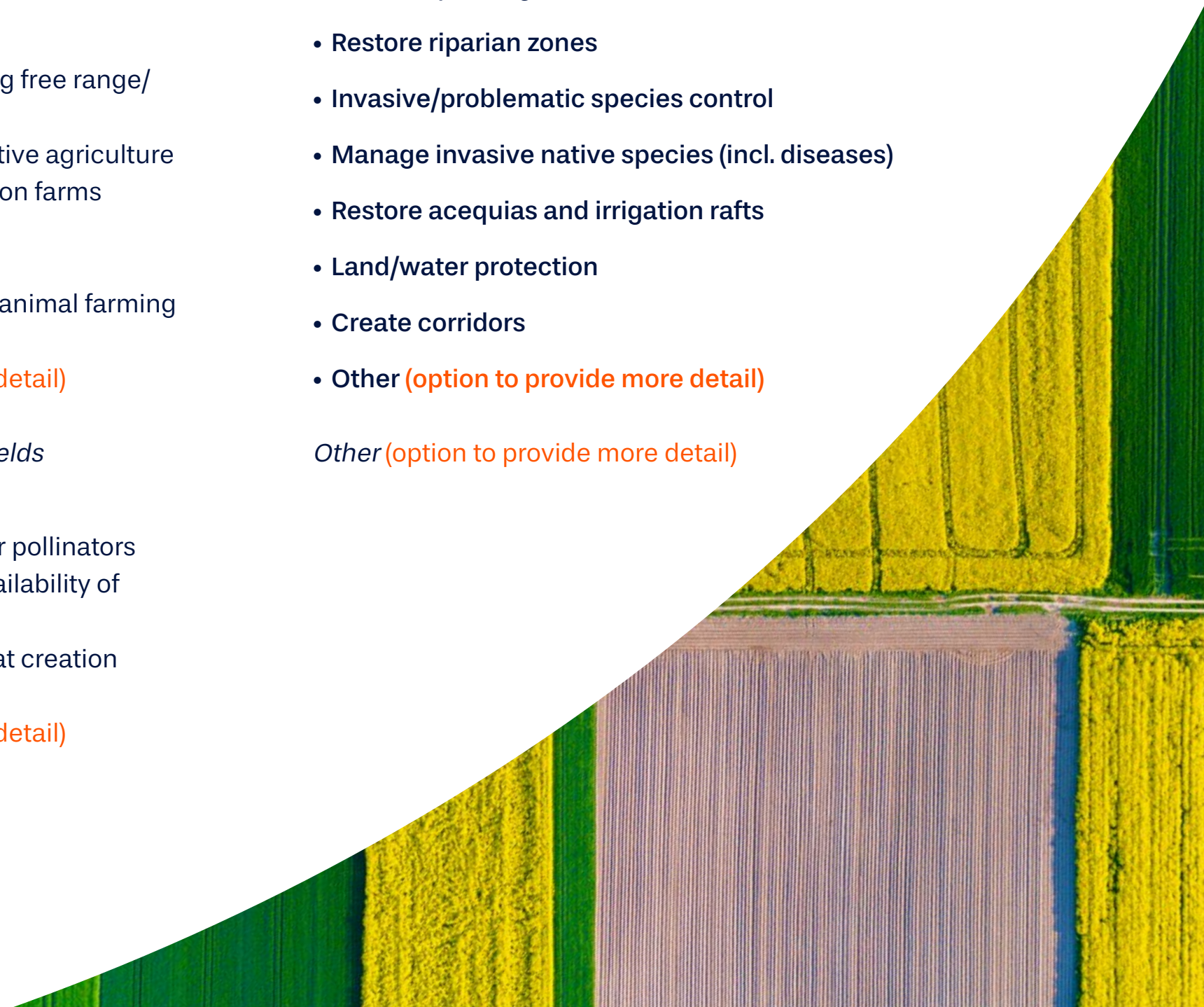
Acknowledgements

The Restoration Barometer has benefitted immensely from the insights of a diverse group of experts. The 2016 development of the original framework and protocol document was led by Dr. Radhika Dave, Lara Murray and Tim Pearson with support from Leander Raes, Silvio Simonit and Gabriel Antunes Daldegan.

In 2020, the material underpinning the Barometer framework was extensively revised to respond to feedback from users, including improvements to the economy and biodiversity indicators. We recognise the contributions of the following individuals (in alphabetical order): Carole Saint-Laurent, Caroline Cogueto, Charles Karangwa, Elmedina Krilasevic, Florien Reinhard, Leander Raes, Muneeswaran Marriappan, Neil Cox, Silvia Guizzardi, Silvio Simonit, Swati Hingorani and Tony Nello. Organisations/task forces that contributed include: International Labour Organization, IUCN Global Programme on Governance and Rights (special thanks to Cate Owren), IUCN Task Force on Diversity, Equity and Inclusion.

The governments of Rwanda, USA, El Salvador, Mexico and Brazil played a key role in the piloting of the protocol.

The Barometer expansion to all terrestrial ecosystems was underpinned by a series of expert workshops to develop a first-of-its-kind typology of restoration interventions to allow land-to-seascape tracking of restoration efforts. The process was led by Swati Hingorani, Carole Saint-Laurent and Florian Reinhard and facilitated by Benjamin Christ of Impact By Design. The experts consulted include (in alphabetical order): Bora Masumboko, Boris Erg, Chris Buss, Daniel Marnewick, Dominic Andradi-Brown, Dorothee Herr, Dr. James Dalton, Dr. Scott Perkin, Dr. Thomas Worthington, Dr. William Darwall, Emily Goodwin, James McBreen, John Stanturf, Jonathan Davies, Kathryn Bimson, Kevin Smith, Laila Annouri, Maria Mejia, Mercedes Muñoz Canas, Mike Acreman, Neil Cox, Peter Frost, Raphael Glement, Richard Lindsay, Russell Galt and Tony Nello. The IUCN Task Force on Agriculture also contributed to the process.

A critical update as part of the 2020 revision was the nuancing of the definition of 'hectares under restoration' for Indicator 5. Many thanks to Professor Jeff Sayer for the formulation now used by the Barometer.

Credits

The designation of geographical entities in this book, and the presentation of the material, do not imply the expression of any opinion whatsoever on the part of IUCN or other participating organisations concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The views expressed in this publication do not necessarily reflect those of IUCN or other participating organisations.

IUCN is pleased to acknowledge the support of its Framework Partners who provide core funding: Ministry of Foreign Affairs of Denmark; Ministry for Foreign Affairs of Finland; Government of France and the French Development Agency (AFD); the Ministry of Environment, Republic of Korea; the Norwegian Agency for Development Cooperation (Norad); the Swedish International Development Cooperation Agency (Sida); the Swiss Agency for Development and Cooperation (SDC) and the United States Department of State.

This publication has been made possible in part by funding from Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)