Financing Nature

A Practitioner's Guide to Results Metrics Selection

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Table of contents

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- Green Bond Corporation
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- Legal & General Group plc
- Moody's Corporation
- NatureFinance (formerly Finance for Biodiversity Initiative)
- Nature Positive Initiative
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- Ocean Risk anResilience Action Alliance (ORRAA)
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- Systemiq Ltd.
- S&P Global Ratings
- Terrasos S.A.S.
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- Taskforce on Nature-related Financial Disclosures (TNFD)
- UBS
- United Nations Environment Programme (UNEP)
- World Resources Institute (WRI)
- World Wide Fund for Nature (WWF)
- WWF-Brasil

[1] The MDBs involved are the African Development Bank; Asian Development Bank; Asian Infrastructure Investment Bank; Caribbean Development Bank; European Bank for Reconstruction and Development; European Investment Bank; Inter-American Development Bank (IDB); IDB Invest; Islamic Development Bank; and the World Bank Group, represented by the World Bank, International Finance Corporation and Multilateral Investment Guarantee Agency.

Executive summary

This Guidance—*Financing Nature: A Practitioner's Guide to Results Metrics Selection*—offers a voluntary and practical framework for selecting metrics to monitor the results of nature finance initiatives. It is intended for use by project developers and is not an operational requirement for MDBs; it addresses challenges faced by practitioners in identifying robust metrics and applying them to specific project contexts. By providing actionable guidance, the document aims to enhance the design and evaluation of nature finance instruments, making it more efficient and ultimately supporting their scalability and effectiveness.

Monitoring and communicating the expected results of nature finance instruments using appropriate metrics during the life of the instrument enables adaptive management and supports market confidence in the achievement of impacts on nature. It also helps demonstrate alignment with societal goals, such as the targets of the Kunming-Montreal Global Biodiversity Framework (GBF).

The Guidance (See *Figure 1*) supports practitioners to communicate how a financed activity intends to benefit nature by considering the objectives and the impact pathway(s) that connect financed activities with intended outcomes. It also guides practitioners on how to identify and select appropriate metrics and practical measurement options, considering capacity and data availability. It can be used flexibly, either as a whole process, or just selecting the relevant steps.

It provides a framework to clarify what is being measured by different types of metrics: Response metrics assess the scale of activities implemented, Pressure metrics assess how far the actions reduce pressures on nature and where feasible, State metrics assess beneficial outcomes for the state of nature. This approach aims to improve transparency, comparability, and confidence in reported results.

Figure 2: Overview of process for selecting appropriate nature metrics

Step	**Preparation:** Clarify objectives	**Step 1: Define and assess impact pathway(s)** *Specify the causal links between actions and outcomes, to inform metric selection*		**Step 2: Identify metrics and measurement options** *Select metrics that can evidence actions and/or outcomes along prioritized impact pathways, collectively meet defined requirements, and are practical to measure*		
Sub-step	Determine project design, management and/or reporting needs	**1.1 Define impact pathway(s)**	**1.2 Prioritize and assess impact pathway(s)**	**2.1 Identify initial metrics set**	**2.2 Review measurement options**	**2.3 Review and adjust the metrics set**
Outputs	Specified objectives to be supported by metrics and associated data collection	Specification of credible causal chain(s) linking project activities to drivers and nature outcomes	Prioritized impact pathway(s) (combined where appropriate), including key assumptions and elements to monitor	Initial set of metrics for monitoring, matched to users' needs and practicalities	Identified approach for monitoring selected metrics, including State of Nature impacts (where relevant)	Final list of metrics suited to meet defined objectives

- The main Guidance (this document), which provides practical guidance for each step as well as two appendices:
    - Draft Metrics Framework - a list of generalized metrics relevant to a broad range of nature finance activities; and
    - Additional Guidance – more detailed practical advice on implementation of key steps (e.g., guidance on tech-enabled data collection options);
- Templates: an accompanying spreadsheet file with templates to support each step of the process; and
- A forthcoming library of case studies demonstrating how the approach can be applied in different contexts. This will be added to the accompanying spreadsheet file and expanded over time.

The Draft Metrics Framework in Appendix 1 is available for use by a variety of stakeholders. Feedback from users will inform any future update of the Framework.

The Guidance is structured as a process, with individual steps that could be followed from start to finish, taking users through initial information gathering to metric selection. It is also designed to be used flexibly, so that individual components can be used in isolation as needed and as relevant to existing process flows.

1.

Introduction to the Guidance

Scaling nature finance is critical to achieving global climate and biodiversity goals. Since the adoption of the Kunming-Montreal Global Biodiversity Framework (GBF) and global recognition of the potential role of the finance sector in contributing towards its targets, nature-related financial instruments have grown rapidly[1]. As the market matures, there is a need for clearer, more consistent ways to demonstrate how these instruments contribute to the GBF.

[1] UNEP FI (2024). private-finance-for-nature-surges-to-over-102-billion

1.1 Background

Financing Nature: A Practitioner's Guide to Results Metric Selection was developed in response to a review of existing guidance available in the market, and workshops with practitioners[2].

The review found that, due to practical and capacity constraints, current metrics used are heavily weighted towards those that measure *actions taken* rather than *results for nature*. Practitioners reported practical challenges, especially navigating the range of guidance available, and selecting robust metrics that account for capacity and data availability constraints.

While the number of nature metric frameworks has grown rapidly, practitioners identified a need for guidance on how they can identify which metrics are most relevant for their specific contents. Metric selection can therefore be time consuming and a barrier to scaling nature finance. This finding has been mirrored in a recent report by World Economic Forum (WEF)[3] which found that standardization of decision-relevant data for investors is key to enabling nature finance to scale.

1.2 Overarching aims and objectives

This Guidance aims to support the scaling of nature finance by improving both efficiency of metric selection for practitioners and market confidence in the impact of nature finance instruments.

The Guidance has the following key objectives:

- help practitioners map the impact pathways[4] of their activities and to understand what can be monitored to demonstrate results; and
- provide practical support for metric selection, accessible to a wide range of nature finance market participants, including how to adapt to resource constrained contexts.

1.3 Audience and scope

This Guidance is intended for a broad range of stakeholders engaged in nature finance. It is primarily aimed at practitioners and institutions[5] who are developing nature finance instruments and who are responsible for

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[2] 77 organizations participated in the consultations and review of current practices related to nature finance metrics (Phase 1: Stock take), including 19 commercial financial institutions; 12 MDBs; 9 NGOs; 5 DFIs; 8 standard setters. 34 organizations have been involved in commenting on the prototype version of the guidance or this draft, including 13 NGOs / standard setters; 9 MDBs; and 4 country representatives.

[3] WEF (2025). Finance Solutions for Nature: Pathways to Returns and Outcomes

[4] A simple causal chain that credibly connects financed activities to changes in a direct driver of nature loss that in turn creates an impact on the state of nature

[5] Private sector financial actors, such as commercial banks or asset managers involved with biodiversity-linked or other nature finance products; Multilateral Development Banks, Multilateral Climate and Environment Funds and other Public Development Banks developing or

designing their KPIs and monitoring approaches. It can also be used as a reference guide by anyone who is assessing nature finance instruments. It is relevant to:

- all asset classes and instrument types, including debt, equity and guarantee-based;
- activities that address any of the drivers of nature loss; and
- terrestrial, freshwater and marine environments.

1.4 How does it complement other guidance?

This Guidance builds upon and complements two other key types of guidance.

1. **Nature finance taxonomies**, such as the MDB Common Nature Finance Taxonomy (part of the MDB Common Principles for Tracking Nature Finance), the IFC Biodiversity Finance Reference Guide and various jurisdictional taxonomies. Taxonomies define what activities should qualify as nature finance and tend to be organized by sector and activity type.

2. **Catalogues of nature finance metrics**, which are developed for a range of specific purposes, including target setting for nature related bonds and loans, and nature related sustainability linked finance such as ICMA's Sustainable Bonds for Nature and IFC's Biodiversity Finance Metrics for Impact reporting as well as other nature related frameworks such as TNFD and SBTN.

This Guidance supports the selection of metrics for assessing the effectiveness of nature finance in achieving its objectives for nature, both for impact reporting and to inform adaptive project management. It does not define what should qualify as nature finance but offers a way to apply metrics to nature finance activities. However, nature finance taxonomies are useful as a precursor to the process set out in this Guidance, as they can help practitioners to consider what activities would likely lead to benefits for nature.

Catalogues of nature finance impact metrics are referenced as useful sources for potential metrics. This guidance provides structure to that process by creating a framework based on documenting an impact pathway between financed activities and impacts on nature. The Draft Metrics Framework (a list of generalized metrics relevant to a broad range of nature finance activities) suggests generalized metrics associated with each step of the impact pathway, and guidance on how to adapt these to individual project contexts, including through reference to other metric frameworks. Providing an overarching framework for metric selection makes it easier to choose metrics that meet specific purposes, from monitoring the implementation of actions, to verifying and communicating the achievement of outcomes for nature. Providing common, generalized metrics, many of which have the same units (e.g. Hectares) facilitates the comparison and aggregation of data across investments.

TNFD recommends financial institutions disclose the amount of capital expenditure, financing, or investment deployed towards nature-related opportunities, by type of opportunity, with reference to a relevant taxonomy.

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supporting biodiversity-focused investments or financial instruments; corporate and sovereign actors seeking to mobilize capital for outcomes for nature; financial ratings agencies, and third-party certifiers; and technical advisors to the above-mentioned entities.

Following this Guidance enables the provision of additional supporting evidence for the results achieved through investments in 'nature-related opportunities'.

The State-Pressure-Response approach is aligned with the forthcoming guidance "Integrating Nature Into Sovereign Debt Markets: Towards a New Sovereign Debt Nature Assessment Model" led by the Finance for Biodiversity Foundation. The new Sovereign Debt Nature Assessment Model provides systematic guidance for integrating nature-related risks and opportunities into sovereign debt analysis.

1.5 How to use this Guidance

The Financing Nature: A Practitioner's Guide to Results Metric Selection consists of the following components:

Main Guidance (this document). Provides a concise step-by-step process for selecting metrics accounting for practical constraints of diverse project contexts. Includes two appendices:

- Draft Metrics Framework. A list of generalized metrics relevant to a broad range of nature finance activities; and
- Additional Guidance. More detailed practical advice on implementation of key steps (e.g., guidance on tech-enabled data collection options).
- **Templates**. Data entry templates that could be used to record relevant information for each step in the process. Each step has a template in the accompanying Excel file.
- **Case studies (in progress)**. Will provide examples of how the process can be applied to different types of nature finance projects in the accompanying Excel file.

The guidance is written as a process, but it can also be used flexibly as appropriate in different contexts. See Table 1. Examples of the flexible use of the Guidance, as appropriate in different contexts. below.

Table 1. Examples of the flexible use of the Guidance, as appropriate in different contexts.

Needs	Approach to using the guidance
Early stage of the design process and want to link project design to robust metrics.	Follow all steps
Metrics needed for reporting only. Nature finance qualifying activities have been identified from a taxonomy.	Use the Draft Metrics Framework to identify potential metrics, using Step 1.1 guidance on identifying relevant pressure and response rows and Step 2.1 and 2.2 to select and tailor relevant metrics to the needs of the project.
Identify how State of Nature metrics could potentially complement Pressure/Response metrics	Use the Draft Metrics Framework with Step 2.1, Step 2.2 and the accompanying practical guidance in the Appendix to select and tailor relevant State of Nature metrics.

2.

Process to select and apply nature metrics

The Guidance is split into two steps. The first supports the definition of impact pathways to communicate how financed activities intend to contribute to the reduction of the drivers of nature loss and outcomes for nature. The second supports the selection, tailoring and prioritization of metrics to monitor the achievement of the intended results (*Figure 2*: Overview of steps and optional sub-steps to select and apply appropriate nature metrics). The process is structured to complement existing good practice on project design and evaluation, allowing practitioners to use it flexibly based on their needs and require.

Figure 3: Overview of steps and optional sub-steps to select and apply appropriate nature metrics

Step	**Preparation:** Clarify objectives	**Step 1: Define and assess impact pathway(s)** *Specify the causal links between actions and outcomes, to inform metric selection*		**Step 2: Identify metrics and measurement options** *Select metrics that can evidence actions and/or outcomes along prioritized impact pathways, collectively meet defined requirements, and are practical to measure*		
Sub-step	Determine project design, management and/or reporting needs	**1.1 Define impact pathway(s)**	**1.2 Prioritize and assess impact pathway(s)**	**2.1 Identify initial metrics set**	**2.2 Review measurement options**	**2.3 Review and adjust the metrics set**
Outputs	Specified objectives to be supported by metrics and associated data collection	Specification of credible causal chain(s) linking project activities to drivers and nature outcomes	Prioritized impact pathway(s) (combined where appropriate), including key assumptions and elements to monitor	Initial set of metrics for monitoring, matched to users' needs and practicalities	Identified approach for monitoring selected metrics, including State of Nature impacts (where relevant)	Final list of metrics suited to meet defined objectives

Preparation

As this Guidance is useful for a broad audience, this is a preparation and navigation step to consider factors that influence the type of metrics that will be useful and relevant given the type of financial instrument and financed activity, as well as how data will be used.

Which financed activities qualify as nature finance?

This Guidance supports the selection of metrics for monitoring the effectiveness of nature finance in contributing towards positive outcomes for nature. It is intended to apply to activities that qualify as nature finance. Relevant taxonomies of nature finance activities include the MDB Common Nature Finance Taxonomy, IFC Biodiversity Finance Reference Guide and ICMA's Sustainable Bonds for Nature. Many countries also have their own nature finance taxonomies. IFC's Guidelines for Blue Finance Version 2.0 is a useful resource for sustainable marine and freshwater activities. If there is more than one qualifying activity, consider which ones are a priority for monitoring. The connection between the qualifying activities and outcomes for nature will be explored in the next step.

How will nature data be used?

Nature data can serve a range of purposes, e.g., project management, stakeholder engagement and public reporting. It is also influenced by the type of financial instrument, for example some instruments link financial incentives to nature impact related targets. The purpose influences the type of metrics (see summary of potential metric purposes provided in Table 2: Guidance on potential metric purposes*)*. These can be revisited at the end of the metric selection process (*Step 2.3*) to ensure metrics are appropriate for the stated purposes and to address any gaps.

How does the instrument and client type influence impact pathway and metric selection?

There are a broad range of instrument types that can be used to finance and incentivize outcomes for nature[6]. Their duration, structure, client types and approaches to incentivizing positive impacts vary and this influences both the types of metric that are useful for each, and the likely availability of data. See Table for examples of common ways that type of instrument influences metric selection.

[6] Useful overviews can be found in WEF (2025). Finance Solutions for Nature: Pathways to Returns and Outcomes and Finance for Biodiversity Foundation and United Nations Environment Programme (2024) Finance for Nature Positive: Building a working model.

Table 2: Guidance on potential metric purposes

Purpose of data collection for nature metrics	Description	Examples of instruments where this is most relevant
Ex ante assessment of potential impact	Usually used by investors to assess likely impact, alignment with strategy and relevance of the financed activities to market needs / challenges prior to making an investment. This could be as part of due diligence / in an investment paper. Selected metrics need to be predictable.	Impact funds; any instrument where magnitude of impact is part of the investment decision
Target setting and performance tracking (including for incentive-based financing)	A sub-set of ex-ante assessment, but with more stringent requirements due to the potential for incentives to be connected to the target. Establishes baseline conditions and sets measurable, time-bound goals for nature related financial instruments. Links financial rewards or penalties to performance.	Sustainability linked loans and bonds; Payments for Ecosystem Services; Debt for nature swaps
Adaptive management of the project and/or local stakeholder engagement	Data collected during the life of the project to assess implementation progress and to take project management decisions to ensure project success. It is extremely valuable to collect data relating to local community priorities and objectives, as well as to involve them in data collection in nature finance projects that aim to achieve results through engagement with local communities.	Potentially relevant to all instruments but especially those where outcomes depend on actions by third parties or where assumptions in the impact pathway are identified as requiring additional monitoring (see Step 1.2)
Impact measurement and verification for internal or external reporting	Tracks progress and verifies that nature-related outcomes (e.g. biodiversity gains, ecosystem restoration) are achieved. Often involves third-party validation.	All instruments

Note: More information about how metrics selection may differ pertaining to the purpose of collecting nature metrics can be found in Step 2.3.

Template

A template for recording instrument and activity data is provided in **Tab 1. Preparation** of the accompanying spreadsheet file. This supports the compilation of basic information on the financial instrument: name of instrument, objectives; planned activities contributing to nature; anticipated purpose of metrics selection that will support the remainder of the process. The template provides a description of each field alongside potential sources of information.

Step 1. Define and assess impact pathway(s)

Within this Guidance, an 'impact pathway' refers to a simple causal chain that credibly connects financed *activities* to changes in a direct *driver of nature loss* that in turn creates an impact on the *state of nature*.[7]

Identifying and clearly specifying the most relevant impact pathway(s) helps to:

- Communicate how activities are expected to generate outcomes for nature (even when these outcomes are not being measured directly) increasing clarity and confidence regarding intended results
- Identify which metrics will be most appropriate
- Make assumptions explicit and identify where uncertainties can be addressed through project design and/or monitoring for adaptive management
- Prioritize pathway steps for monitoring using relevant metrics
- Increase confidence in the attribution of nature benefits arising from financed activities.

The impacts expected to result from project activities are relative to the scenario where these activities do not take place, which may be called the 'baseline', 'non-project' or 'business as usual' (BAU) scenario. This scenario needs to be specified if project results are to be measured (see Step 1.1 Define impact pathway(s).

Step 1.1 Define impact pathway(s)

Institutions may have their own approaches to defining project impact pathways, which might cover climate and human development impacts as well as nature impacts. To apply the Draft Metrics Framework outlined here, impact pathways need to be specified in relation to:

- The **direct drivers** of nature loss that planned activities will address, as defined by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019)[8]
- The category of response undertaken to address a driver. These categories can be related to activity groups in existing nature finance taxonomies (Box 1).

These direct drivers and action categories are described in Table 3. (a) the direct drivers of nature loss, (b) response categories, used for defining relevant impact pathways. Note that these may occur anywhere

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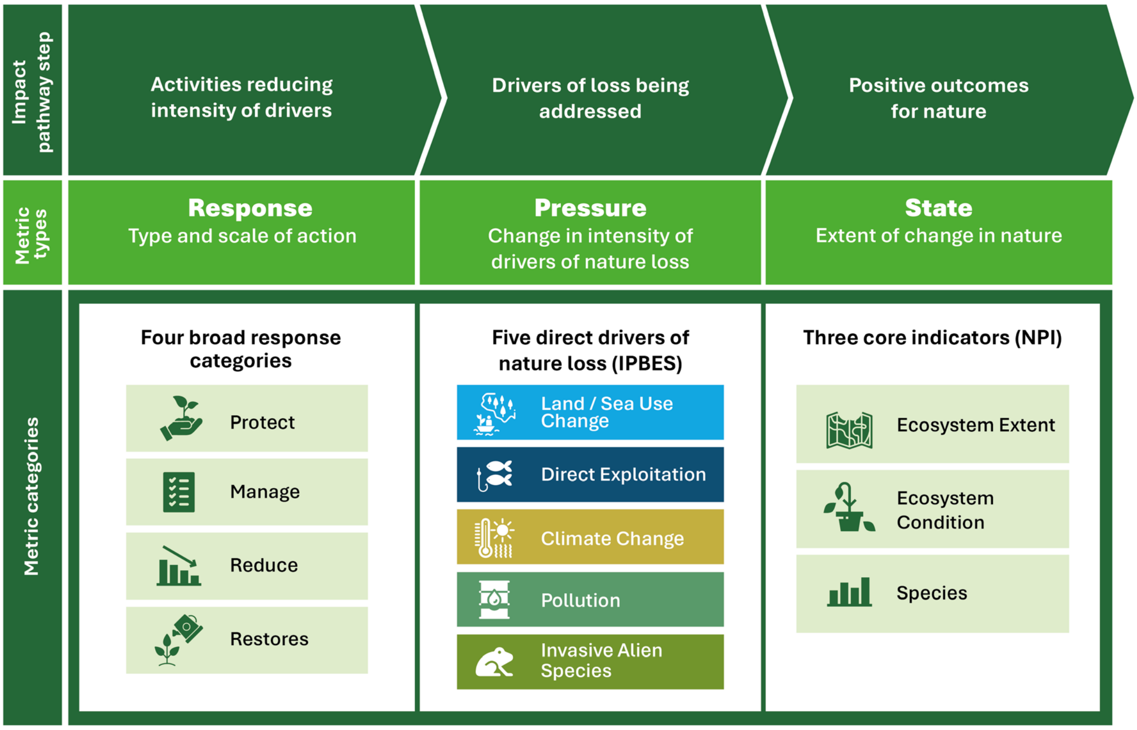
[7] Response, Presssure, State are a subset of the broader Driver-Pressure-State-Impact-Response (DPSIR) framework. See Burgess et al. (2024). Global Metrics for Terrestrial Biodiversity. *Annual Review of Environment and Resources*, *49* (Volume 49, 2024), 673–709. https://doi.org/10.1146/annurev-environ-121522-045106 A useful resource for considering Impact Pathways for impact investment is provided by the Impact Management Platform

[8] *IPBES (2019), Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services*, DOI: 10.5281/zenodo.3553579

along a value chain.and illustrated in *Figure 3*: Overview of metric types (Response, Pressure, State) associated with each step of a project impact pathway and general metric categories proposed for each stage.

Figure 4: Overview of metric types (Response, Pressure, State)[9] associated with each step of a project impact pathway and general metric categories proposed for each stage[10]



For this step it is recommended to:

- Define discrete, impact pathways, i.e. each should be for a unique *action category – direct driver* combination.
- Ignore impact pathways that are likely only to produce trivial impacts. The aim is not to develop a comprehensive set of all possible pathways, but to identify the pathway(s) that potentially have substantive impacts.

[9] Response, Pressure, State are a subset of the broader Driver-Pressure-State-Impact-Response (DPSIR) framework. See Burgess et al. (2024). Global Metrics for Terrestrial Biodiversity. *Annual Review of Environment and Resources*, *49* (Volume 49, 2024), 673–709. https://doi.org/10.1146/annurev-environ-121522-045106

[10] The five drivers of nature loss are based on *IPBES (2019), Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services*, DOI: 10.5281/zenodo.3553579; State metrics correspond to Indicators from the Nature Positive Initiative's (NPI) State of Nature Metrics

Table 3. (a) the direct drivers of nature loss, (b) response categories, used for defining relevant impact pathways. Note that these may occur anywhere along a value chain.

A. Five direct drivers of nature loss (that planned activities will address)	
Land / Sea Use Change	Land and sea-use change includes the conversion of natural ecosystems (terrestrial, freshwater or marine) into agricultural, urban or industrial areas, leading to habitat loss, degradation and fragmentation. Activities such as unsustainable grazing in rangelands or excessive water abstraction from natural ecosystems also fall under this driver.
Direct Exploitation	Unsustainable harvesting of organisms through activities like hunting, fishing, and logging, as well as unintended deaths from bycatch or collisions.
Climate Change	Alterations in temperature, precipitation, and extreme weather patterns that disrupt species distributions, phenology (timing of seasonal biological events such as flowering), and ecosystem functions. Generally, project activities that support climate change mitigation or adaptation will have very small positive impacts on climate change as a global driver of nature loss. The MDB Common Principles for Tracking Nature Finance (2025) therefore only consider such activities eligible as nature finance if they demonstrate other targeted benefits for biodiversity or ecosystem services. A valid nature impact pathway should therefore focus on targeted activities aimed at increasing the climate resilience of species and ecosystems, e.g. through reducing the risk of wildfires, drought or flooding that cause mortality and habitat loss.
Pollution	The introduction of harmful substances into air, water, and soil, including plastics, pesticides, and excess nutrients, which degrade ecosystems and harm species.
Invasive Alien Species	The introduction and spread of non-native organisms that outcompete, prey on, or bring diseases to native species, often leading to ecosystem imbalance.
B. Response categories (to address a particular driver)	
Protect	Maintaining existing natural and semi-natural ecosystems and species, including associated ecosystem services, to avoid any further decline.
Manage	Sustainable production in working land- and seascapes, and from wild harvested species.
Reduce	Reducing use and demand for resources to reduce damaging pressures on nature and ecosystem services.
Restore	Recovering, rehabilitating, or remediating nature including ecosystem services where they have already been lost or depleted.

Box 1. Relating Nature Finance activity groups to response categories in this guidance.

The MDB Common Principles for Tracking Nature Finance (and their associated taxonomy) define four broad activity groups for nature finance:

- **a.** Restoration and conservation of biodiversity or ecosystem services;
- **b.** Reduction of the direct drivers of biodiversity or ecosystem services loss;
- **c.** Integration of nature-based solutions[i] across economic sectors;
- **d.** Design and implementation of policy, tools, or other sectoral instruments enabling a) to c)

Individual activities in these groups can be examined to determine if they are classed as Restore, Protect, Manage or Reduce. As a general guide:

- Activities falling within **a)** would usually be classified as **Restore** (restoration) or **Protect** (conservation) respectively.
- Activities in **b)** would usually be classified as **Manage** where they reduce drivers at the point of impact, and **Reduce** where they decrease pressures through demand-side interventions.
- Activities falling in **c)** and **d)** would be classified according to which driver(s) of nature loss they address. This is most easily done at the activity level.

Note that individual activity groups may align with multiple response categories.

Below are illustrative examples from each of the taxonomy's activity groups.

Restoration and conservation of biodiversity or ecosystem services

- Example: Protecting or maintaining natural habitat features or fragments e.g. in the Forestry or Crops sector, by maintaining or managing 'set-asides' of High Conservation Value (HCV) areas, High Carbon Stock Approach (HCSA) or establishing protected **and conserved** areas.
- IPBES Driver: This would be classified as Land/Sea Use Change, as it relates directly to natural habitats
- Response category: This would be classified as Protect, as the habitat is being protected from further loss or degradation.

Reduction of the direct drivers of biodiversity or ecosystem services loss

- Example: Adopting diversified cropping systems (e.g. in the Crops sector, through intercropping; use of cover crops to improve resilience and soil quality; agroforestry; silvo-pastoral systems).
- IPBES Driver: This addresses Pollution (through reduction of agrochemical use) and Land/Sea Use Change (by improving biodiversity within a productive landscape and potentially

improving water use efficiency for irrigation). It may also address Climate Change through increasing soil carbon and carbon sequestration in woody vegetation, although this is not expected to be a valid nature finance impact pathway: see **Table 1**.

- Response category: This would be classified as Manage, because the sustainability of crop production is being improved / managed.

Integration of nature-based solutions across economic sectors

- Example: Using green infrastructure or combined green/grey solutions with clear localized benefits to biodiversity, for example by: constructing wetlands for water treatment.
- IPBES Drivers: This addresses both (1) Pollution, through quality improvement for water released downstream (note that this is not contingent on a nature-based solution, but would also apply to 'grey' infrastructure), and (2) Land/Sea Use Change, because new wetlands are being established
- Response category: For (1): Manage, because it is decreasing the amount of pollution being released; for (2): Restore, because an area of wetland is being established, provided that this uses appropriate native species.

Policy, tools, or other sectoral instruments

- Example: In the Fisheries and Aquaculture sector, strengthening monitoring, control and surveillance, including by integrating port-state measures, trans-boundary intelligence sharing, compulsory electronic reporting, and risk-based inspection protocols.
- IPBES Driver: Direct Exploitation, because fishing relates to harvesting wild stocks of species.
- Response category: this depends on the objective of the financed activities, and more than one category may apply. If the activity is aiming to prevent any offtake of a species, the category is Protect; if ensuring compliance with plans to manage offtake within sustainable harvesting limits, the category is Manage; and if to decrease demand for illicitly harvested species, then the category is Reduce.
- Note: Many policy programs may involve more than one response category, in which case metrics from multiple categories may be appropriate.

Defining Non-Project Scenarios

Project impacts are considered relative to the alternative scenario where the project activities do not take place. This non-project scenario should be identified, alongside identification of impact pathways.

So far as possible, the non-project scenario should refer to an appropriate defined area or scale of intervention, such as the focal geographic area for project activities, or the spatial or other scale at which results are expected to materialize. Depending on the project context, the non-project scenario may then reflect:

- Continuation of a standard business practice ('business as usual') that the financed activities intend to replace

- The baseline situation in the area of intervention, which may involve:

    - A static baseline reflecting the situation before the financed activity starts

    - A dynamic baseline (usually declining but possibly increasing) that is projected forward over a time period appropriate to the financed activities.

The non-project scenario provides a reference point against which impacts of the financed activities are assessed, for either a qualitative or quantitative comparison. For example, the quantity of pollutants for an area of intervention or volume of commodity produced may be estimated for the relevant standard business practice ('business-as-usual') and for improved practice resulting from financed activities. The difference between these two reflects the impact of the financed activity on the Pollution driver.

Reliable, quantified baselines are especially important in cases where financial incentives or payments are linked to the magnitude of the impact achieved, such as in the nature-based carbon credits and biodiversity credits sectors. Academic research[11,12] and biodiversity credit methodologies[13] have established more robust approaches involving reference / control scenarios. These have yet to be adapted into user-friendly guidance relevant to nature finance and so would likely require expert assistance.

Template

A template for defining impact pathways and providing a narrative description of the Non-Project Scenario is provided in **Tab 2. 1.1 DefineImpactPathways** of the accompanying spreadsheet file. This includes a description and examples for each of the required fields.

Step 1.2. Prioritize and assess impact pathway(s)

This step involves reviewing the relevant impact pathways identified in Step 1.1 to:

- Identify and select the most important impact pathways, for which appropriate metrics will be identified

- Consider where it is appropriate to combine impact pathways (all or in part)

- Document key assumptions that may require additional action or monitoring.

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[11] Keith, H., Czúcz, B., Jackson, B., Driver, A., Nicholson, E. & Maes, J. (2020) A conceptual framework and practical structure for implementing ecosystem condition accounts. *One Ecosystem* 5: e58216.

[12] McNellie, M.J., Oliver, I., Dorrough, J., Ferrier, S., Newell, G. & Gibbons, P. (2020) Reference state and benchmark concepts for better biodiversity conservation in contemporary ecosystems. *Global Change Biology* 26: 6702–6714.

[13] SD VISta Nature Framework, v1.0 (2024). Verra and The Biodiversity Consultancy.

Prioritization

Initial prioritization of impact pathways should already have been undertaken in Step 1.1, by excluding potential pathways that are likely only to create trivial impacts.

Financed activities are often multifaceted and may seek to benefit nature in numerous ways. It may not be either practical or useful to assess the impacts of every one of these. Thus, this step involves further prioritization of the initial set of relevant impact pathways.

A number of criteria may be considered when prioritizing impact pathways for nature finance investments, including:

- Their relevance to the primary objectives of the finance instrument, and/or the financial institution and its beneficiaries
- The likely scale of positive impact
- Importance to stakeholders
- The strategic relevance to global or other goals for nature.

While the initial set of relevant impact pathways should be defined for unique driver/activity combinations (Step 1.1), individual activities may often address more than one driver, and different activities may address the same driver. As part of the prioritization process, relevant impact pathways should be reviewed to identify common activities, pressures and state of nature outcomes (Figure 4: Example of combining impact pathways.

Common metrics can be used for overlapping activities, drivers and State of Nature outcomes, helping to streamline the set of metrics to be applied.

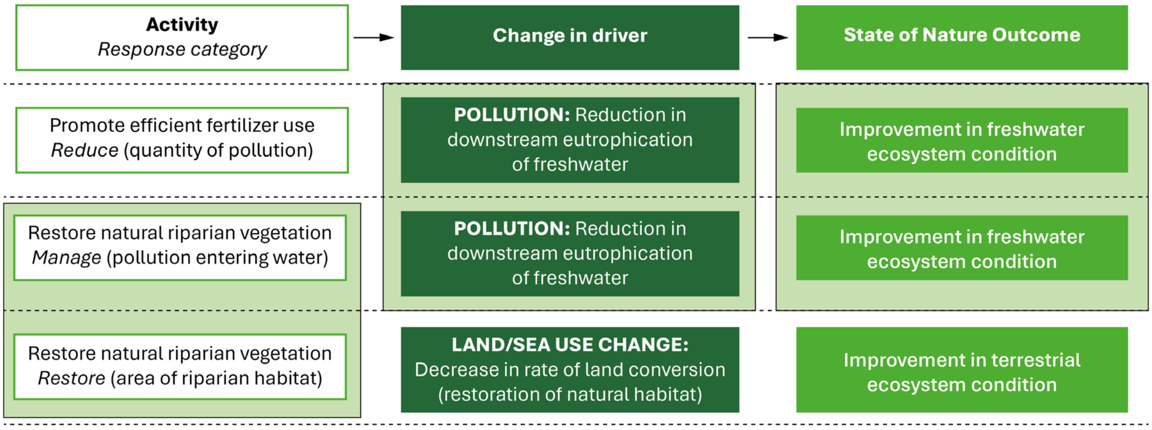
The example in Figure 4 includes two financed activities: promoting efficient fertilizer use, and restoring natural riparian vegetation. Both aim to reduce pollution of local freshwater sources. The restoration activity also improves riparian habitat. This results in three impact pathways.

To simplify measurement:

- The same pollution reduction and freshwater ecosystem condition metrics can be used for the first two pathways, since they address the same driver of nature loss.
- A single response metric can be used for riparian habitat restoration as it reduces two different pressures through one activity.

This approach avoids the need for unique metrics at every step of each impact pathway.

Figure 5: Example of combining impact pathways.



Documenting assumptions

Once impact pathways have been prioritized, the next step is to identify any key assumptions that may need further investigation, testing or tracking. These could relate to causal links that rely on effective implementation by stakeholders, are not well evidenced, where evidence is ambiguous or context-dependent, or when anticipated results depend on robust management of particular risks.

As with identifying relevant impact pathways, the aim is not to produce a comprehensive list of every assumption but to identify those that can be addressed with further action: through project design, targeted monitoring and adaptive management, and/or identification of additional metrics.

The following steps are recommended:

1. Document assumptions underpinning the causal links between steps of the impact pathway.

To identify assumptions, consider the intermediate steps that are required between stages of the impact pathway so that the financed activities result in the intended benefits for nature. Consider factors within the project's control, as well as external factors over which the project has more limited (or no) influence but that could still affect project results. Assumptions to consider could include, for example:

- Relevant stakeholders (IPs, LCs, employees, etc.) support the activities and are able and willing to adopt changed practices or behaviors
- Planned activities have a high likelihood of delivering the expected reductions in pressure
- Species or ecosystems will respond to reduced pressures in the expected way
- Sufficient funding and resources will be sustained throughout the project
- Necessary legal or policy reforms will be implemented in good time

- External factors are unlikely to undermine project results, and/or will be adequately controlled, for example:
    - Climate change, natural disasters or extreme weather events
    - Changes in government, policy or political instability
    - Changes in market forces, opportunity costs or demographic pressures
    - Leakage of impacts, for example where conservation activities in one place displace negative impacts elsewhere.

2. Prioritize assumptions requiring additional investigation or monitoring.

Not all assumptions require specific attention. A simple prioritization process, based on likelihood of the assumption holding true and severity of effect if it does not, can help to decide where to focus. When assessing the likelihood of the assumption holding true, consider what evidence is available to support the assumption. How "tried and tested" is the approach? Have peer-reviewed studies, experts or practitioners validated that the planned actions lead to the intended benefits for nature in similar contexts, or is the project using innovative and untested approaches? There is additional guidance on prioritizing assumptions provided in Appendix 2. Step 1.2 (Assess impact pathway assumptions).

3. Identify opportunities to adjust project design or monitor key assumptions.

For the most significant assumptions, consider whether adjustments can be made to project design to improve the chances of success. Also consider what additional metrics can be used to monitor the validity of assumptions, to support early identification of problems and inform adaptive responses.

Template

A template for documenting assumptions is provided in **Tab 3. 1.2 PrioritizeAssessPathways** of the accompanying spreadsheet file, including a description and source of information for each of the required fields.

Step 2. Identify metrics and measurement options

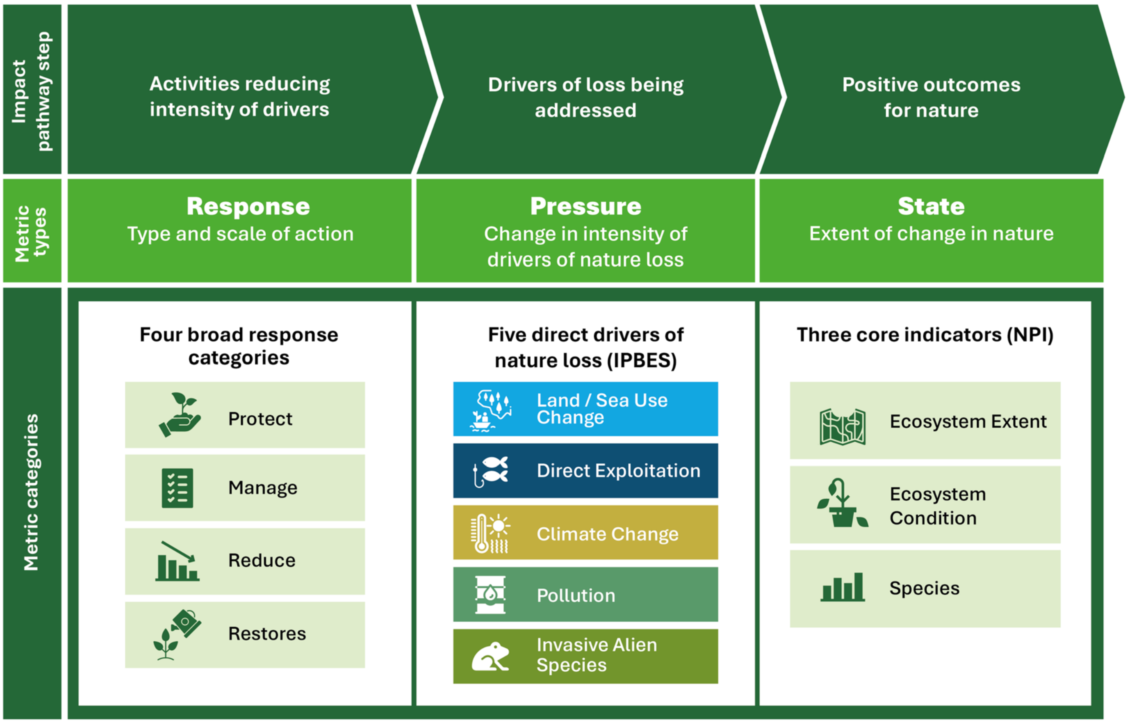
Using impact pathways as the basis for metric selection makes clear the connection between financed activities and inferred or demonstrated benefits to nature.

The three main steps of an impact pathway relate to three broad classes of metrics (*Figure 5*: Overview of metric types (Response, Pressure, State) associated with each step of a project impact pathway and general metric categories proposed for each stage.):

- **Response** metrics, assessing the implementation and scale of **activities**[14]
- **Pressure** metrics, assessing changes in the intensity of a **driver** of nature loss[15]
- **State** metrics, assessing outcomes for the **state of nature**[16].

Measuring a set of appropriate, interlinked metrics for Response, Pressure and State along an impact pathway should promote confidence in claims regarding impacts on nature, as well as supporting adaptive management. However, not all projects will need to, or be able to, measure metrics for Response, Pressure *and* State. Generally, both the measurement challenges and the certainty of demonstrating nature benefits increase from Response through Pressure to State metrics.

Figure 6: Overview of metric types (Response, Pressure, State) associated with each step of a project impact pathway and general metric categories proposed for each stage.



In Step 2.1 (Identify initial metrics set) a potential metric is identified for one or more stages (depending on objectives) of the impact pathway(s).

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[14] Response, Pressure, State are a subset of the broader Driver-Pressure-State-Impact-Response (DPSIR) framework. See Burgess et al. (2024). Global Metrics for Terrestrial Biodiversity. *Annual Review of Environment and Resources*, *49* (Volume 49, 2024), 673–709. https://doi.org/10.1146/annurev-environ-121522-045106

[15] The five drivers of nature loss are based on *IPBES (2019), Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services*, DOI: 10.5281/zenodo.3553579

[16] State metrics correspond to Indicators from the Nature Positive Initiative's (NPI) State of Nature Metrics

In Step 2.2 (Review measurement options) the practicality of metric measurement is reviewed, and Step 2.1 iterated if necessary to adapt the chosen metrics. Practical challenges are often greatest for State of Nature metrics, but a wide range of measurement approaches are available.

In Step 2.3 (Review and adjust the metric set) the selected set of metrics is checked against the objectives originally identified (Preparation), significant assumptions in the impact pathway, and the requirements of relevant reporting frameworks. If necessary, adjustments in the set (including inclusion of additional metrics) may be made.

Step 2.1. Identify initial metrics set

This step involves identifying an initial set of metrics that are relevant to measure for Responses, Pressures and/or State. The step involves three sub-steps:

1. *Decide which of Response, Pressure and State metrics are required*
2. *Identify relevant generalized metrics*
3. *Adapt generalized metrics into specific metrics relevant to the project context*

Step 2.1.1 Decide which of Response, Pressure and State metrics are required

Consider the originally defined objectives (Preparation), impact pathway(s) and assumptions to decide whether Response, Pressure and State metrics are all needed for the project, or only a sub-set of these.

For example, using only a pressure metric may be appropriate for a nature finance instrument where:

- the objective is to demonstrate positive impact on nature compared to a 'business as usual' scenario;
- there is no requirement to measure the absolute change in state of nature;
- the evidence linking reduction in pressure and improvement in state of nature is strong;
- there are no other assumptions that require testing or monitoring;

Whilst selecting only a Pressure metric may be adequate in these circumstances, there could still be good reasons for including both a Response and State metric if feasible (e.g. to demonstrate implementation progress, to strengthen attribution, for adaptive management, and to demonstrate the scale of contribution to state-of-nature goals).

Where a Response metric is required, this step should consider whether a directional or a threshold metric is appropriate (*Box 2*).

Box 2. Directional and Threshold Response Metrics

*The Draft Metrics Framework provides two options for generalized Response metrics: **directional** and **threshold** metrics.*

Directional Response metrics assess the area or scale of project activities (e.g., area under restoration). They demonstrate implementation progress and show the direction of change relative to the non-project scenario, but without further contextualization. Directional Response metrics are relatively easy to measure but on their own they do not provide strong support for claims about project results. To demonstrate outcomes, they are best deployed alongside complementary Pressure and (where relevant and feasible) State metrics.

Threshold Response metrics assess the scale of results achieved by financed activities relative to a target (e.g., for the proportion of degraded land under restoration in an area of intervention) or a threshold (e.g., a freshwater nutrient load above which eutrophication is defined to occur). While these metrics do not directly measure outcomes for nature, they contextualize the scale of change achieved. Threshold Response metrics are thus better suited than directional Response metrics for stand-alone use, where Pressure and State metrics are not essential and/or feasible. They more robustly indicate expected positive outcomes for nature, and can help demonstrate alignment with global, national or local targets.

Appropriate targets or thresholds for Response metrics will be case-dependent. They may be derived from sources such as:

- International targets such as those in the GBF.
- National or local targets, such as those set out in National Biodiversity Strategies and Action Plans (NBSAPs), National Adaptation Plans (NAPs) or in landscape or watershed action plans.
- Local social or ecological thresholds, such as eutrophic thresholds, sustainable yields, or desired abundance of particular species.
- Downscaled science-based targets, such as those provided by the Science-based Targets Network (SBTN).

Relevant generalized metrics can be extracted from the Draft Metrics Framework in Appendix 1. Draft Metrics Framework**.** The impact pathways prioritized in Step 1.2 (Assess impact pathway(s)) can be used to navigate the Draft Metrics Framework.

For each combination of IPBES driver and response category, the first table Draft Response Metrics contains generalized Response metrics, and the second table Draft Pressure & State Metrics contains Pressure and State metrics. The generalized metrics outline how to measure that step of the impact pathway for a range of contexts, irrespective of the specific sector or ecosystem.

State metrics from the second table all correspond to Indicators from the Nature Positive Initiative's (NPI) State of Nature Metrics. Although ecosystem extent and condition metrics are shown separately, measuring both metrics together (when feasible) can help avoid undesirable hidden trade-offs, such as protection effort focused on poor-quality habitat.

Step 2.1.3 Adapt the generalized metrics into specific metrics relevant to the project context

The generalized metrics are relevant to a broad set of activities. They can be adapted into specific metrics to better fit the project context.

Adapting generalized to specific metrics can be done by:

- Choosing appropriate metrics specific to sector and activity from other metrics frameworks, for example IFC's Biodiversity Finance Metrics for Impact Reporting, ICMA Sustainable Bonds for Nature, IRIS + Catalogue of Metrics or IFC's Guidelines for Blue Finance. Examples are given in Table 3.
- Defining or specifying the general terms in the generalized metrics. The Considerations columns of each table in the Draft Metrics Framework provide further guidance. For example,
    - For Response metrics, define how terms such as "under sustainable management" or "subject to climate change adaptation measures" should be interpreted in the context of the activity.
    - For Pressure metrics, specify the pressure being addressed. For example, the cause of ecosystem degradation for a land-use change impact pathway, the pollutants involved for a pollution impact pathway, or the type of climate impacts for a climate change adaptation impact pathway.
    - For State metrics, use forthcoming NPI guidance[17] on specific metrics for different project types, and metrics suitable for use in freshwater and marine environments. This includes considering whether the metric should be disaggregated and measured separately for different aspects of a project, for example, where numerous habitats are involved, or there are several sub-projects with different approaches (see key considerations column on Table 7: Pressure & State Metrics).

[17] The metrics, currently being tested as part of a piloting process, are summarized here. NPI plans to publish an output report on the consensus metrics once learning from the piloting process has been integrated.

Table 4: Examples of matching draft generalized metrics with metrics from other frameworks

Impact category and Generalized metric	Context / sector	Context specific metric	Source
Land / sea use change / Reduce **Response metric** Reduction in area of land/Improved water use efficiency for irrigation during production of [commodity]] (total or per unit of production)	Agriculture	Reduction in the annual absolute (gross) water use per hectare or per ton of production (in m^3/ha.y or m^3/t.y and %))	IFC's Biodiversity Finance Metrics for Impact Reporting
	Sustainable aquaculture	Reduction in the use of fish meal and fish oil taken from wild stocks as feed (% and tons p.a.)	ICMA, Sustainable Bonds for Nature
	Infrastructure	% of virgin raw materials substituted by secondary raw materials and byproducts (% and tons p.a.)	ICMA, Sustainable Bonds for Nature
Land / sea use change (all activity types) **Pressure metric** Net rate of conversion of natural and/or semi-natural habitats within area of interest (ha/year)[18]	Agriculture	Percentage increase in area of land restored or rehabilitated	IFC's Biodiversity Finance Metrics for Impact Reporting
	Forestry	Percentage increase in area reforested with native or naturalized species	IFC's Biodiversity Finance Metrics for Impact Reporting
Pollution (all activity types) **Pressure metric** Pollutant discharge per unit area within area of interest, per year (tons/ha/year)	Water, sanitation and waste management	Avoided plastic and/or solid waste runoff to freshwater and marine habitats (in t/y; increase in %)	IFC Biodiversity Finance Metrics for Impact Reporting
	Agriculture	Reduction in pesticide use (kg/ha and % of total pesticide used)	IFC Biodiversity Finance Metrics for Impact Reporting
	Water, Sanitation and Waste Management	Reduction in volume of untreated wastewater during the reporting period, to surface water, groundwater, seawater, or a third party and for which the organization has no further use	IRIS + (adapted)

[18] Where the activity is focused on ecosystem restoration, net rate of conversion may be negative

Template

A template for extracting indicators is provided in **Tab 4. Step 2 IdentifyMetrics+Measurement** (columns A-G) of the accompanying spreadsheet file, including a description and source of information for each of the required fields.

Step 2.2 Review measurement options

Having identified an initial set of metrics, appropriate to objectives and specified to the project context and activities, the next step involves reviewing the feasibility of measurement and adjusting the metric set if necessary.

Data availability is affected by a wide range of factors, including capacity constraints, instrument type and how site specific the impact on nature is. Considering these factors, and whether there are opportunities to address any constraints is useful at this stage. See Appendix 2 Step 2.2.

Measurement is often particularly challenging for State of Nature metrics, but there can be practical constraints and considerations for Response and Pressure metrics also. Measurement challenges may differ depending on objectives, for instance whether metrics are being used only for *ex-ante* estimation or for *ex-post* monitoring of impact. Important questions to consider include:

1. Are reliable techniques available to measure the metric in question?
2. What depth and frequency of sampling are required to provide accurate, precise and consistent estimates of metric values?
3. What are the costs associated with data collection?
4. What human capacity is required to collect, process, manage and analyse the data effectively?
5. Can new technologies and/or citizen science approaches reduce the cost and capacity requirements for measurement and monitoring?
6. Will the anticipated scale of change attributable to project activities be detectable, given a realistic data collection approach?
7. Will measurable change likely take place within the intervention period, or could there be lags in metric response (as is likely with State of Nature metrics in many contexts)?
8. Are there potential issues related to data privacy or data security?
9. Is the metric compatible with existing country monitoring systems, and does it complement or enhance these systems?
10. Given the project context, is it appropriate to consider participatory monitoring that involves Indigenous Peoples and Local Communities? (Box 3)

Where the feasibility of measuring a metric is doubtful, a suitable proxy measure may be considered instead. Box 4 outlines how proxies may be used for Response and Pressure metrics. Proxies may also be identified for State metrics, where these are precursors to the expected change in state of nature.

Box 3: Participation and collaboration with Indigenous People and local communities

Where projects and activities affect Indigenous Peoples (IPs) or local communities (LCs), their engagement is essential for project success. The active participation of Indigenous People and local communities can help ensure project success by aligning project activities with the needs of local communities. Financial institutions will have their own processes and environmental and social standards guiding appropriate engagement with IPs or LCs. Regarding nature finance metrics specifically, evidence suggests involving those living alongside nature and biodiversity in monitoring activities—such as metric selection, data collection, and analysis—can enhance data accuracy and strengthen community engagement[19]. Joint monitoring plans that include metrics aligned with the overall aims of the financial instrument, as well as those representing the priorities of local communities, help to create a shared understanding of project objectives, and if these objectives are not being met, can facilitate dialogue to enable solutions to be found.

Indigenous People and local communities also hold traditional knowledge relating to the natural environment that can be harnessed as part of project monitoring. For example, traditional knowledge can be used to identify seasonal behaviors, migration patterns, appropriate reference sites, and understand historical species ranges.

Due consideration must be given to the distinct rights Indigenous Peoples hold under international law, including rights to self-determination and land governance. These rights are affirmed in instruments like United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and include free, prior, and informed consent (FPIC). Engagement must follow their protocols and honor their decision-making authority. Indigenous Data Sovereignty must be respected, following the principles of Collective Benefit, Authority to Control, Responsibility and Ethics.

Shared metrics and monitoring are about more than reporting project results. They can foster shared ownership and project buy in, supporting ongoing communication while helping the project remain responsive to the needs of all stakeholders.

Additional resources

WWF (2020). A guide to Community-Based Monitoring, Reporting and Verification - WWF Community Monitoring

CARE Principles for Indigenous Data Governance by Research Data Alliance Indigenous Data Sovereignty Interest Group

[19] Danielsen, et al. (2024). Involving citizens in monitoring the Kunming–Montreal global biodiversity framework. *Nature Sustainability*, *7*(12), 1730-1739.

Brittain et al. (2024). Introduction to community-based environmental monitoring: practical guidance for monitoring of natural resources by Indigenous Peoples and local communities - https://transformativepathways.net/wp-content/uploads/2024/04/Introduction-to-community-based-environmental-monitoring.pdf

The REDD+ Environmental Excellence Standard (TREES) by Architecture for REDD+ Transactions (ART)

Box 4: Using proxy metrics in data-poor environments

There are many situations where limited relevant data are available for nature finance metric measurement. Contextual or historical data may not have been collected or made accessible, owing to capacity or other constraints. For instance, an activity aiming to reduce offtake of endangered fish stocks might find there are challenges in quantifying offtake by small-scale fishers (which would require weighing the catch) and in assessing the total size of the stock (which would require expert input by marine biologists).

In such cases, it may be possible to identify a suitable proxy metric to substitute for the Response, Pressure or State metric that would ideally be measured.

Suitable proxies should:

- Address the reason(s) why the original metric cannot be measured, e.g. data are cheaper and easier to collect, or change takes place within the timespan of the intervention.
- Be closely correlated with the ideal metric, or a precursor to it; if the proxy is observed to change, there is a logical reason to expect that the underlying ideal metric would also be changing; and
- Not substantially affected by factors that do not affect the ideal metric, so they would not change for reasons that are not relevant to the ideal metric.

In the fisheries example provided above, a Pressure metric of *fish offtake relative to the total fish stock* could be substituted by several potential proxies, such as *number of fisher-days*; *numbers of boats fishing each day*; or *numbers of fishing-km travelled by fishing boats*. All these metrics would be easier to measure than offtake, either through surveys or GPS data, and would provide an indication of fishing effort, which would be assumed correlated with fish offtake as biomass.

Using proxies clearly involves new assumptions. So, in a similar process to that outlined for assessing assumptions to impact pathways in Step 1.2, consideration should be given to any circumstances that could result in the proxy not correlating closely with the target metric. For example, the number of fisher-days might reduce, but fishers might adapt by using more effective fishing methods and catching more fish.

Table 10 in Appendix 2 gives further information on desirable characteristics of proxies for State of Nature metrics.

Approaches to state of nature measurement

Expressing project impacts in terms of state of nature outcomes provides a clear and comparable way of demonstrating how financed activities have achieved benefits for nature. However, there are contexts when it may be challenging to measure the state of nature directly, for example where project impacts are spatially diffuse and not tied to particular sites (e.g. activities to reduce demand for a polluting chemical). Where there are multiple actors operating in a shared landscape, attribution of positive impact is more challenging, although Statistical Attribution is an option that seeks to address this. Where the duration of financing is shorter than the time required to observe the intended changes in the State of Nature, it may be possible to identify proxies that are precursors to the intended change and that respond on shorter timeframes. There can also be significant technical and practical challenges (including cost) in effectively measuring metrics such as ecosystem condition or species populations. All of these challenges, and potential solutions are explored in greater depth in Appendix 2. Step 2.2.

When it is not feasible to measure State of Nature metrics directly, a range of other options can be considered. In addition to proxy measures (Box 4) these include modelling how changes in pressures relate to changes in state of nature, using established relationships. Rapid improvements in the sophistication and accessibility of Earth Observation data, and of automated or semi-automated biodiversity monitoring technologies, are also increasing the feasibility of state of nature assessment and monitoring. Broad options for state of nature assessment in different spatial contexts are shown in Table 5: Broad options for state of nature assessment according to spatial context, in decreasing order of the level of confidence in assessment. Tick marks indicate the general suitability of the approach in a particular spatial context.Table 5.

Table 5: Broad options for state of nature assessment according to spatial context, in decreasing order of the level of confidence in assessment. Tick marks indicate the general suitability of the approach in a particular spatial context.

Assessment Approach	Site-specific[a]	Landscape / Jurisdictional[b]*	No discrete or accessible site[c]
A1: Direct measurement – field-based measurement at a site	✓✓	✓	
A2: Direct measurement – earth observation of a site	✓✓	✓✓	✓ (Discrete but not accessible)
B (1 and 2): Measurement of state proxies at a site	✓✓	✓	
C: Estimation (statistical allocation) *May use A1, A2 or B types of data.*		✓✓	
D: Pressure-state model, with or without calibration	✓✓	✓✓	✓✓
E: Qualitative corroboration / support / evidence	✓✓	✓✓	✓✓
F: Evidence-based Impact Pathway (Step 1)	✓✓	✓✓	✓✓

* The landscape or jurisdictional-scale estimation process would be conducted by measuring indicators using the same techniques as for A1, A2 or B across the area, but including a subsequent additional step to allocate changes

measured to the actors in the landscape. See Guidance on Statistical Allocation in Appendix 2. Step 2.2 (additional guidance). Its role within the NPI consensus metrics, and in particular in claims-making, is still under discussion.

[a]Site-specific: The project site or sites perimeter(s) are known, and the relevant actions are being implemented across the whole area. If there are numerous, known sites, measurements can be taken from a representative sample of them if measuring each site is not feasible.

[b]Landscape or jurisdictional scale: The project region is known but implementation may be dispersed or fragmented across a large geographic area.

[c]No discrete or accessible site: Location of impacts on nature is not known or site is not accessible for data collection and remote sensing is not possible.

A1, A2 and B (in green) align with the NPI metrics. Options C-F are outside the scope of the NPI framework but can be used to assess or estimate the same metrics.

Appendix 2. Step 2.2 provides additional guidance on state of nature assessment approaches. Table 10 summarizes each approach, including requirements for implementation, guidance on when it is not appropriate and examples. As in Table 5, confidence in the assessment is highest at the top of the table, and lowest at the bottom. It is therefore advisable to consider options starting at the highest level possible, moving down the list only when higher-confidence options have been ruled out.

Appendix 2. Step 2.2 also provides further information about approaches enabled by technology (e.g., remote sensing, environmental DNA, bioacoustics) and citizen science, outlining the advantages and limitations of each approach for collecting state of nature data.

For measurement approaches A-C in **Error! Reference source not found.**, Nature Positive Initiative guidance[20] (an overview of the NPI framework is here) can be used to select the appropriate level of granularity for the metric(s) selected, considering project capacity versus need for accuracy.

Template

A template for reviewing measurement options is provided in **Tab 4. 2.2 IdentifyMetrics+Measurement (columns H – M)** of the accompanying spreadsheet file, including a description and source of information for each of the required fields.

Step 2.3 Review and adjust the metrics set

This final step provides the opportunity to review the proposed set of metrics as a whole, to answer the following questions:

[20] The Nature Positive Initiative is working to build global consensus on a minimum core set of State of Nature metrics for measuring nature positive outcomes. In 2025, draft metrics are being piloted by companies in over 30 countries. Learnings will be incorporated to produce a final set of metrics ready for embedding in frameworks and standards in early 2026. Companies piloting the Practitioner's Guide to Impact Metric Selection will benefit from referencing these source metrics and the accompanying underlying guidance. Further guidance, including on freshwater and marine metrics is due to be published soon.

- As a set, do the chosen metrics satisfy the required objectives (as identified in the Preparation step)?
- Are any additional metrics needed (e.g. to test assumptions, to support attribution, related to community participation, or for adaptive management)?

This step can also provide a valuable opportunity to engage relevant stakeholders and begin to build collaborative, participatory approaches to monitoring.

Assess metrics against objectives

The four metric purposes in Table 2: Guidance on potential metric purposes provide a useful framework for reviewing the selected metrics and identifying any gaps or adjustments necessary.

Purpose 1. Ex-ante assessment of potential impact before making an investment decision

Consider estimating or modelling State metrics in addition to Response and Pressure metrics, where it is useful to demonstrate or compare state of nature outcomes to justify making an investment decision. Having comparable metrics across different potential nature finance investments can inform an assessment of magnitude of results for nature for amount of capital deployed.

For example, modelling approaches can be used to estimate impact on state of nature based on anticipated changes in Response and Pressure metrics. See the Modelled and Qualitatively Evidenced Approaches for further guidance.

Purpose 2. Target setting (including for incentive-based financing)

This Guidance may also be appropriate for informing potential ambitious and achievable targets for incentive-based financing instruments or the metrics selected to report against those targets. When users intend to use the selected metrics from applying the process in this Guidance for this purpose, users can review whether the metrics generally meet the following criteria (adapted from ICMA SLBP):

- Are they relevant, core and material to the core business (e.g., as in the case for sustainability-linked bonds) and/or impact pathway of the financed activities?
- Are they externally verifiable?
- Can they be benchmarked, i.e., as much as possible using an external reference of definitions to facilitate the assessment to the targets' level of ambition?

It is also advisable to ensure that the metrics are:

- Aligned or correlate well with the baseline or reference scenario identified in Step 1.
- Are likely to change measurably within the duration of the instrument.
- Aligned with global frameworks important to key stakeholders, e.g. GBF, TNFD.

Other useful guidance on setting KPIs for nature finance instruments, includes:

- Sustainable Bonds for Nature – A Practitioners Guide
- ICMA Illustrative KPIs registry for SLB

Purpose 3. Adaptive management of the project and/or local stakeholder engagement

Ensure that metrics are included to enable adaptive management of projects, whereby adjustments can be made to project implementation plans if assumed results are not materializing. Adaptive management requires metrics that are responsive on shorter, within project, time scales to enable these management decisions. These additional metrics are not necessarily for public reporting, but they play an essential role in project management and long-term success.

Such metrics could relate to any aspect of project implementation where actions and their effects need tracking, or assumptions need testing or confirming, including for the causal connections between steps of the impact pathway (Step 1.2). The focus of metrics might range from implementation of new procedures within company operations, to whether target species are responding to financed activities as anticipated e.g. are they using wildlife bridges intended to enhance connectivity between adjacent areas? The Key Considerations column of the Appendix 1. Draft Metrics Framework provides examples of additional metrics to consider.

Where activities involve community-based approaches (e.g. sustainable livelihoods programs) or rely on local communities' engagement to achieve nature outcomes, it is important to collect data relating to local community priorities and objectives (see Box 4). Involving communities and local stakeholders in data collection can also strengthen trust, engagement and support effective project implementation.

Purpose 4. Impact measurement and verification for external reporting

Review the selected metrics to ensure they meet stakeholder reporting requirements. These are most likely to be from the capital providers or third-party investors in the instrument so may require adherence to specific reporting requirements for the instrument e.g. ICMA's guidelines for Green Bonds and Sustainability Linked Bonds, but could also include a desire to incorporate results achieved into broader corporate level sustainability reporting. Adhering to relevant industry reporting frameworks provides stakeholders with additional confidence.

Important elements to check include that metrics effectively capture additional results resulting from financed activities, support attribution to those activities (to the extent possible) and are responsive within the reporting cycle timeframe. If reporting requires aggregated metrics, consider selecting those with common units e.g. Hectares. It may be useful to aggregate within action categories e.g. Hectares protected, Hectares under sustainable management etc. to provide additional context.

Consider whether additional indicators can give a full picture of attributable outcomes. For example, if activities are addressing land or sea use change but also benefit a particular species of stakeholder concern, it might be informative to measure the population abundance of that species in addition to ecosystem indicators.

Nature finance & other impact reporting frameworks

- ICMA Principles Guidance and their recently released Sustainable Bonds for Nature: A Practitioner's Guide
- IFC's Biodiversity Finance Metrics for Impact Reporting and Guidelines for Blue Finance
- Impact investing – impact measurement/management framework by Global Impact Investing Network: GIIN IRIS+.
- Impact Management Platform

Disclosure & other related frameworks

- TNFD
- CSRD
- SBTN – Land, Freshwater, Oceans
- ISSB IFRS Sustainability Disclosures Standards
- GRI 101: Biodiversity 2024
- SFRD

International good practice resources

- Cross-sectoral regenerative agriculture outcomes: WBCSD Business Guidance for Deeper Regeneration.
- International standard for responsible water use: Alliance for Water Stewardship.
- Ecological restoration guidance for protected areas: IUCN, other guidance on forest landscape restoration and others.
- Restoration implementation standards and guidance: Society for Ecological Restoration (SER).
- Global standard for recognizing and promoting effective and equitable management of protected and conserved areas: IUCN Green List of Protected and Conserved Areas Global Standard.
- The REDD+ Environmental Excellence Standard (TREES) by Architecture for REDD+ Transactions (ART).

Template

A template for reviewing measurement options is provided in **Tab 5. 2.3 Review+Adjust** of the accompanying spreadsheet file, including a description and source of information for each of the required fields.

Abbreviations

BAU	Business as Usual
CBD	Convention on Biological Diversity
DPSIR	Driver-Pressure-State-Impact-Response
EO	Earth Observation
FPIC	Free, Prior, and Informed Consent.
GBF	Global Biodiversity Framework
IAS	Invasive Alien Species
ICMA	International Capital Market Association
IDB	Inter-American Development Bank
IFC	International Finance Corporation
IPs	Indigenous Peoples
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IUCN	International Union for Conservation of Nature
KPI	Key Performance Indicator
LC	Local Communities
MDB	Multilateral Development Bank
MSA	Mean Species Abundance
NPI	Nature Positive Initiative
PDF	Potentially Disappeared Fraction
REDD	Reducing Emissions from Deforestation and Forest Degradation
SBTN	Science-Based Targets Network
SLB/SLBP	Sustainability-Linked Bond/ Sustainability-Linked Bond Principles
SoN	State of Nature
TNFD	Taskforce on Nature-related Financial Disclosures
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UNEP FI	United Nations Environment Programme Finance Initiative
WEF	World Economic Forum
WWF	World Wildlife Fund

Glossary

Baseline - measurement or assessment representing the state or condition of biodiversity at, or prior to, the start of a period of interest, with which to compare changes in a metric. Can be static or a trend.

Biodiversity - As defined by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019), biodiversity is the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part. This includes variation in genetic, phenotypic, phylogenetic, and functional attributes, as well as changes in abundance and distribution over time and space within and among species, biological communities and ecosystems.

Business as Usual - Plausible reference benchmark or scenario for the outcome of interest (condition of biodiversity feature or pressure of interest), prior to, or in the absence of, the nature finance instrument and its activities.

Debt-for-nature swaps - an established mechanism to re-structure sovereign debt to finance conservation and restoration.

Effective Conservation - That which results in successfully conserving native ecosystems and their components, including species, genetic diversity, and ecological processes. (IUCN)

Extinction risk - The probability or likelihood that a species will disappear from existence in the foreseeable future, often quantified through assessments of habitat loss, population size, and the impact of threats like climate change and human activity.

Green credit line - A financial intermediation tool provided by a development finance institution or other financial entity to a local bank, with the specific purpose of promoting lending to projects that deliver environmental benefits.

Impact funds - Capital pools designed to achieve environmental or social outcomes, often accepting higher risk or concessionary returns. They may follow private equity or venture capital structures and often use blended finance to combine catalytic and commercial capital.

Impact pathway – A simple causal chain that credibly connects financed *activities* to changes in a direct *driver of nature loss* that in turn creates an impact on the *state of nature.* See further definition of impact pathway from Impact Management Platform.

Intensity – In the context of generalized Pressure metrics relating to land/sea use change, the frequency and/or severity of events leading to degradation of ecosystems. These can be direct human actions (e.g. extraction of timber) or unintentional consequences of wider human activity (e.g. frequency and severity of forest fires).

Invasive alien species - animals, plants or other organisms that are introduced by humans, either intentionally or accidentally, into places outside of their natural range, negatively impacting native biodiversity, ecosystem services or human economy and well-being.

Lagging indicator – An indicator which reflects past outcomes and so confirms past performance.

Leading indicator – An indicator which is forward-looking and predicts future performance.

Manage - A response category in the Draft Metrics Framework - sustainable production in working landscapes and seascapes.

Mean Species Abundance - Developed for use in the GLOBIO model to estimate ecosystem condition as function of select anthropogenic pressures on terrestrial and freshwater ecosystems. It measures condition in terms of the average abundance of species in selected groups compared to a natural reference state. It can in principle also be derived from direct field measurements, but this is notably challenging.

Metric - A metric is a quantitative measure that can be observed, counted, or otherwise recorded to understand performance, condition or change.

Metrics (directional) - Directional metrics assess the area or scale of project activities. They demonstrate implementation progress and show the direction of change relative to the non-project scenario, but without further contextualization.

Metrics (threshold) – Threshold metrics express change relative to a target (e.g., for the proportion of degraded land to be restored in a region) or a threshold (e.g., a nutrient load at which eutrophication occurs). They contextualize the amount of change, providing greater confidence in the expected outcomes for nature, and can help demonstrate alignment with global, national or local targets or benchmarks.

Nature - biodiversity, including genes, species and ecosystems, and the services it provides.

Nature finance - Nature finance is defined in the MDB Common Principles for tracking Nature Finance as finance contributing to the nature positive goal of halting and reversing nature loss and supporting the implementation of the GBF through one or more of the following activity groups:

- **(a)** Restoration and conservation of biodiversity or ecosystem services;
- **(b)** Reduction of the direct drivers of biodiversity or ecosystem services loss;
- **(c)** Integration of nature-based solutions across economic sectors; and
- **(d)** Design and implementation of policy, tools, or other sectoral instruments enabling (a) to (c).

Payments for ecosystem services - voluntary agreements offering financial incentives for landowners or stewards (and to a lesser extent, marine communities) to manage land in ways that preserve or enhance ecosystem services such as clean water, carbon storage and biodiversity. Payments are typically conditional on verified outcomes, with tiered rewards for overperformance.

Policy based loan - These are typically loans from multilateral development banks to governments to support policy reforms.

Potentially Disappeared Fraction - a metric developed for life-cycle impact assessments (LCA) as a measure of local loss of ecosystem condition caused by specific anthropogenic pressures. Best interpreted as the probability (from 0 to 1) that a randomly selected species at a location will be locally extirpated (i.e. abundance reduced to zero) for a certain amount of time as a result of the pressures in question.

Pressure - Human activities that directly or indirectly change the state of the environment and ecosystem. Following the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), five key pressures or 'drivers of nature change' contribute most to the loss of nature globally: land and sea use change; direct exploitation; climate change; pollution; and invasive alien species.

Pressure Metrics - quantify how and where the state of nature is being influenced by pressures (e.g., agriculture, pollution, invasive alien species, species utilization). See Burgess et al., 2024.

Protect - A response category in the Draft Metrics Framework - Maintaining existing natural and semi-natural ecosystems and species, including associated ecosystem services, to avoid any further decline.

Reduce - A response category in the Draft Metrics Framework - Reducing use and demand for resources to reduce damaging pressures on nature and ecosystem services..

Responses - relate to the discrete actions that are intended to directly or indirectly benefit nature. For example, direct actions include conservation activities that aim to protect natural habitat or restoration of degraded lands. More indirect actions include sourcing or producing livestock feed with reduced environmental impacts or integrated spatial planning.

Response metric - quantify policies or management actions that reduce pressures or otherwise help recover the state of nature (e.g., establishment and management of protected areas, eradication of invasive alien species, or habitat restoration). See Burgess et al., 2024.

For a list of responses that are known to reduce impacts users can consult sources such as IFC's Biodiversity Finance Reference Guide.

Restore - A response category in the Draft Metrics Framework - Recovering, rehabilitating, or remediating nature including ecosystem services where they have already been lost or depleted.

State (of Nature) – The status of one or more aspects of nature, in terms of quantity and/or quality. Can encompass any aspect of nature but often expressed in terms of extent and condition of ecosystems, and species population size and extinction risk.

Adapted from United Nations.et al. (2021) System of Environmental-Economic Accounting - Ecosystem Accounting (SEEA EA).

State Metric - Quantify the condition of nature (e.g., habitat extent, species extinction risk, ecosystem condition, genetic diversity). See Burgess et al., 2024.

Sustainable Management - Management of nature to ensure that the goods and services derived from it meet present-day needs while ensuring their continued availability for future generations. (Derived from FAO Sustainable Forest Management definition).

Sustainability-linked bonds or loans - Instruments whose financial terms are tied to entity-level KPIs, not specific projects. They allow broader use of proceeds and are often used as part of "transition finance" strategies.

Thematic or use-of-proceeds bonds or loans – Instruments whose proceeds are used for clearly defined projects with measurable outcomes, such as ecosystem restoration, regenerative agriculture or sustainable watersheds[21].

[21] Thematic bonds can include Sukuk, Sharia-compliant financial certificates that are similar to conventional bonds but represent a share of ownership in an underlying asset or project, rather than a debt obligation.

Appendix 1. Draft Metrics Framework

This Appendix provides examples of generalized Response (Table 6), Pressure and State (Table 7) metrics for impact pathways, as a starting point for developing metrics that are specific and relevant to the project context.

Response metrics are organized by both response type and IPBES driver of nature loss (Table 6). Pressure and State metrics are organized by the IPBES driver of nature loss (Table 7). State metrics are selected from the Nature Positive Initiative's (NPI) State of Nature Metrics.

For Response metrics, generalized examples are provided for both *directional* and *threshold* metrics (see Box 2). Directional Response metrics assess the scale of activities. They can demonstrate implementation progress and show the direction of change relative to the non-project scenario. Threshold metrics scale the results achieved by activities relative to a defined target or threshold, contextualizing the scale of change achieved. Threshold Response metrics are thus better suited than directional Response metrics for stand-alone use, where pressure or state outcomes are not assessed.

The generalized metrics in the framework form a basis for formulating metrics that are specific and relevant to a project and the impact pathway being assessed (Step 2.1.3). Examples are given in Table 4. The framework lists key considerations for appropriately formulating and applying such metrics.

There are very many potential Response metrics for any Response type-driver combination, depending on the project context and activities being implemented. The generalized examples are framed so that they align with potential State metrics (e.g. by referencing area, which can be related to ecosystem extent). These formulations can be adapted when developing specific metrics relevant to the project context (for example, proportion, volume or population rather than area might be relevant quantitative units). Where Pressure and State metrics are also to be assessed, however, it is important to ensure that metrics form a coherent and consistent set (Step 2.3).

Where State metrics are used, it may not always be feasible to measure them directly. Guidance for use of proxy measures is provided in Box 3, and different measurement approaches outlined in Table 5, with further guidance in Appendix 2. Appendix 2 also provides guidance on approaches to data collection for monitoring metrics, including the use of new technologies and citizen science.

Draft Response metrics

Table 6: Response metrics

Response type	Example activities	Generalized Response Metrics	Key Considerations (Responses)
IPBES Driver: LAND / SEA USE CHANGE			
Protect remaining natural and semi-natural ecosystems and species, including associated ecosystem services, from conversion and degradation	• Protecting or maintaining natural habitat features or fragments (including within forest concessions or other productive forests) • Establishing and enforcing marine protected areas (MPAs) • Public-private partnerships with tax incentives for private landowners to establish and manage privately managed protected and conserved areas adjacent to existing protected areas. • Establishment of early-warning systems to prevent and respond to forest-related threats, such as illegal deforestation or damaging forest fires. • Technical training and dissemination of environmental laws and regulations among communities to reduce the impact of artisanal and small-scale mining • Supporting establishment of protected and conserved areas (including other effective area-based conservation measures; OECMs) in terrestrial, inland water, coastal and marine ecosystems, especially areas of particular importance for biodiversity or ecosystem services. • Supporting effective protected and conserved area management (e.g., strengthening patrolling; improving management capabilities; infrastructure improvements; increasing revenues of management authorities through visitor fees; establishing collaborative management partnerships for improved protected area management) Implementing alternative livelihoods and pathways aimed at reducing pressure on natural ecosystems (e.g., by replacing livestock production with alternative income sources; by reducing extensification pressures).	*Directional* Area of ecosystems with conservation measures improved since [date] *Threshold* Area of ecosystems under effective conservation	- Consider supplementing with metrics tracking the specific conservation measures taken. - Threshold approach requires definition of "effective", such as the IUCN definition, or clear statements of the practices considered “effective”.

Response type	Example activities	Generalized Response Metrics	Key Considerations (Responses)
Manage - Improved sustainability of production from existing working lands and waters	• Intensifying production on existing agricultural landsntensifying production on existing agricultural lands by improving practices, varieties, technology, or infrastructure to increase crop yields or quality. • Implementing sustainable aquaculture to reduce its impact on freshwater or marine ecosystems • Establishing 'buffer zones' with native species or of natural ecosystems • Using nature-based remediation technologies to reduce pollution, promote erosion control and enhance soil properties (e.g., bioaccumulation; bioremediation, including phytoremediation and mycoremediation; other biological treatments of soil, such as bioaugmentation, biostimulation, and biomining).	*Directional* Area of working land/water with sustainability measures improved since [date] *Threshold* Area of working land/water under sustainable management	- Consider supplementing with metrics tracking individual sustainability measures - Requires a clear definition of 'sustainable management' relevant to the context. For example for "regenerative agriculture", the specific practices considered "regenerative" should be specified, and for threshold metrics the intensity of implementation of the practice should also be specified (e.g., "area of working land with at least X% natural or semi-natural habitat") - Supplement with measures of total yield to track trade-offs and leakage risk - For sustainable use of aquatic ecosystems, the area of ecosystem under improved management can be reported e.g. Area of ocean with fishing restrictions.
Reduce current and/or future demand for working land/water	• Supporting integrated spatial planning and management that incorporates biodiversity or ecosystem services, Strategic Environmental Assessments (SEA), and landscape- or seascape-scale cumulative impact assessments. • Measures to substitute meat-based proteins with plant-based protein alternatives (e.g., promoting plant-based diets) or reformulate products to reduce demand for meat-based protein. • Implementing activities aimed at reducing total water consumption or withdrawal (e.g. water recycling, sustainable reuse of greywater, water reuse through closed loops; rainwater harvesting) • Implementing climate-smart techniques for water conservation (e.g. 'Zai' or half-moons for water harvesting; plant pits with mulch; precision irrigation) or shifting to cultivation of native species with low water consumption to reduce overall demand for wate • Reducing waste and developing circular economy solutions in tourism facilities to reduce their impacts on nature (e.g., redistribution of food surplus for animal feed; biomaterial processing; composting and anaerobic digestion of waste; reducing plastic waste generated by tourism facilities). • Environmental (e.g., repurposing of harmful subsidies; taxing chemical pesticides) and establishment of fiscal measures (e.g., conservation tax credits) that incentivize sustainable practices in sectors such as agriculture, forestry, fisheries, and water resource management. • Replacing conventional materials with substantial nature footprints (e.g., steel, concrete, aluminum, plastics) in sourcing and product design with or using biodegradable or compostable materials.	*Directional* Reduction in area (or volume) of land/water used for production of [commodity] (total or per unit of production) *Threshold* Reduction in area (or volume) of land/water used for production of [commodity] (total or per unit of production) in line with local or global ecological thresholds	- Consider disaggregation by high-impact resource - Consider reporting percentage of total resource consumption or flow-through by undertaking in addition - Local or global ecological thresholds may be obtained from SBTN, or via other data sources - If reporting a Directional metric for reduction of volume of water used (i.e. without the relevant ecological threshold for the water catchment), it is useful to also report whether the water savings are in an area of water stress.

Response type	Example activities	Generalized Response Metrics	Key Considerations (Responses)
Restore degraded land or water	• Restoring degraded land or natural habitat (including at landscape level). • Restoring of degraded natural marine/freshwater habitat (at seascape/catchment level) • Restoring freshwater ecosystem connectivity and connectivity between habitats such as rivers, floodplains, ponds, and other perennial or seasonal wetlands to address barriers to fish mobility (e.g. retrofitting/removing dams, fish ladders) or to restore seasonal water regimes. • Rewilding through reintroducing native species or creating and restoring habitats for wildlife (e.g. developing biodiversity corridors, restoring riverbanks).	*Directional* Area of natural ecosystems undergoing restoration or rehabilitation since [date] *Threshold* Area of natural ecosystems reaching defined restoration or rehabilitation milestones.	- Requires clear and science-based definition of milestones appropriate to the ecosystem type. - Consider supplementing with descriptions of restoration actions and tracking of implementation.
IPBES Driver: DIRECT EXPLOITATION and ACCIDENTAL MORTALITY			
Protect resources and prevent the overexploitation of wild-harvested species.	• Establishing and enforcing MPAs (e.g., static MPAs that permanently safeguard critical habitats such as spawning grounds; dynamic MPAs where the boundaries shift in response to oceanographic conditions and species movements; multi-use MPAs that delineate zones for no-take cores, limited-gear fishing, or other low-impact activities; no-take reserves that prohibit extractive uses to allow ecosystem recovery). • Supporting establishment of protected and conserved areas (including other effective area-based conservation measures; OECMs) in terrestrial, inland water, coastal and marine ecosystems, especially areas of particular importance for biodiversity and ecosystem services. • Establishing or strengthening of institutions (e.g., national, subnational, local; government and non-government) charged with development, monitoring, or enforcement of environmental policies and regulations, or with environmental assessment and monitoring	*Directional* Proportion of population/stocks of harvested species becoming subject to no-take provisions since [date] *Threshold* Proportion of population/stocks of harvested species subject to effective no-take management	- Express proportion in terms of a defined scope of intervention (e.g., a landscape) - Consider reporting additional aspects of actions, e.g. understanding of level of compliance with no-take provisions - Requires definition of "effective" appropriate to context
Manage - Sustainable use and management of wild-harvested species, including minimization of accidental mortality	• Implementing capacity-reduction and catch-limit measures • Implementing gear selectivity and bycatch mitigation • Applying (or calibrating) seasonal bans that coincide with spawning, nursery, or migration periods. • Adoption of measures to prevent wildlife fatalities (e.g. deterrents to prevent migrating birds colliding with windows or wires; lighting that does not attract insects or turtles; staff training on the safe removal of wildlife such as snakes). • Strengthening natural resource governance • Preventing of overharvesting natural resources and measures to reduce the collection, use or purchase of threatened or protected plant and animal species as food for visitors or as souvenirs, including illegally or unsustainably traded wildlife and forest products.	*Directional* Proportion of population/stocks of harvested species with management practices improved since [date] *Threshold* Proportion of population/stocks of harvested species with sustainable management practices	- Consider reporting in detail the actions implemented, e.g. if seasonal closures, the area affected, timescale of closures, understanding of level of compliance with closures - Requires definition of "sustainable" appropriate to context

Response type	Example activities	Generalized Response Metrics	Key Considerations (Responses)
Reduce demand for wild-harvested species that are overexploited	• Implementing alternative livelihoods and scaling up green jobs (e.g., in community-based or small and medium-sized enterprises (SMEs)) and pathways aimed at reducing pressures on natural ecosystems (e.g., to reduce incursions on protected and conserved areas). • Preventing overharvesting of natural resources including addressing illegal or unsustainable trade or use of wildlife and forest products (e.g., species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)), for example by: (...) Consumer demand reduction and behavior change campaigns. •	*Directional* Reduction in quantity consumed / harvest of wild-harvested species *Threshold* Proportion of population/stocks of harvested species with consumption reduced below a threshold identified as sustainable	- Substantial risk of leakage if product substituted by product sourced elsewhere - Challenging to measure - could be partially assessed through market-based observations - Consider also reporting level of consumption of alternative (substitute) resources - Consider reporting each of total reduction, proportion of population, and reduction per consumer - Threshold requires definition of "sustainable" appropriate to context
Restore - Actions to replenish species depleted through wild harvesting	• Re-stocking with native species while minimizing domestication, to help enhance ecosystem structure for accelerated restoration rates. • Rewilding through reintroducing native species or creating and restoring habitats for wildlife (e.g., developing biodiversity corridors; restoring riverbanks). • Restoring nursery habitats and spawning grounds. • Activities to maintain or restore genetic diversity within and between populations of native, wild and domesticated species.	*Directional* Proportion of population/stocks of harvested species subject to restoration measures since [date] *Threshold* Proportion of population/stocks of harvested species replenished to a level identified as healthy	- Supplemented as relevant by metrics specific to interventions, e.g. Area of habitat managed Number of individuals replenished. - Threshold requires an estimate of "healthy" population appropriate to context.
IPBES Driver: CLIMATE CHANGE			

Response type	Example activities	Generalized Response Metrics	Key Considerations (Responses)
Protect - Actions seeking to prevent climate change from impacting species and ecosystems	• Using Managed Aquifer Recharge (MAR) of groundwater systems (e.g., through rainwater harvesting; increasing recharge through rivers or other aquifers; redirecting drainage pipes; using treated wastewater). • Implementing fire management/fire risk reduction programs that directly reduce threats from uncontrolled fires, or manage fire regimes, where there is a demonstrated benefit to biodiversity. • Using green infrastructure or combined green/grey solutions with clear localized benefits to biodiversity(e.g., constructed wetlands for treating runoff from irrigation, stormwater, greywater, or wastewater).	*Directional* Area subject to protection from climate change-related threats also providing benefits to nature undertaken since [date] AND/OR Number of species of conservation interest intended to be conserved through protection from climate-change related threats *Threshold* Area subject to effective protection from climate change-related threats also providing benefits to nature undertaken since [date]	- Clearly specify the adaptation measures taken and the approach used to calculate area (likely as area intended to be protected) - Adaptation measures should clearly show benefits for nature - If species-level metric added, provide a description of how the protection actions are intended to conserve each species - Threshold example requires a definition of "effective" appropriate to context (likely very difficult to establish in many cases).
Manage - Actions enabling species and habitats to adapt to climatic change	• Monitoring of fish stocks, monitoring the impacts of climate change on fisheries, and projecting sustainable harvest levels to inform management. • Cultivating more climate resilient crop varieties adapted to local environmental conditions (e.g., heritage crop varieties or native species that can more readily adapt to variations in production cycle, water quality or quantity, and temperature, and thus require fewer inputs and resources with better consistency of yields). • Creating crop production systems that are more climate-resilient and provide localized benefits for biodiversity or ecosystem services (e.g., by using drought-resistant seeds; using native shrubs as wind breaks or fire prevention).	*Directional* Area subject to climate change adaptation measures also providing benefits to nature undertaken since [date] AND/OR Number of species of conservation interest subject to climate change adaptation measures since [date] *Threshold* Area subject to effective climate change adaptation measures also providing benefits to nature	- Clearly specify the specific adaptation measures - Adaptation measures should clearly show benefits to nature - Consider supplementing with metrics relevant to the specific measures, e.g. Number of individuals relocated
Reduce GHG emissions and increasing GHG removals	*Out of scope - covered by climate finance guidance and frameworks*	*Out of scope - covered by climate finance guidance and frameworks*	*Out of scope - covered by climate finance guidance and frameworks*

Response type	Example activities	Generalized Response Metrics	Key Considerations (Responses)
Restore - Restoration of habitats or species populations following climate change impact	• Establishing artificial reefs (appropriately designed and sited) • Re-stocking with native species while minimizing domestication, to help enhance ecosystem structure for accelerated restoration rates.	*Directional* Area subject to climate-change related restoration measures since [date] AND/OR Number of species subject to active management for climate change adaptation *Threshold* Area subject to effective climate change-related restoration measures	- Clearly specify the specific restoration measures - Consider supplementing with metrics relevant to the specific measures, e.g. Number of individuals restocked
IPBES Driver: POLLUTION			
Protect - Measures to avoid pollution impacting natural ecosystems and species	• Land administration legal and regulatory framework reform (e.g., formalization of land tenure for smallholders or Indigenous Peoples and Local Communities), user rights reform, or user conflict resolution to enable improved conservation, restoration, or management of biodiversity or ecosystem services. • Capacity building to support adoption of sustainable practices or compliance with environmental laws and regulations among private sector actors • Processing previously deemed uneconomical low-grade stockpiles or mined rock waste to reduce leaching potential, waste generated, and pollution.	*Directional* Area under improved measures to prevent application of damaging pollutants since [date] *Threshold* Area with measures adequate to keep application levels of damaging pollutants below a locally or globally appropriate threshold	- Areas likely to be jurisdictional sizes in this case - Identification of appropriate thresholds may be derived from SBTN or other data sources
Manage - Minimizing the impacts of necessary use of potential pollutants	• Establishing sanitary landfills to prevent pollution from entering the environment. • Collecting and transporting wastewater (with or without stormwater), fecal sludge, septage, and waste from container-based sanitation to treatment facilities including through pipes, sewers, drains, pumps, and collector sewers (e.g., to reduce discharge into marine ecosystems; to support circular approaches, such as biogas or nutrient recovery). • Creating bioretention areas using shallow vegetated depressions (e.g. bioswales; rain gardens; detention ponds; permeable pavements; constructed wetlands) to reduce flood risks (e.g., by intercepting, infiltrating, and reducing the velocity of stormwater flow). • Improving manure management to reduce runoff of nutrients. • Deploying recycling technologies and processes (e.g., chemical recycling to depolymerize plastics) and building recycling facilities, including on-site recycling systems, to process manufacturing scraps and defective products, or to increase recycled content of manufactured products.	*Directional* Area under or influenced by improved measures to reduce discharges of damaging pollutants since [date] *Threshold* Area with measures adequate to keep discharge level below a locally or globally appropriate threshold	- Consider supplementing as relevant by metrics specific to interventions, e.g. Volume of polluted water treated (m^3/y) - Note that "discharge" in this context includes both runoff and point sources of emissions of damaging pollutants - "Influenced by" refers to area impacted by improved management of point sources - Identification of appropriate thresholds may be derived from SBTN or other data sources.

Response type	Example activities	Generalized Response Metrics	Key Considerations (Responses)
Reduce - Measures to reduce demand for products produced with high pollution risks	• Reducing the use of pesticides, herbicides, and other chemicals, or promoting the use of biological solutions such as biocontrol using natural enemies of pest species. • Preventing or reducing downstream eutrophication, through reducing synthetic fertilizer use, promoting efficient fertilizer use or the use of biofertilizer or other organic solutions (e.g., compost). • Bioleaching to extract metals from ores with less chemical input (e.g. using fungi and bacteria) (reduces demand for raw materials). • Reducing or eliminating the use of hazardous chemicals in production processes and materials e.g., through phasing out their production; reengineering products toward materials that are not toxic). • Efficient use of fertilizer, increasing fertilizer use efficiency, or reducing use of fertilizer, particularly in areas where run-off leads to downstream eutrophication through excess nitrogen and phosphorus. • Substituting plastic packaging that impacts marine, freshwater, and terrestrial biodiversity with sustainable, compostable and biodegradable materials. • Introducing measures to reduce need for chemical control of invasive species that could harm native biodiversity (e.g. by using biological, cultural, mechanical, and physical control methods)	*Directional* Quantity of reduction in use of pollutant per unit of production *Threshold* Proportion of resource or commodity production where pollutant use is reduced below local or global ecological thresholds	- Consider disaggregation by high-impact resource - Consider reporting percentage of total resource consumption or flow-through by undertaking in addition - Local or global ecological thresholds may be obtained from SBTN, or via other data sources
Restore - Remediation of land/water/sea and species impacted by high pollutant loads.	• Phytoremediation or bioremediation of contaminated forest soils or adjacent waterways. • Improving Municipal Solid Waste Management (MSWM) with targeted local benefits for biodiversity. • Rehabilitation of degraded industrial sites by restoring vegetation, creating buffers, and implementing other measures that benefit biodiversity or ecosystem services. • Conserving or restoring biodiversity on non-operation land ('set asides') to enhance biodiversity or ecosystem services, beyond compliance with E&S risk management standards (i.e., offsets). • Landfill restoration to seal landfills and promote vegetation growth to repurpose the land for future use.	*Directional* Polluted area subject to improved remediation since [date] OR Polluted volume subject to improved remediation since [date] *Threshold* Area or volume (as appropriate) remediated to a standard above a locally or globally appropriate threshold	- Consider supplementing as relevant by metrics specific to interventions, e.g. Volume of polluted water remediated (m^3/y) - Identification of an appropriate threshold as a standard may be derived from SBTN or other data sources.

Response type	Example activities	Generalized Response Metrics	Key Considerations (Responses)
IPBES Driver: INVASIVE ALIEN SPECIES[22]			
Protect - Prevent introduced invasive alien species (IAS) from establishing	• Deploying measures and technologies to prevent, eradicate, contain, and manage invasive species (e.g., biosecurity protocols; tourism ventures that implement tourist activities that prevent or reduce the spread of invasive species; shoe disinfection; education and awareness on invasive species introduced or spread by tourists; avoiding known or potentially invasive species in landscaping or aquascaping) • Implementing programs to prevent, eradicate, contain, and manage freshwater or riparian invasive species	*Directional* Area under improved measures to prevent establishment and spread of IAS since [date] *Threshold* Area under effective measures to prevent establishment and spread of IAS	- Clearly specify the measures taken and the approach used to calculate area - Requires definition of "effective" appropriate to context
Manage - Control of invasive species in areas where they are established to limit their impact	• Implementing measures to prevent, eradicate, contain and manage exotic species. • Creating demand for invasive species utilization (e.g. promoting the consumption of lionfish) where such utilization supports the local control of the invasive species.	*Directional* Area under improved measures to manage the impacts of IAS since [date] *Threshold* Area under effective measures to manage the impacts of IAS	- Clearly specify the measures taken and the approach used to calculate area - Requires definition of "effective" appropriate to context
Reduce – Minimise the risk of introducing invasive species	• Installing or using ballast water treatment systems on ships or in ports, with enforcement of their use, to prevent contamination with invasive species. • Building port, customs, or other border control facilities to prevent, search for and handle or treat invasive species, illegally-traded wildlife, or other prohibited activities harmful to nature (e.g., illegal, unreported, and unregulated (IUU) fishing under the Agreement on Port State Measures (PSMA)). • Measures to reduce infestation of pests and invasive species to lower pressure on I water recsources and on land	*Directional* Area under improved measures to prevent arrival of IAS since [date] Threshold Area with measures adequate to keep risk of introduction minimal	- Areas likely to be jurisdictional sizes in this case - Clearly specify the measures taken and the approach used to calculate area - Requires definition of "risk" and "minimal" appropriate to contexts

[22] Reduce, protect, manage and restore correspond to different aspects of addressing the invasive species driver: respectively, minimising risk of introduction, preventing establishment, managing impacts when established and (where feasible) complete removal. In practice, some activities will overlap between response types, and a common sense approach should be taken to defining impact pathways.

Response type	Example activities	Generalized Response Metrics	Key Considerations (Responses)
Restore - Eradication of invasive species in areas where outbreaks have occurred.	• Implementing measures to prevent, eradicate, contain, and manage exotic species • Re-stocking with native species while minimizing domestication, to help enhance ecosystem structure for accelerated restoration rates.	*Directional* Area under measures to eradicate IAS since [date] *Threshold* Area under effective measures to eradicate IAS or reduce impacts to an insignificant level	- Clearly specify the measures taken and the approach used to calculate area - Requires definition of "effective" appropriate to context

Draft Pressure & State metrics (Separated by IPBES Driver)

Table 7: Pressure & State Metrics

This table follows on from Table 6: Response metrics. Pressure and State metrics do not vary by activity type, so it is only necessary to identify the relevant IPBES Driver to use this table. For this reason, example activities have not been provided. The example activities in any of the four Response types for the relevant Driver in Table 6, would also apply to the row for the Driver in this table. See Table 8: Alignment between Appendix 1 Draft Metrics Framework (State of Nature) and NPI Consensus Indicators. for an explanation of how the Generalized State Metrics recommended here correspond to those recommended by the Nature Positive Initiative.

Generalized Pressure Metrics	Key Considerations (Pressures)	Generalized State Metrics	Key considerations (state)
IPBES Driver: LAND / SEA USE CHANGE			
Net rate of conversion of natural and/or seminatural habitats within area of interest (ha/year) Proportion of area of interest affected by ongoing degradation Intensity (see Glossary) of degradation within affected portion of area of interest	- Ideally measure both conversion and degradation - Consider supplementing rate of conversion with leading indicators, such as number and length of new roads created per year in a deforestation frontier - Define the causes of degradation that are relevant for the area of interest - e.g. unplanned harvesting of trees - Intensity of degradation can be expressed in terms of severity (e.g., proportion of trees cut, proportion of area burned), and/or in terms of frequency of damaging events (e.g., number of fires per year)	Change in extent of ecosystems Change in condition of ecosystems (site and landscape) *Case-specific metrics:* *Change in extent of natural and semi-natural habitats* *Change in condition of natural and semi-natural habitats* *Species population abundance*	- In working lands measure proportion of natural and semi-natural habitat in each km^2 as well as total extent - Consider measuring landscape condition as well as site condition, e.g. through inclusion of a connectivity or fragmentation metric - Consider disaggregating by ecosystem type as specified within NPI guidance; may also be disaggregated further as suggested in the GBF Monitoring Framework. - Consider measuring extinction risk at the landscape scale to assess contextual importance, following NPI guidance.
IPBES Driver: DIRECT EXPLOITATION and ACCIDENTAL MORTALITY			
Rate of resource offtake or mortality, as individuals or weight (biomass), per area or per capita, per time unit Rate of resource offtake or mortality as proportion of sustainable offtake / mortality	- Users should note that these metrics also include accidental mortality, e.g. bycatch - Calculation of sustainable offtake may require assessment of population size and reproductive rate.	Species population abundance in area of interest - for species subject to direct exploitation or accidental mortality	Consider supplementing where relevant by: - Population age structure - Size of reproductive individuals - Impacts of non-selective harvesting (e.g. for charcoal, or dynamite fishing) may be better captured by an ecosystem condition metric - For highly threatened species, consider expressing changes in terms of extinction risk (of impacted species)

Generalized Pressure Metrics	Key Considerations (Pressures)	Generalized State Metrics	Key considerations (state)
	- Rate of offtake is best expressed per unit area when the primary response is Protect, Manage, or Restore, and per capita when the primary response is Reduce - Simplified methods like Potential Biological Removals can be used to estimate sustainable offtakes when data availability is limited[23]		- For multi-species harvests, or if the interventions also have benefits for natural ecosystems, consider whether ecosystem extent and condition metrics may be more appropriate or complementary.
IPBES Driver: CLIMATE CHANGE			
Proportion of area of interest affected by ongoing climate change impacts Intensity (see Glossary) of impacts within affected portion of area of interest	Define the causes of impacts that are relevant for the area of interest, e.g. - frequency of fire events - fire severity - storms resulting in loss or degradation of habitat - length of coral bleaching events etc. Intensity of impacts can be expressed either in terms of severity of effects relevant to the habitat or species (e.g., proportion of large trees brought down by storm blow per year, or Degree Heating Weeks for a coral reef), and/or frequency of events (e.g., number of overtopping storm surges)	Change in extent of ecosystems Change in condition of ecosystems (site and landscape) *Case-specific metrics:* *Change in extent of natural and semi-natural habitats* *Change in condition of natural and semi-natural habitats* *Species population abundance*	Consider supplementing where relevant by: - Population size (of impacted species) - For highly threatened impacted species, consider expressing changes in terms of extinction risk.
IPBES Driver: POLLUTION			
Pollutant concentration (kg/m³ water or soil)	- Ideally, important to provide concentration relative to a locally contextually appropriate threshold value	Change in extent of ecosystems Change in condition of ecosystems (site and landscape)	Consider supplementing where relevant by: - Population size (of impacted species)

[23] See for example discussion and links to technical guidance in Bennun *et al.*, 2024

Generalized Pressure Metrics	Key Considerations (Pressures)	Generalized State Metrics	Key considerations (state)
Pollutant discharge per unit area within area of interest, per year (tons/ha/year)	- Pollutant discharge per unit area may require allocation or modelling approaches rather than direct measurement	*Case-specific metrics:* *Change in extent of natural and semi-natural habitats* *Change in condition of natural and semi-natural habitats* *Species population abundance*	- For highly threatened impacted species, consider expressing changes in terms of extinction risk.
IPBES Driver: INVASIVE ALIEN SPECIES			
Number of new establishment events of recognized Invasive Alien Species (IAS) per year [in defined area of interest] AND Change in area infested by IAS per year (ha/year) [in defined area of interest] AND/OR Abundance of invasive species (individuals/ha) [in defined area of interest]	- Use of more than one metric here can help to contextualize each - Individual IAS to be named	Change in extent of ecosystems impacted by IAS Change in average condition of ecosystems impacted by IAS (site and landscape) *Case-specific metric:* *Species population abundance (of species impacted by IAS)*	Consider supplementing where relevant and feasible by: - Population size (of species impacted by IAS) - For highly threatened species impacted by IAS, consider expressing changes in terms of extinction risk (using a site-focused metric such as IUCN's Species Threat Abatement and Restoration metric, STAR). - In the intensive land-use biome, also include change in extent and condition of semi-natural habitats, following NPI guidance

Table 8: Alignment between Appendix 1 Draft Metrics Framework (State of Nature) and NPI Consensus Indicators. Note that these metrics can be measured at different granularity levels.

Metric from Appendix 1 Draft Metrics Framework	Corresponding NPI Indicator and Descriptor
Ecosystem extent	Area (absolute and percentage) of loss, gain and net change in extent of each ecosystem type, and per ecosystem asset (ha) - **IND1.** As **IND1.1** when in priority ecosystems.
Ecosystem condition	Site condition: Area and change (absolute and percentage) of each ecosystem type and each ecosystem asset, by condition class (ha per condition class) - **IND3.** As **IND3.1** when in priority ecosystems. Landscape condition: Value and change, within site and surrounding area, of a) landscape intactness, b) structural connectivity, and c) functional connectivity (at high granularity level) – **IND4**.
Extent of natural and semi-natural habitat	Value and net change in the average proportion of natural and semi-natural habitats within each 1-km2 (%) - **IND2.** Triggered when site is located within the Intensive Land Use biome, other than urban areas.
Condition of natural and semi-natural habitat	Area and change (absolute and percentage) of natural and semi-natural habitat of each ecosystem asset, by condition class (ha per condition class), as measured by a) connectivity, b) proportion of core area and c) relative abundance of species important for ecosystem function (at high granularity level) - **IND5.** Triggered when site is located within the Intensive Land Use biome, other than urban areas.
Extinction Risk	Species extinction risk score showing the contributions of a site and its surrounding area to extinction risk of threatened species - **IND6.**
Population Size	Change in the number and proportion of priority species with: 1) stable or increasing populations, and 2) declining populations - **IND7.** Triggered by priority species trigger.

The Corresponding NPI Indicator and Descriptor column refers to the codes of relevant indicators in the Nature Positive Initiative framework.

Appendix 2. Additional Guidance

The following appendix provides additional practical guidance on Step 1.2 and 2.2.

Step 1.2. Assess impact pathway assumptions

Following documentation of assumptions for each stage of their impact pathway users can translate these into potential impacts on project results.

Scoring and prioritizing assumptions. It is recommended that users prioritize documented assumptions, identifying weakly-supported assumptions that may require additional monitoring or action. Users can categorize each assumption by the **likelihood** that it fails to be met, and **severity** of effect on results if that happens.

Likelihood relates to the probability the assumption will fail and impact to the project and its results. To assess likelihood, you can use several methods:

- **Existing / historical data** – Has the identified assumption failed / occurred during similar interventions?
- **Expert / local knowledge** – Do implementation experts or local stakeholders think the assumption will fail / occur?
- **Contextual factors** – Are there external factors which mean the assumption is likely to fail (e.g. poverty, weak governance, competing pressures etc.)?

Severity refers to the scale to which a failed assumption may affect the anticipated benefits to nature and other intended results of activities. To assess severity, it is important to consider how a failed assumption could affect results through several possible routes:

- **Ecological** – on planned nature and biodiversity outcomes
- **Social** – on planned improvements to livelihoods, equity, or community
- **Technical** – relating to technical feasibility, design and project implementation, e.g. inappropriate methods, poor analysis, lack of technical resource or capacity.

A likelihood and severity ranking for each assumption can provide an overall score to help prioritize assumptions.

Step 2.2. Factors affecting data availability and suitability

A number of factors, beyond site-level assessment feasibility, influence what type of metrics are most suitable to meet different purposes.

Duration of the Instrument

If the duration of the instrument is substantially shorter than the time required for a significant change in state of nature to occur and be measurable, consider use of proxies / adaptations for state of nature that change on shorter timescales e.g. abundance of shorter lifecycle indicator species that respond more quickly than the return of endangered species to an area. This is especially important if the metric is being used for setting incentive-based targets. If for assessing outcomes, then monitoring may be able to continue beyond the duration of the instrument, and so the duration is less critical. Different metrics can be selected for different purposes, so whilst a proxy State or a Pressure metric could be used for target setting, if longer term monitoring is possible, direct measurement of the change in State could be used for longer term impact assessment to inform stakeholders about the effectiveness of the project.

Degree of influence over state of nature outcome

In projects where there are large numbers of stakeholders influencing state in an area, it is difficult to attribute changes in the state of nature to the financed activities. In these cases, there are several options:

- If sites are known and data can be collected, select proxy metrics for the SoN impacts of interest that change on a smaller geographic scale. For example, if considering biodiversity impacts of changes in practices of numerous smallholders distributed over a wide area, consider measuring changes in populations or diversity of invertebrates on a selection of sites, rather than for example birds that will travel across the whole landscape and be influenced by the activities of numerous actors.

- If individual sites are not known, statistical attribution (level C in Table 5: Broad options for state of nature assessment according to spatial context, in decreasing order of the level of confidence in assessment. Tick marks indicate the general suitability of the approach in a particular spatial context.) is an option, or if no site data can be collected, consider one of the lower levels in the assessment table that create an evidence base to support the connection between the activities and the ultimate outcomes for nature without measuring them directly.

Data availability, capacity and measurement feasibility

Data availability and capacity will influence which options are possible on the assessment spectrum in Step 2.2, especially when third-party datasets are required, where local capacity is limited or where there is no direct relationship between the financier and the site(s) where the impact on nature occurs. If outcomes to nature are central to the objectives of the instrument, it may be worth considering whether technical assistance could be used to support data collection. Otherwise, alternative approaches to assessment can be selected in Step 2.2. Table 5 in Step 2.2 provides additional guidance on this.

Instrument type

There are a broad range of instrument types that can be used to finance and incentivize outcomes for nature[24]. Their duration, structure, client types and approaches to incentivizing positive impacts vary and this influences both the types of metric that are useful for each, and the likely availability of data. Based on the definitions used by WEF[25] (see Glossary) but with the addition of two extra instruments: Policy based loans and Green credit lines Table 9: Illustrative examples of how instrument and client type can influence impact pathways and metric suitability illustrates common ways that type of instrument influences metric selection.

[24] WEF (2025). Finance Solutions for Nature: Pathways to Returns and Outcomes

Finance for Biodiversity Foundation and United Nations Environment Programme (2024) Finance for Nature Positive: Building a working model.

[25] WEF (2025). Finance Solutions for Nature: Pathways to Returns and Outcomes

Table 9: Illustrative examples of how instrument and client type can influence impact pathways and metric suitability

Instrument	Example Client / investee type	Where the impact on nature occurs	Location specificity	Use of proceeds	Target / incentive	Approx duration (years)	Considerations for defining the impact pathway and selecting metrics
Impact fund	Natural capital focused: Regenerative agriculture, sustainable forestry, NBS project developers	Investee sites	Site-specific	Whole company qualifies	No	3-8 (per investee)	As the investment is in a whole company, which may have diverse operations, the impact pathway, and therefore the metrics, should relate to the most material aspects of the company's business that have benefits for nature. It may be desirable to amalgamate data from individual investments at the fund level. As most investments are land based, State metrics may be useful. Likely impact is also often estimated as part of the investment decision.
Impact fund	Tech focused: High growth corporates with tech solutions reducing pressures on nature	Sites of the clients of tech companies	Within value chain not direct operations	Whole company qualifies	No	3-8 (per investee)	As above but most impacts will occur at sites in the value chain. Metrics may be developed based on volume of products sold, combined with an assessment of the impact of the product based on data gathered by the company to communicate the benefits of its products.
Debt for nature swap	Government	Region / site	Site / jurisdiction	Savings from debt relief	Incentives and penalties	15-20	KPIs are often set relating to the implementation of actions financed through the savings. Increased confidence in the effectiveness of the actions could be achieved by also collecting data on Pressure and / or State.
Policy based loan	Government	Jurisdiction	Country	No	Triggers for tranche payments	3-20	The focus is on policy outcomes. Therefore, the impact pathway and associated metrics should aim to assess the most material ways in which the policies will benefit nature. Depending on the capacity in country, it may be possible to use or support national monitoring efforts to monitor results e.g. with Technical Assistance.

Instrument	Example Client / investee type	Where the impact on nature occurs	Location specificity	Use of proceeds	Target / incentive	Approx duration (years)	Considerations for defining the impact pathway and selecting metrics
Sustainability linked bond	Corporate	Variable – company or value chain sites	Multiple or no discrete site	No	Yes	3-7	The impact pathway should relate to the KPIs associated with the incentive mechanism. Consider Threshold Response metrics that set the target relative to a relevant framework or standard.
Thematic Bond	Corporate	Company sites	Often site specific	Yes	No	3-15	Proceeds are used to finance clearly defined projects with measurable outcomes. As these are often site specific and significant scale, State metrics may be possible.
Green credit line	Bank	Clients of the bank	Multiple or no discrete site	Yes	No	1-5	The aim is to promote lending to projects that deliver environmental benefits. Eligibility criteria will be stipulated to determine what activities can be financed. Reporting requirements may also be included and can be used as an opportunity to stipulate metrics to be collected. The capacity of the local bank and their clients to collect data, must be considered. If location data can be collected, it may be possible to collect Earth Observation data centrally or through an audit / third party review process.

Additional guidance on how to assess state of nature

The following table outlines considerations for options to assess the state of nature, when the user is searching for state metrics to be included in the chosen metrics set. Using a State metric (either directly measured, or a reliable proxy or inference well supported by evidence) supports claims for the finance activity producing positive changes in the state of nature. It is also important to clearly document and disclose assumptions and evidence. NPI is currently working on guidance regarding this topic, to be published shortly.

Table 10 below provides additional detail (building on Table 5 in Step 2.2) to support the decision regarding which approach to State of Nature assessment is most appropriate for the financed activity. Starting at the top, review the *requirements* and *when not to use it* columns for each option to determine whether it is appropriate and feasible for the project. If not, review the next row down in the table until an appropriate and feasible option is found. Broadly speaking, the options at the top of the table provide greatest confidence in the assessment results, so working from top to bottom ensures the approach selected is as robust as is feasible.

Table 10: Additional guidance to select approach to assessing state of nature.

Approach	What is it / Why use it?	Requirements and Enabling Factors	When not to use it?	Examples and NPI Alignment
A1: Direct measurement - site based **[site specific projects only]**	**Field data collected from representative project sites, directly measuring changes in the aspect of nature that the project seeks to influence.** Provides the most robust assurance that the intended outcomes of the project have been achieved.	**Requirements:** -Site identification and access required, -Method for measurement is field-based. **Enabling Factors:** -Budget for baseline and regular monitoring -Local technical teams able to collect relevant data (including through establishment of technical assistance facilities), often enhancing engagement and facilitated by modern technologies.	Impacts are diffuse / non-site specific; Site of ultimate impact on nature is not within the borrower's control; SoN outcome will not change within the duration of the instrument, or changes are not detectable; No access to site;	**Extent**: Unlikely used, other than for very small areas. **Condition**: Likely used for fine-scale assessment of ecosystem structure, composition and function when needed for assessing IND3 or IND5. **Species Abundance**: Likely used for counting individuals of a species for assessing IND7 at site, using appropriate methods including technology such as camera traps, pitfall traps, bioacoustics or eDNA.

Approach	What is it / Why use it?	Requirements and Enabling Factors	When not to use it?	Examples and NPI Alignment
			If a remotely sensed alternative is more appropriate or efficient.	
A2: Direct measurement – remote **[site specific projects only]**	**Remote sensing can be used to measure many aspects of nature that a project seeks to influence. This can enable cost effective monitoring even where access to site is difficult.** **Different levels of granularity image interpretation are available, using different tools and platforms for collecting data.**	**Requirements:** -Site identification required, i.e. distinct project site -Availability of data at appropriate levels of temporal and spatial resolution **Enabling Factors:** -Budget for data analysis or data collection (e.g. drones, aircraft, acquisition of high-resolution remotely sensed data as needed) -Technical teams able to collect and analyze relevant data. -Access to site for ground-truthing may be required.	Impacts are diffuse / non-site specific or the site location is not known, SoN outcome will not change within the duration of the instrument Changes are not detectable with methods and under timescale available, given natural variation.	**Extent**: Remote sensing of land cover with categorization, as part of IND1 assessment. **Condition**: Remotely sensed assessment of ecosystem structure, composition and function when needed and feasible for assessing NPI's IND3 or IND5. **Species Abundance**: Direct counting of individuals for IND7 of large species through aerial imagery. Likely only feasible when the species is large and detectable and identifiable through aerial imagery (e.g. elephants, canopy tree species, whales).
B (1 and 2): Measurement of state proxies **(may be either field-based or remote)** **[site specific projects only]**	**Where the specific aspect of state of nature cannot be measured directly (e.g. due to budgetary limitations) easier-to-measure proxies can often be used.** **Proxies should correlate with the intended change.** **Assessment may be field-based or remotely sensed, depending on the proxy.**	**Requirements:** -Site identification required -Valid proxy identifiable -As above, depending on whether remotely sensed or field-derived **Enabling Factors:** -Understanding of how to identify valid proxies. -As above, depending on whether remotely sensed or field-derived	If direct measurement is possible; If no adequate proxy is identifiable (i.e. closely correlated with SoN outcome and not with other confounding changes); If no site is identifiable	**Extent**: Unlikely necessary as remote sensing measurement of extent should be possible. **Condition**: Proxies for ecosystem structure, composition and function when needed and feasible for assessing NPI's IND3 or IND5. Most of these will be remotely sensed. Some aspects, such as composition, will be difficult to assess with proxies. **Species Abundance**: Use of habitat extent or condition as proxies for abundance (IND7) when direct relative abundance measurements are too difficult. These could be remotely sensed forest cover as a proxy

Approach	What is it / Why use it?	Requirements and Enabling Factors	When not to use it?	Examples and NPI Alignment
	Proxies are also often more responsive to changes than the intended ultimate outcome			for abundance of a forest-dependent species, or field-sampled aspects of condition (food availability, abundance of predator/prey species, nest sites).
C: Estimation (statistical allocation), non-specific site within a landscape. **[Landscape / Jurisdictional]** **May use direct or proxy metrics, which can either be based on field measurements or remotely sensed.**	**When an activity is implemented across a broad area—landscape, watershed, or jurisdiction—but specific sites of implementation are not identifiable.** **In such cases, it is possible to measure the overall change in the state of nature across the area and then attribute contributions to individual actors. This means using indirect data—like landownership or agrochemical use—to estimate each actor's contribution.** **Measurements that are then attributed can be based on field data collection or remote sensing.**	**Requirements:** -No site identification, but limitation of possible action implementation to a wider, delimited, area -Valid approach to statistical allocation, including relevant data, available -As above, depending on whether remotely sensed or field-derived **Enabling Factors:** -Understanding of commonly used approaches for attribution. -As above, depending on whether remotely sensed or field-derived	The area of impact is not identifiable; It is not possible to estimate the relative contribution of different actors in the landscape. Issues relating to direct measurement, such as cost and duration, will in some cases be shared with measurement approaches in this case - if so, may also require use of a proxy.	**Extent**: Earth Observation of land cover with categorization, as part of IND1 assessment, plus attribution approach. Estimation approaches are being piloted by the NPI as potential means of companies managing lack of traceability when assessing state of nature metrics. Results of this work will be published in 2026 **Condition**: Measurement of condition using the IND3 approach, plus attribution approach (see discussion within NPI's low-traceability documentation). Examples could be attribution of effect of excessive fertilizer application on freshwater biodiversity when freshwater system covers land managed by large numbers of actors; measurement of forest condition metrics across a large area (such as species diversity or NDVI), changes in which can then be attributed to individual landowners. **Species Abundance**: Appropriate measurement method for species in question, whether field-based or remotely sensed, across the area of interest. This may imply measurements by a number of stakeholders as part of a landscape initiative.
D: Pressure-state models, with or	**If the user does not have any location or traceability information, has no way to allocate changes in an outcome to**	**Requirements:** -Clear understanding of pressure-state relationship	If no well-accepted or adequately evidenced pressure-state models	**Extent:** Modelled statistical land use change or Life Cycle Analysis-based values for estimations of land use change. The NPI's work focuses on measured nature positive

Approach	What is it / Why use it?	Requirements and Enabling Factors	When not to use it?	Examples and NPI Alignment
without calibra tion **[All projects, provided models exist]**	**individual actors, or the change in state of nature is expected to be very small over the duration of the instrument, then the user should not measure state of nature outcomes.** **Instead, users can use or develop ecological or statistical models which generalize relationships between pressures and state of nature. These models are often most appropriate for projects aiming to reduce resource use, but where the supply chain is long and complex and traceability is impossible.**	- If calibrating, understanding of appropriate context (relevant features of implementation area) -For some types of model, area delimitation (e.g. watershed) **Enabling Factors:** -Well-evidenced and accepted pressure-state method already exists (e.g. GLOBIO, BII) -If model does not exist, resources for model development based on understanding of pressure-state relationship -Calibration (in general)	exist, for the pressures in question. If there is a lack of confidence in uncalibrated models or conversion factors in the context in question, or no resources or suitable test sites available for calibration. Statistical allocation or measurement to be preferred if possible.	outcomes, rather than modelled. Modelled approaches may be useful for screening or interim steps whilst companies progress towards measuring changes in state of nature. **Condition**: Modelled ecosystem condition values based on metrics such as GLOBIO-MSA, BII or PDF. Weakly aligned with NPI (provisional use of models in IND3 low granularity approach also requires field-based calibration). Models rely on assumptions that may produce inaccurate results, and these may differ across models, so reducing comparability. Transparency about methodology, including key assumptions, is important when reporting modelled results. **Species Abundance**: Unlikely ever applicable as biodiversity is place-based.
E: Qualitative corroboration / support / evidence	**If impossible to meaningfully measure or estimate outcomes using any of the approaches above, then qualitative evidence may be used.** **This could be derived from interviews or reports corroborating the intended change in state of nature outcomes, or by evidencing the presence of the predicted linkages between Pressure and State.**	**Requirements:** -Access to sources of data or information to corroborate aspects of the impact pathway -Site or area identification, and possibly access, if information is interview or narrative-based evidence **Enabling Factors:** -Technical teams able to collect good-quality qualitative data (including through establishment of technical assistance facilities)	When quantitative approaches, including all of the above, are necessary for reporting purposes or for meeting a benchmark or target (without quantification, aggregation is not possible).	**In general: These approaches are not sufficiently robust alone to produce NPI-aligned metrics.** **Extent**: Unlikely ever relevant as should be monitored with remote sensing data. **Condition**: Assessment of ecosystem condition changes based on discussions with stakeholders describing their observations over time before and after instrument action implementation. **Species Abundance**: Local knowledge could provide evidence that pressure-reduction actions (e.g. anti-

Approach	What is it / Why use it?	Requirements and Enabling Factors	When not to use it?	Examples and NPI Alignment
				poaching patrols) have led to increased frequency of encounters.
F: Evidence-based Impact Pathway (Step 1) [All projects]	**If direct qualitative evidence cannot be obtained, then impact pathway can be supported through other reports or literature.**	**Requirements:** - None in addition to step 1 requirements	When approaches above are feasible.	**In general: These approaches are not sufficiently robust alone to produce NPI-aligned metrics.** **Extent**, **Condition**, **Species Abundance**: Ex-ante setting of targets when state of nature indicators change over a period much greater than the instrument duration.

Additional guidance on measurement options for state of nature assessment

Please refer to Table 5 and Table 10 above for definitions of the Measurement approaches (A1-F).

Site-based Direct Measurement

Where the site of the intended impacts on nature is known, and resources can be made available to collect data from the site or from Earth Observation data, there are a number of options available.

The most accurate and specific techniques for biodiversity data collection, particularly when measuring a change in the *condition* of biodiversity, is to collect data directly from the site (field data (**A1**)). This includes techniques to assess population sizes of target species such as direct observation or use of camera traps, as well as the use of technology-based approaches such as eDNA and bioacoustics, which can sometimes enable more efficient data collection at scale, including by non-specialist local stakeholders if a small amount of training can be provided. Further information on eDNA, bioacoustics, and citizen science approaches is available below. Whereas information on integrating Local Ecological Knowledge and working with Indigenous Peoples and local communities is presented in Box 3.

In some cases, the specific aspects of nature that the financed activity intends to benefit cannot be effectively measured, for example if they are unlikely to change to a measurable extent during the life of the instrument. In these cases, it is often possible to identify a ***proxy*** **(B1 and B2)**. Proxies should be easier, cheaper, or otherwise serve to overcome particular challenges associated with measurement of the aspect of nature of interest directly. Proxies can be based on site-based field data (**B1**) but most frequently are based on Earth Observation (**B2**) because of the often-lower cost per unit area in acquiring these data. See below for guidance regarding when and how to utilize EO data instead or as a complement to field data.

In cases where the impacts of the financed activity are spread over a wide area and may be interspersed with other factors that influence the state of nature, it may be possible to measure changes in the state of nature across the whole area and use ***statistical allocation*** **(C)** to estimate the contribution of the financed activity to the observed changes. This can be useful for example if the project targets changes in farming practices by smallholder farmers in a landscape, but not all farmers choose to adopt the new practices. It may then be reasonable to apportion changes according to the proportion of land where new practices have been implemented e.g. if you know how many farmers have adopted the practices within a landscape but not their exact location. Descriptions of statistical allocation can be found in: the Accountability Framework's Land Use change guidance and the GHG Protocol's Chapter 17.2 (as well as forthcoming SBTi FLAG guidance and SBTN land version 2.0). Tools such as that provided by Land Griffon may be able to be used for this.

For some changes that are very hard or simply impossible to measure quantitatively, it may still be possible to collect ***qualitative evidence*** **(E)** of a change from local stakeholder observations, such as increased sightings of a rare or cryptic species. Whilst these would not form the core of reporting, and could not be the basis of targets, this additional evidence could help to corroborate outcomes that cannot be measured in any other way, as one element of a suite of metrics that together provide evidence that financed activities are contributing to a change in the state of nature.

Earth Observation-based Direct Measurement

There are also an increasing range of options of how Earth Observation data can be used to monitor changes in the state of nature, many of which are highly cost effective. They vary in their granularity, cost, and expertise required to interpret them.

The primary technology that has been used for this for many decades is satellite-derived imagery, from platforms such as Landsat, Sentinel or MODIS. These are used for tracking habitat extent and land-use changes, structural integrity of habitats and fragmentation, and various aspects of vegetation dynamics and ecosystem function such as photosynthetic activity. Satellite-based remote sensing is also not limited to terrestrial biomes, with coral reefs now being mapped through satellite imagery and eutrophication in freshwater bodies being monitorable. Broadly speaking satellite imagery should be used for larger scale monitoring and long-term change detection but may present challenges based on atmospheric or other conditions restricting image availability and quality, limited spatial resolution, and image availability being dependent upon third parties.

If finer spatial resolution data is needed, users may access Very High Resolution (<5m) satellite imagery, such as that provided by Maxar and other similar providers, or may collect their own data through drone-based or light-aircraft-based surveys. These offer a number of additional applications, including fine-scale habitat mapping and change such as tree loss, assessment of fine-scale structure or function changes, tree species composition, or large species presence. Such approaches are often costly and require high levels of technical capacity, as well as being restricted by weather and regulatory constraints in the case of drone surveys; however, user-friendly platforms and services are becoming available that make use of this data more feasible. Further information surrounding the use of remote sensing technologies is provided below, Remote sensing technology.

EO data can be used for site-specific measurement (**A2**), collecting proxy metrics (**B2**), in particular facets of ecosystem function which are not visible (e.g. Normalized Difference Vegetation Index or Net Primary Productivity models as a proxy for photosynthetic activity or carbon sequestration) or use of habitat extent or condition as a proxy for species population abundance. It can then also be used for statistical allocation (**C**) when combined with an allocation approach.

It is particularly useful where historical data is required, such as when assessing historical rates of habitat loss to set a dynamic baseline for a Non-project scenario or where targets are being set that require historical data as recommended by ICMA.

Modelled and Qualitatively Evidenced Approaches

There are many scenarios where it is not possible or meaningful to collect site-based field data or remotely sensed data, such as when the finance is intermediated and it is not possible to identify all the sites of the underlying financed entities or where the impacts occur within a supply chain. There may also be cases where it would be possible but not meaningful, such as when the scale of impact of the financed project is dwarfed by the influence of other actors in the landscape. Finally, it may be desirable to assess the likely impact of a project on nature before the project has begun, for example as part of a pre-investment (positive) impact assessment to inform an investment committee how much a project is likely to contribute towards the nature positive goal of the financier. In these cases, it may be possible to model or corroborate the impact of the project using evidence collected through similar projects.

Evidence is increasingly available to demonstrate how changes in common pressures / drivers of nature loss, lead to changes in the state of nature, particularly changes in condition of ecosystems. These Pressure – State Models (**D**) can be found both in the academic literature and increasingly they are being compiled in databases such as GLOBIO and other resources such as the currently under-development version 2 of the SBTN Land Guidance. Detailed descriptions of how to conduct Pressure-state modelling can be found in the Articulating and Assessing Biodiversity Impact report. The Partnership for Biodiversity Accounting Financials (PBAF) foot printing standard guidance provides a summary of available Pressure-state modelling approaches (referred to in the document as Pressure-impact models) as well as the metric used as an output.

This approach can be useful for projects that are focused on reducing pressures on nature, but where it is useful to articulate the outcome in terms of a change in the state of nature, such as to enable impacts of diverse projects to be compared or amalgamated and to quantify the anticipated contribution towards the goals of the GBF.

In the simplest cases, extent can be derived from project plans that detail the area the project intends to cover, and condition can be based on the MSA or PDF score (see Glossary) of the current habitat type on the project site and the anticipated habitat type at the end of the project. In many projects that reduce pressures, the area affected might be quite large, but the actual condition change could be very small, demonstrating the limitation of relying solely on area-based indicators.

However, use of models introduces additional assumptions, so the details of the methodology should be disclosed, along with any associated assumptions and directly measured data e.g. Pressure metrics, should be reported as well.

This approach is much more robust if the generalized relationship between the pressure and state of nature outcomes can be calibrated at a site comparable to the project site(s) to adjust the relationship to the context and realities of the project in question.

Despite all the options above, there will be cases where it is not possible to quantitatively assess the outcomes in terms of state of nature (**E** & **F**). This could be due to a wide range of factors, the most common of which are:

- The project impacts are not site-specific, and the Pressure-state relationship is unclear, or there is no widely accepted model available.
- The site is known but the cost of any data collection is prohibitive or otherwise impossible, including due to lack of capacity, and without any suitable proxy available either.
- The project is focused on pressure reduction and does not need to express outcomes in terms of state of nature.

In these cases, following Step 1 and documenting the intended impact pathways, the assumptions associated with them, actions to manage any assumptions not being borne out as well as evidence supporting the assumptions, will help to provide reassurance to external stakeholders and the market that the project is well designed and that anticipated benefits to nature will materialize (evidence-informed impact pathway (**F**)). This is still a significantly more robust approach than simply measuring Response and / or Pressure metrics and not documenting the associated assumptions and whether those assumptions are or are not borne out.

Use of technology and citizen science for monitoring state of nature

Remote sensing technology

Remote sensing technologies have transformed how ecosystem extent and condition can be assessed. Remote sensing technologies, particularly those on satellites, have revolutionized monitoring by enabling consistent tracking over large areas. Recent advancements in sensor technology—such as RGB cameras, multispectral and hyperspectral cameras, LiDAR systems, and Terrestrial Laser Scanning (TLS)—have provided detailed data on ecosystem attributes across various scales.

Remote sensing data is available at different spatial and temporal resolutions. Satellite-mounted sensors have historically provided global coverage, with missions like NASA's Landsat detecting land cover changes at a 30 m resolution, while ESA's Sentinel satellites offer optical and radar data at 5-10 m resolution. Commercial satellites, such as those from Maxar Technologies, provide even higher resolution imagery, down to 0.5 m, albeit at a higher cost.

Multispectral and hyperspectral satellite sensors detect plant traits and vegetation diversity at medium resolutions, while radar sensors measure canopy structure and biomass at coarser scales. Instruments like the GEDI LiDAR on the International Space Station and ESA's upcoming Biomass mission are paving the way for advanced biomass and forest structure estimates at global scales.

UAVs have emerged as a valuable tool at finer scales, offering high spatial resolution from various sensors at lower costs. UAVs are increasingly used to integrate sensor data with field inventories, improving assessments of forest structure, biomass, and species diversity. Hyperspectral and LiDAR remote sensing from UAVs has advanced tree species mapping and biomass estimation, particularly in disturbed forests.

Limitations: Feasibility of distinguishing landcover changes varies by realm and landcover type. Earth Observation data are most easily applied to distinguishing forested from non-forested landcover but is also good at distinguishing other terrestrial biomes from each other. Quality of delineation depends on differences between classes (specifically, spectral signatures). It is also starting to be used for measuring coral reef extent as well as other shallow aquatic environments. Challenges remain in applying remote sensing tools to real-world land management, especially at local scales, due to cloud cover, slope, shadows, and other atmospherically derived interference with images. High technical barriers and a lack of standardized workflows hinder widespread adoption. Additionally, ground-truthing data is still needed to calibrate and validate remote sensing predictions. However, combining UAVs with field surveys has been linked to reduced costs and increased accuracy of forest indicators compared to field surveys alone.

Environmental DNA

Another transformative innovation is the use of **environmental DNA (eDNA)**, which is an advanced technique for monitoring biodiversity by detecting genetic material that organisms shed into their environment, which is collected, amplified and sequenced before being compared to a database of known sequences, unique to individual species. This process is non-invasive, as it relies on DNA shed through cells, mucus, or feces, enabling species detection without direct observation.

This method offers advantages over traditional biodiversity assessments in terms of scope, cost-effectiveness, and practicality as samples can be collected by non-specialists with minimal training. It is particularly useful for assessing the diversity of species in an area, especially in marine or freshwater environments where Earth Observation is less effective, and for detecting otherwise hard to observe species, but does not provide abundance / count data, although research is ongoing into using it for relative abundance.

eDNA is commonly collected from water samples, from marine or freshwater sources. Freshwater samples can be used to detect both aquatic species, as well as terrestrial species that interact with the water e.g. to drink. It is especially valuable in challenging environments, like deep-sea ecosystems, where traditional survey methods are impractical. There is some bias in detection rates of different species for various reasons including the rate they shed DNA e.g. sharks are much harder to detect than fish, who leave scales in the water. Such biases exist for all biological monitoring techniques, so it is important to understand the biases relevant to the specific context and species of interest.

eDNA can also be collected from soil samples and invertebrate samples, although it is then more accurately referred to as organismal DNA. Soil samples can be used to monitor soil health through looking at the diversity of fungal, invertebrate and bacterial communities. Invertebrate samples can be used to assess the diversity of invertebrates, but researchers are also exploring its potential to detect vertebrate DNA from hematophagous, saprophagous, and coprophagous invertebrates, including mosquitoes, carrion flies, midges, and leeches. This approach leverages the fact that these invertebrates are cosmopolitan and can be easily sampled using both commercial and homemade traps. By analyzing DNA extracted from these invertebrates, researchers can detect a broad range of terrestrial vertebrate species with greater accuracy than eDNA extractions (e.g. from water sources), as these invertebrates tend to have more localized home ranges.

Limitations: The movement and persistence of eDNA in the environment is not fully understood, making interpretation of results complex, for example water samples from a river could contain eDNA from species upstream. The effectiveness of eDNA analysis also depends on strong anti-contamination procedures in the collection and processing of samples, the quality of genetic reference libraries and the sensitivity of sampling and analytical methods. Accurate species identification relies on comprehensive genetic reference libraries. Incomplete or outdated databases can limit the effectiveness of eDNA analysis presenting challenges when applied to less-researched places. However, due to the similarity of sequences between closely related species, even where a specific species is not present in a database, it is usually possible to identify to a higher taxonomic group based on similarity to other known species. Additionally, eDNA does not provide precise species abundance data and is susceptible to errors like false positives and negatives. As with other monitoring techniques, understanding the strengths, limitations and appropriate application of eDNA is key to its effective use.

Bioacoustics

Bioacoustics is an approach to monitoring biodiversity which uses sound recordings to detect and identify presence of species. By setting up microphones at appropriate locations within species habitats and using them to capture vocalizations of animals such as birds, frogs, and insects, researchers can assess species presence and abundance, as well as some aspects of behavior. Bioacoustics can be particularly useful in dense habitats where visual observation is challenging. Automated recording devices and machine learning algorithms may be used to both improve accuracy of identification of species on recordings and filtering through very large amounts of data collected.

Limitations: Only a small proportion of species in an ecosystem are vocal, meaning that the method's application is inherently restricted to a limited number of taxa. Within those taxa, it can be difficult to distinguish between similar-sounding species, which can lead to misidentification, and identification is dependent upon comprehensive reference libraries. Environmental noise can also interfere with recordings, obscuring calls. Use of bioacoustics to assess abundance is possible but challenging. Costs can be relatively high due to installation and maintenance of recording systems and data processing requirements.

Citizen science

Citizen science is an approach to monitoring biodiversity which involves public participation. Volunteers contribute observations of species or other facets of ecosystems, often reporting through smartphone or tablet-based apps and online platforms. This approach strengthens community engagement and environmental awareness while also providing researchers with very large datasets which would be difficult to obtain through professional researchers or technicians only. Most citizen science projects, but not all, are focused on direct visual observation as the method of monitoring. Citizen science projects have been used to identify species distributions and richness, migration behavior, and trends in population abundance.

Limitations: Data quality can be highly variable due to differences in participants' skills. Over-representation of easily accessible areas or charismatic species is common, and this makes certain taxa (e.g. birds) much more appropriate for use with citizen science approaches. Technical methods (e.g. eDNA) may also be combined with citizen science approaches, provided adequate training for volunteers and a clear and consistently applied quality control process are implemented to ensure reliable data.

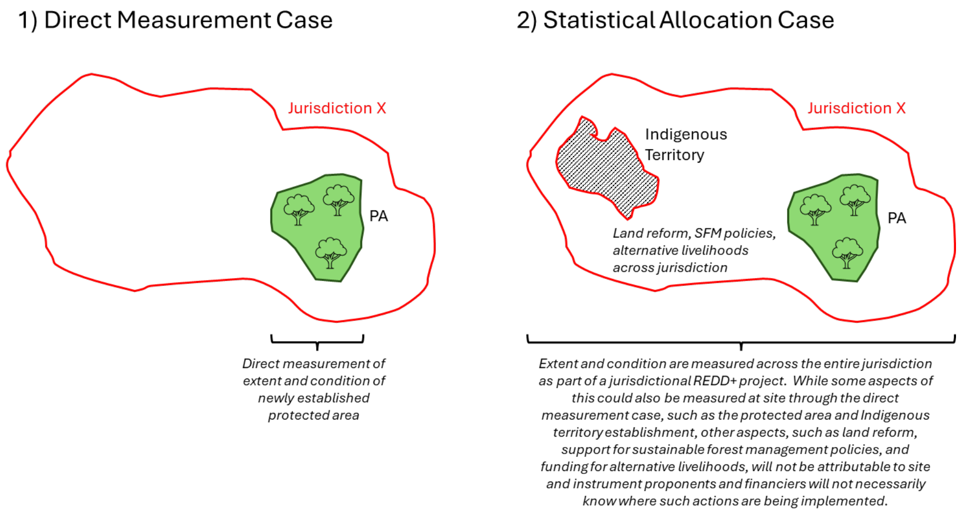
Complex landscapes and numerous impact pathways

As discussed above, instruments and associated activities may have several impact pathways associated with them, and so each could be assessed against the assessment spectrum separately. However, it is likely that for practicality and cost reasons, it will be valuable to prioritize the impact pathways that are most material or most central to project objectives for detailed measurement. This can lead to identification a suite of metrics, under different approaches for SoN assessment.

For instance, a jurisdictional-scale REDD+ project may include components such as establishment of forested protected areas, which have clearly defined boundaries with all the content within them under the treatment in question, meaning that forest extent may be assessed through use of remotely sensed direct measurement. Even when areas are large, direct measurement can be used provided the area has a clear boundary and implementation of the financed activities has occurred across the area. Disaggregation or measurements by factors such as ecosystem functional group, Indigenous territory, Protected Area, and others mentioned within the GBF Monitoring Framework may help in assessing such large-scale assessments.

However, assessing the state of nature across the entire jurisdiction may similarly use remotely sensed assessment of extent, but statistical attribution would be the appropriate approach rather than direct measurement because the intervention might not in practice have been implemented across the entire area, and furthermore, the effects of certain aspects of the intervention (e.g. capacity building, land reform) would be difficult to ascribe to any particular areas within the jurisdiction.

Figure 7: Situations of direct measurement versus statistical allocation of state of nature.



In case 1 above the establishment of a protected area would allow for direct measurement of forest extent and condition within it. However in case 2, while some components of a jurisdictional REDD+ project such as protected area establishment or Indigenous territory declaration can also be measured by direct measurement, other elements of the REDD+ project as a whole would require statistical allocation of changes in forest extent and condition across the jurisdiction, because many of the component actions will not be identifiable to site by the implementer.

Multiple approaches to assessment of a single indicator can similarly be recommended when the metric has multiple purposes associated with it, such as target setting and impact evaluation of outcomes. A proxy metric may be necessary for setting and assessment of a state of nature target during the timescale of an instrument itself, due to long periods of change in the underlying facet of state of nature making it insufficiently sensitive to change for assessment against targets; meanwhile direct measurement could be used for subsequently evaluating impact, especially if measurements would be able to be made beyond the endpoint of the instrument itself.

[1] See the resolution on nature-based solutions for supporting sustainable development of the Fifth Session of the United Nations Environment Assembly (UNEA-5, 2022).

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