

# **NARIA**

## **Natural Asset Recovery Investment Analytics**

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Framework Overview | October 2024

The Leading Ecosystem Metric Framework for  
Nature-Positive Investment, Disclosure and Reporting

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**Version Number:** 1.0

**Date:** October 2024

**Status:** Open access

### **Suggested Citation**

Jepson, P., Bass, D., Bedford, B., Hodgson, T. M., & Jones, S.  
(2024) NARIA: Natural Asset Recovery Investment Analytics.  
Framework Overview. 1.0. CreditNature Ltd. Harwell, Oxford.

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### **Acknowledgements**

We thank ten anonymous reviewers who provided  
invaluable feedback on an earlier version of this document,  
and the many people who have provided feedback and  
encouragement in response to our presentations and  
briefings on the NARIA framework.

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Harwell, Oxford

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# Executive Summary

Our world is facing unprecedented challenges, including climate change, biodiversity loss, rural decline, and a growing public health crisis. Ecosystems are indispensable allies in addressing these issues, yet human activities have degraded over a third of the world's farmland and wetlands, leaving them marginal or abandoned. Restoring ecosystems is essential not only for climate resilience and adaptation but also for benefiting people and economies. However, with rising pressure on public sector budgets, private finance and corporate involvement are crucial to scaling restoration efforts.

The NARIA framework provides a scalable and consistent approach to measuring and forecasting gains in ecosystem and biodiversity condition driven by restorative land management. It translates the complexity of ecosystems into standardised, auditable units for ecological reporting and accounting, ensuring credibility, transparency, and consistency. This is key to developing credible nature finance instruments and corporate strategies.

NARIA aligns with global initiatives such as the Kunming–Montreal Global Biodiversity Framework (GBF), the Taskforce on Nature-related Financial Disclosures (TNFD), and the EU Corporate Sustainability Reporting Directive (CSRD). By responding to the shift from narrative-based sustainability reporting to a more quantitative, data-driven approach, NARIA supports companies in protecting against 'greenwashing' risks while enabling them to gain reputational benefits from their ecosystem restoration investments.

The NARIA framework consists of three core assessment tools:

- **Ecosystem Condition Index (ECI):** Measures the condition of key natural processes that determine an ecosystem's ability to maintain and recover its structure, function, and complexity over time (i.e., ecosystem integrity).
- **Ecosystem Management Rating (EMR):** Uses an A–G energy rating system to assess the impact of current and future land management practices on ecosystem processes.
- **Ecosystem Services Metric Portfolio (ESMP):** Provides a set of metrics that quantify the condition of ecosystem services, offering insights into their material benefits for businesses and investors.

This overview paper is written for corporate executives implementing TNFD guidelines and Nature Positive commitments, asset managers investing in natural capital assets, and professionals working in nature finance. It offers a primer on the key concepts crucial for the development of high-integrity nature markets based on robust ecosystem accounting methods and introduces each component of the NARIA framework with its applications in finance and corporate sustainability reporting under CSRD. It will also be of great interest to landholders, scientists developing ecological credit methodologies, and community groups seeking to understand nature markets. We recognise, however, that such readers may want more detailed technical information. This is available in comprehensive technical documents shared with our partners, collaborators and clients.



As part of an evolving operating system for nature markets, NARIA will continue to advance, responding to new market needs, user feedback, and scientific progress. CreditNature will release NARIA updates to ensure it remains at the cutting edge of ecosystem accounting and nature finance.

Investing in ecosystem restoration will create a more resilient planet, yielding long-term financial and societal benefits. The NARIA framework equips investors with a scientifically robust tool to account for improvements in the condition and management of ecosystem assets, ensuring that nature-positive investments are measurable and impactful, helping to secure a better future for all.



# Section 1: Introducing the NARIA Framework

## 1.1 Key concepts in ecosystem accounting and impact reporting

Quantifying and accounting for changes in the dynamic and location-specific complexity of biodiversity and ecosystems is far more challenging than measuring a single physical property, such as the carbon content of trees or soils. This complexity poses significant challenges for decision-makers, including asset managers, corporate executives, and land managers, who must both navigate their sector-specific regulations and justify their investment and land management decisions in the nascent and evolving field of nature finance. As this field grows, clarity on the underlying concepts is crucial to ensure informed and transparent decision-making processes.

This section aims to clarify the key concepts that underpin nature markets and the NARIA framework. In complex systems like ecosystems, the boundaries between concepts can be nuanced and blurred. However, the distinctions outlined here have provided us with the clarity and structure needed to design a practical ecosystem measurement and accounting framework, which, in turn, supports nature markets and decision-making on where and how to invest in ecosystem recovery.

### **Biodiversity *vis a vis*. Ecosystems**

Biodiversity and ecosystems are deeply interconnected concepts that are essential for understanding the complexity of life on Earth. **Biodiversity** refers to the variety and variability of life on Earth. In contrast, an **ecosystem** refers to the living systems formed by the interaction of a community of organisms with their physical environment.

To put it simply, biodiversity is nested within ecosystems. An ecosystem is a larger unit that includes all living organisms (biodiversity) and their interactions with the non-living environment, such as soil, water, and air. These interactions between the biological (living) and physical (non-living) components of an ecosystem are what create system integrity, resilience and 'health'.

The 1992 Convention on Biological Diversity clearly specifies this distinction and relationship. The primary purpose of the convention was to create an international regime aimed at conserving biodiversity and ensuring the sustainable use of its components. Over the 30 years since the Rio Earth Summit, 'biodiversity' has firmly established itself as the dominant term in law, policy, and applied science and practice. However, the current imperative is to restore ecosystems, alongside conserving and sustainably using biodiversity, which adds complexity to nature finance and markets.



Additionally, ecosystems are often perceived as more or less 'natural' systems with limited human influence. Advances in long-term ecology challenge this view, revealing that human activities have profoundly impacted many ecosystems for millennia. Human activity is embedded within, and influences, ecosystems worldwide<sup>1</sup>. NARIA conceptualises humans as ecosystem engineers who have 'downgraded' ecosystems but who are also integral to ecosystems with the capacity to aid and steer their recovery, generating value for nature, people, and the economy.

In short, as professionals, we need to continue using the term biodiversity due to its established legacy in policy and law. However, it's crucial that we think, design, invest, and manage with ecosystems in mind. Progressive policy professionals are already foregrounding the ecosystem approach in government biodiversity strategies<sup>2</sup>, and the NARIA framework offers nature finance and land management professionals an opportunity to do the same.

### **Ecosystems *vis a vis*. Ecosystem Services**

Ecosystems supply a bundle of ecosystem services, either through identifiable ecosystem components or through the system operating as a whole. Ecosystem services are the contributions of ecosystems to the benefits that are used in economic and other human activities. These benefits manifest through physical consumption, passive enjoyment, hazard reduction, or indirectly, as contributions to well-being.

In many instances, these benefits are the result of a joint production process involving both the ecosystem and human inputs. For example, the provisioning service of clean water becomes a benefit when the water is extracted by water or beverage companies. Similarly, the cultural service of wildlife becomes a benefit when production companies transform it into nature documentaries. These examples illustrate that, in some cases, there is a strong geographic relationship between the ecosystem, its services, and the beneficiary, while in others, the connection is less direct.

The value of some of these ecosystem service interactions can be directly reflected in business and monetary terms, such as cost savings when water extracted from rivers is clean, reducing the need for additional treatment. However, for many ecosystem services – especially those where benefits accrue to society as a whole, such as climate change resilience, public health and well-being, rural regeneration, and arts and culture – the connection is more indirect with 'returns' on private investment accruing in the longer term and/or from business innovations that monetise societal benefits through, for example carbon and nature credits, eco-tourism ventures, and green infrastructure projects.

The capacity of an ecosystem to supply services is linked to its ability to maintain and recover its characteristic composition, structure, functioning, and self-organisation over time within a natural range of variability. In short, this relates to its integrity, resilience, and ability to evolve in response to environmental changes. This is why the restoration of ecosystem integrity is

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<sup>1</sup> For an overview see Jepson, P & Blythe, C. 2021. *Rewilding. The radical new science of ecological recovery*. Illustrated Edition. Icon Books.

<sup>2</sup> See e.g. [Scottish Biodiversity Strategy to 2045. Tackling the Nature Emergency](#). Scottish Government



included as a key goal in the Kunming–Montreal Global Biodiversity Framework, with a 30 x 30 restoration target, making it a key investment focus.

### **Ecosystems *vis a vis* habitat**

During the 20th century, policy often adopted the term ‘habitat’ as a proxy for ecosystems<sup>3</sup>. This approach was based on the observation that nature exhibited consistent associations of plant species that supported characteristic wildlife species. These plant associations, or habitats, could be classified, specified and therefore protected under law. The habitat approach was practical in an era when ecological data, computation, and data science were limited and when nature was under threat from rapid agricultural intensification. However, with advances in ecological science and technology, our understanding of ecosystems has evolved, allowing us to move from a narrow habitat-based approach to a more sophisticated ecosystem approach. The NARIA framework embodies this shift by quantifying the condition of natural processes that underpin ecosystem structure, function, and complexity, rather than merely focusing on habitats, which are expressions and components of broader ecosystem dynamics.

### **Ecological restoration *vis a vis* rewilding**

The 2021 UN Report ‘[Becoming #GenerationRestoration](#)’ distinguishes between ecological restoration, which focuses on restoring ecosystems to a chosen reference condition, and rewilding, which emphasises the restoration of functioning, self-sustaining ecosystems with fully occupied trophic levels and no predefined endpoint. In Europe, rewilding is increasingly recognised as a nature-based solution that allows for human involvement to actively steer and accelerate ecosystem recovery<sup>4</sup>. The NARIA framework is founded on this European rewilding approach: it integrates advances in ecosystem science and restoration practices while acknowledging the role of humans in creating ecosystem assets and infrastructure. This approach supports rural economic regeneration and climate resilience, alongside the creation of new natural heritage, thereby presenting an investment opportunity for both private and public finance.

### **Ecosystem Integrity *vis a vis* Ecosystem Condition**

Understanding the distinction between ecosystem integrity and ecosystem condition is crucial in the field of ecosystem accounting and nature finance. Ecosystem integrity refers to the overall health, functionality, and resilience of an ecosystem – its ability to maintain its characteristic composition, structure, and processes over time, and to adapt to environmental changes. It is the state or goal that we aim to achieve through ecosystem restoration policy and nature finance<sup>5</sup>. Ecosystem condition is what is measured and refers to the current state of an ecosystem based on specified biological, physical and/or chemical attributes. In ecosystem accounting, we quantify and track ecosystem condition to evaluate progress toward achieving ecosystem integrity. Measured units of improvement in ecosystem condition evidence financial instruments such as nature credits and investment KPIs.

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3 See e.g., Mehtälä, J. and Vuorisalo, T., 2007. [Conservation policy and the EU Habitats Directive](#). *European Environment*, 17. .363–375.

4 See e.g., [Rewilding Europe](#); Jepson, P., et al., 2018. [Governing with nature Phil](#). *Trans, Royal Soc.* 373. 20170434.

5 E.g. Goal A of the Kunming–Montreal Global Biodiversity Framework



The conceptual clarity provided in this section is foundational to the design of the NARIA framework and its alignment with the [UN System of Environmental Economic Accounting -Ecosystem Accounting](#) guidelines (UN SEEA-EA). By distinguishing between interconnected but distinct concepts such as biodiversity, ecosystems, ecosystem services, habitats, and ecosystem integrity, we ensure that decision-makers have the necessary tools to navigate the complexities of nature finance. This clarity not only supports informed and transparent decision-making but also underpins the NARIA framework's ability to effectively quantify and account for ecosystem changes. As a result, the NARIA framework offers a scientifically robust and practical architecture for developing nature-based financial instruments, guiding investments that contribute to ecosystem recovery and sustainable development.

## 1.2 Summary of NARIA Framework Components

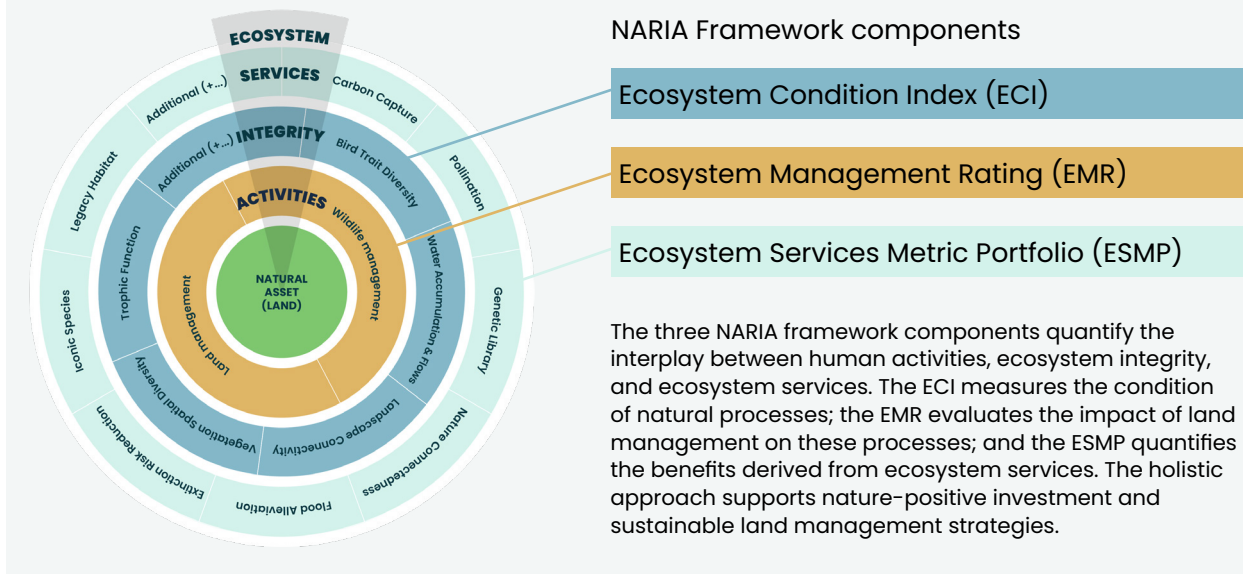
The NARIA framework conceptualises land as an asset - a class of real estate that humans engineer to varying degrees to generate value for themselves and wider society. This human ecosystem engineering, commonly referred to as land management, impacts the integrity of ecological systems, influencing the quality and quantity of ecosystem services and benefits valued by businesses, the economy, and society (Box 1).

Throughout history, humans have managed ecosystems to produce food and natural resources, create land for towns and cities, enable transport and power generation, and protect these assets and society from environmental risks, such as flooding and landslides. As society and the economy have evolved, we now understand that investing in restoring ecosystem integrity can pay dividends in the form of enhanced climate resilience and new business and economic activities that support the transition to a civilisation and economy less dependent on fossil fuels. The NARIA framework quantifies improvements in ecosystem condition and integrity arising from investable programs of restorative land management.

The NARIA framework comprises three assessment analytics that generate distinct yet complementary measures of ecosystem integrity and ecosystem services. The core analytic measures the condition of ecosystem integrity. Interacting with this is an ecosystem management rating and a suite of ecosystem service metrics that can be presented individually or combined. These three components are more fully introduced in Sections 2-4.



## Box 1. NARIA Conceptual Framework and Analytical Components



The **CreditNature Ecosystem Condition Index (ECI)** supports nature-positive investments in the recovery and maintenance of ecosystems as assets and infrastructure for regenerative land economies and climate resilience. The index measures the condition of key natural process that determine the capacity of ecosystems to maintain and recover their composition, structure, function, complexity, and self-organisation over time (integrity). The choice of characteristics and the metrics that make up the index consolidate advances in functional ecology and ecosystem restoration science.

The **CreditNature Ecosystem Management Rating (EMR)** brings standardisation, efficiency, and quality assurance to the design and delivery of ecosystem restoration and stewardship practices that enhance and maintain ecosystem condition and services within a project (accounting) area. This tool scores the impact of human land management activities against the characteristics measured by the ECI metrics, generating a rating (on an A–G scale) of an area’s management in maintaining and recovering ecosystem integrity. The EMR provides land managers with a decision support tool to explore the relationship between different land management scenarios, ecosystem condition forecasts, and financial requirements. For investors and policy makers it provides information on the quality of land management and the ‘durability’ of improvements in ecosystem condition and services.

The **CreditNature Ecosystem Services Metric Portfolio (ESMP)** offers a set of metrics that quantify the condition of ecosystem services material to businesses and investors, such as their products and services, brand reputation, and regulatory compliance. These ecosystem services include carbon sequestration, water purification, and extinction risk reduction, all of which contribute to the well-being of society and the economy. These metrics supplement the Ecosystem Condition Index. Depending on location and investor requirements, the choice of these metrics will vary.



NARIA is designed for application at the scale of landholdings with a minimum contiguous area of 200 hectares. This is the minimum area where the current version of our ECI can reliably measure the condition of natural processes. It is best suited to landholdings of more than 1,000 hectares, where a land asset tends to become financially viable from a nature crediting and/ or investment perspective. Landholdings subjected to NARIA assessment are variously referred to as estates and farms (by landholders and society), environmental accounts (for reporting), supply areas (of environmental credits – carbon & nature), and natural capital assets (as a category of real estate investment). The Ecosystem Condition Index can also be applied to landscapes and regions, with metric adjustments to support larger-scale data feeds.

### 1.3. NARIA Ecosystem Accounting Architecture and Design Principles

Each NARIA assessment component follows a three-level architecture inspired by the Human Development Index dimensions and indicator approach. It aligns with an indicator framework developed independently by Czúcz et al. (2021)<sup>6</sup> to implement the Ecosystem Accounting (EA) protocol of the United Nations System of Environmental and Economic Accounting (UN SEEA)<sup>7</sup>.

The NARIA framework specifies key system dimensions of land assets, identifies data sources that can indicate their condition and translates data into metrics that represent a meaningful proxy of the dimension on a scale of 0-100. The ‘top level’ dimension is specified differently in each NARIA component (Table 1).

**Table 1. Specification of the ecosystem dimension measured by each NARIA Component**

	Ecosystem Dimensions		
NARIA components	Ecosystem Condition Index	Ecological Management Rating	Ecosystem Service Metric
Dimension specification	Ecosystem Characteristics	Ecosystem Asset	Ecosystem Services
Focus	Natural Process	Land Management Practices	Direct Ecosystem Services

In the NARIA framework, each dimension – whether it pertains to ecosystem condition, ecosystem (land) assets or, or ecosystem services – is supported by specific data sources that indicate the state of that dimension. However, raw data alone does not suffice for meaningful policy or sustainability action. To transform this data into a metric, the NARIA framework integrates ontologies (classifications and scoring systems) that add meaning and context to the data ensuring that it represents the relevant natural process, management practices and direct ecosystem services.

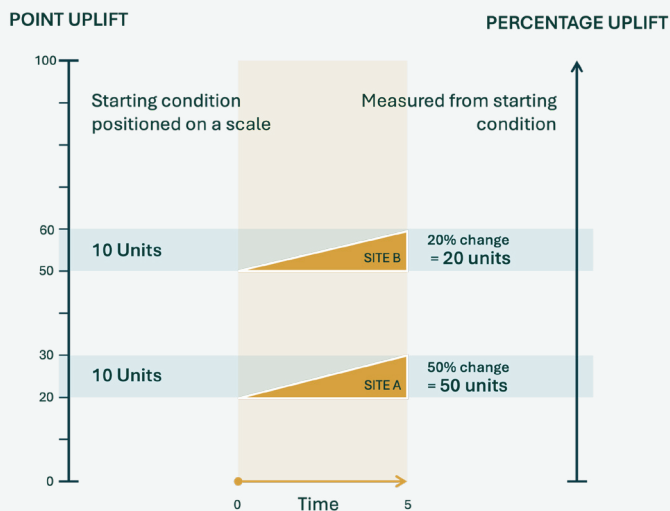
Additionally, normalisation techniques are employed to convert this data into a standardised 0-100 scale. This is to ensure that a metric (and composite index) represents a consistent and comparable unit of accounting and sustainability reporting, irrespective of the starting conditions of a land asset receiving investment (see Box 2).

<sup>6</sup> Czúcz, B., Keith, H., Maes, J., Driver, A., Jackson, B., Nicholson, E., Kiss, M. and Obst, C., 2021. Selection criteria for ecosystem condition indicators. *Ecological Indicators*, 133, p.108376.

<sup>7</sup> The EA protocol of the UN System of [Environmental-Economic Accounting \(SEEA\)](#) was developed to support such stocktaking activities globally and formally adopted by the UN in March 2021. It establishes a measurement framework for tracking changes in ecosystems as natural assets providing services and benefits and linking this information to economic and other human activities.



## Box 2. Benefits of a 0–100 Metric Scale



Translating metrics to a 0–100 scale ensures that a point increase represents the same amount of improvement, irrespective of the landholding's starting conditions. This standardisation allows corporate buyers to aggregate nature credits from diverse areas and report them consistently, facilitating clear communication of environmental impact. For institutional investors, it enables the creation of diversified portfolios across different ecosystems, enhancing comparability and decision-making. The uniform scale also supports participation in nature markets, where credits can be traded or bundled into investment funds, promoting scalability and continuous improvement in ecosystem condition while driving value creation in nature finance.

Metrics are typically scaled by choosing a 'natural' reference site to represent 100. This approach is inconsistent with the more open-ended rewilding approach, because it prescribes a cultural judgement on 'natural baselines' that are increasingly being shown to have degraded ecosystem integrity, due to the impacts of human activities over millennia<sup>8</sup>. To address these limitations, we developed an Attainable Maximum Reference Point approach (See Section 2.2).

Work on the design and development of the NARIA framework, including its indicators, ontologies, and metrics, began in 2020. The metric R&D process was guided by a set of design principles compiled from various reports and our ongoing learning (Box 3). The NARIA framework is designed to function as an operating subsystem for nature markets, providing a foundational quantification layer that allows for consistent reporting, data aggregation, and comparison across different projects and geographies. This, in turn, supports the development and integrity of nature finance products, services, and novel applications. Like an OS, we envision the NARIA framework evolving through new updates and releases, responding to advances in technology, data, science, market needs, and emerging applications.

## Box 3. NARIA Metric Design Principles

Our framework design expresses the following nine principles.

**Holistic** – the metrics capture key dimensions of ecological systems that interact to generate emergent properties and outcomes.

**Socio-ecological** – the framework recognises humans as part of ecosystems and 'hyper' ecosystem engineers who can be agents of nature recovery and not only degradation.

**Scientifically rigorous** – the metrics expresses advances in ecosystem and ecological indicator theory and research.

**Consistent** – the metric architecture can be applied in a consistent manner across different ecoregions and land systems.

**Future-proofed** – the framework architecture and metrics can be improved and updated as science, technology, and data availability advances.

**Affordable** – metrics are based on data that is cost-efficient to acquire, monitor, verify and report on.

**Auditable** – the framework, constituent metrics and their scores and ratings can be independently validated and verified.

**Usable** – metric outputs are easily communicable, meaningful and understandable, and compatible with decision-making platforms.

**Composable** – outputs can be readily combined with data from other sectors (e.g., climate, health and development).

<sup>8</sup> See e.g. Jepson, P & Blythe, C. 2021. Rewilding. The radical new science of ecological recovery. Illustrated Edition. Icon Books.



## 1.4 NARIA Validation and Verification Pathways

Nature Credits and Nature Finance-related KPIs are certificates whose value lies in their reporting utility, grounded in technologies of quantification and assurance structured by standards. NARIA analytics and metrics have been designed with two rigorous verification and validation (V&V) pathways.

The first pathway focuses on the validation of the NARIA framework's index, metrics, and rating methods. These methods are detailed in comprehensive technical documents that:

- i) scientifically justify the selection of dimensions, metrics, and the design and integration of ontologies, as well as the calculation algorithms;
- ii) present the results of pilot applications and sensitivity testing; and
- iii) specify reportable data quality standards and data capture protocols.

These methods are either accredited under an approved third-party method standard or validated by an independent scientific panel with expertise in crediting methodologies. The second pathway addresses the implementation of these methods via CreditNature's end-to-end digital platform. This platform includes data capture applications designed to ensure efficient collection and verification of data from supply areas, project developers, and other data providers. The platform quantifies Ecosystem Condition Index baselines, forecasts, and tracks changes over time, supporting accurate measurement, reporting, and verification (MRV) crucial for robust ecosystem recovery management. It also enforces adherence to data standards through both human oversight and automated systems, ensuring accuracy and reliability. Additionally, the platform offers analytics dashboards that make project data readily accessible to market participants, including buyers, suppliers, and public bodies, with role-based security features.

## 1.5 Framework Development and Governance

The development of the NARIA Framework is guided by a scientific consultative group. We plan to formalise this into a Scientific Advisory Committee, which will oversee and provide input on future developments and the framework's application in new ecoregions.

The NARIA Framework will continue evolving in response to:

- Knowledge gained from its application in diverse accounting areas and ecoregions
- Advancements in ecosystem monitoring technologies
- Improvements in crediting methods.

Additionally, it will adapt to scientific developments and strive to align with emerging protocols and standards for ecosystem condition accounting and measurement, while addressing the needs of government agencies, corporations, and financial institutions.



## Section 2: The CreditNature Ecosystem Condition Index (ECI)

### 2.1. Purpose

The purpose of the Ecosystem Condition Index is to make the recovery and maintenance of ecosystems investable by providing a scientifically robust and scalable measure of their condition. A point improvement on the index scale can be translated into impact reporting units to support investment decisions and Corporate Sustainability Reporting and Disclosure (CSRD)<sup>9</sup>, including guidelines of the [TaskForce on Nature-related Financial Disclosures \(TNFD\)](#). It is also relevant for reporting progress towards international biodiversity targets by governments.

### 2.2. Approach and Rationale

The Ecosystem Condition component of the NARIA framework adopts a natural process-oriented approach to quantifying ecosystem integrity. This approach is inspired by the work of Perino et al. (2019)<sup>10</sup> who, drawing from advancements in long-term ecology, functional ecology and complexity theory, proposed a framework centred on three fundamental natural processes: dispersal, natural disturbance, and trophic cascades. These processes, which shaped modern ecosystems during the Pleistocene, are theorised to foster and accelerate the recovery of complex ecosystems and the ecosystem services they provide. Leveraging natural processes to address social and environmental challenges is a central concept of nature-based solutions (NBS)<sup>11</sup>.

In the NARIA framework, natural processes are considered system properties, aligning with the UN-SEEA definition of an ecosystem characteristic. Despite their frequent mention in the scientific literature, natural processes are often poorly theorised and classified. These processes involve the movement or transfer of energy, materials, or organisms within ecosystems, driving functions and dynamics that influence ecosystem condition, recovery, resilience, and long-term evolution. While natural processes encompass a wide range of interactions – such as photosynthesis, predation, and pollination – the NARIA framework focuses on higher-order natural processes as key ecosystem characteristics. These higher-order processes, such as natural disturbance, dispersal, and trophic cascades, operate on a broader scale and encapsulate multiple basic ecological processes.

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<sup>9</sup> The [EU CSRD directive](#) is an important development in this regard.

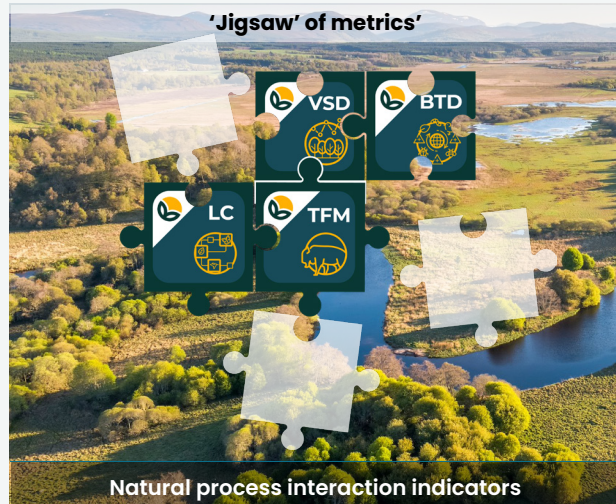
<sup>10</sup> Perino, A., et al., 2019. [Rewilding complex ecosystems](#). *Science*, 364(6438)

<sup>11</sup> See earlier and e.g. Macias-Fauria, M et al., 2020. [Pleistocene Arctic megafaunal ecological engineering as a natural climate solution?](#) *Phil. Trans. Royal Soc*, B375(1794)



#### Box 4. A Jigsaw of Metrics Approach to Composite Index Design

Quantifying the complexity of nature to evidence units of ecological accounting requires multi-characteristic measurement translated into composite metrics or indexes. There are two general approaches. Our Ecosystem Condition Index adopts the 'jigsaw of metrics' approach because the ecosystem processes measured are interrelated and together contribute to ecosystem integrity.



**Example:** Human Development Index (HDI)

Good when interdependence between factors is important.

**Holistic 'picture':**  
Provides an integrated view.

**Quite rigid:** Conceptual links are required for adding/removing metrics.

**Coherent, scalable:** Offers a consistent and clear understanding.



**Example:** Consumer Price Index (CPI)

Good for capturing a wide range of independent factors.

**Less integrated:**  
Relationship between metric choice less clear.

**Flexible:** Individual metrics can be added or removed without disrupting the overall index.

Interpretation can be challenging due to the diverse nature of included metrics.

Our method requires that at least three such higher-order natural processes be represented in a composite Ecosystem Condition Index (ECI). The metrics selected or developed to represent and quantify these processes are designed to integrate with other natural processes within the index, ensuring a holistic representation of the ecosystem's condition. We term this approach the 'jigsaw of metrics' (Box 4).

Many higher-order natural processes are consistent across different ecosystems, although they may be expressed differently. As the NARIA framework is applied and adapted to various biomes, we are developing a 'suite' of higher-order natural processes and associated metrics from which appropriate sets can be selected to represent different ecoregions. Despite ecological variations across these regions, the resulting Ecosystem Condition Index scores will provide a standardised and comparable measure of ecosystem integrity, irrespective of biogeography. This consistency is particularly valuable for nature finance, as it allows investors and companies to compare and assess the ecological performance of different projects across various ecoregions with confidence and accuracy.

Each metric is normalised to a 0–100 scale using a reference condition benchmark. To reduce subjectivity in reference condition selection, we employ an attainable maximum approach for setting 100. For each metric, this is specified as either:

- The metric's theoretical maximum, if it has a grounded reality;
- A 'capped' theoretical maximum, e.g., at 80%, to reflect what is ecologically desirable or feasible;
- A regional species pool filtered for habitat use relevant to the account;
- A fixed percentage higher than the score for a local reference site considered 'natural' or 'pristine' (e.g., 10%).

This approach enables the ECI to be applied to degraded regions where no 'natural' reference condition remains (as is generally the case in Europe) and to regions where high-integrity natural ecosystems remain.

Metrics are aggregated into a composite Ecosystem Condition Index using the geometric mean, which moderates extreme values in individual metric scores. An ECI point improvement is achieved only when the majority of the metrics have higher scores, representing improvements in the condition of interacting natural processes that underpin ecosystem integrity. The use of the geometric mean also ensures that the future integration of new metrics into the Ecosystem Condition Index will not significantly alter the ECI score. This is because the difference in metric values from the central value matters more than the number of metric values contributing to the aggregated score.

## 2.3 NARIA Terrestrial Ecosystem Condition Index

This ECI is designed to measure the recovery trajectory of ecosystems from states of degraded, and/or limited ecosystem integrity towards a state of ecosystem integrity where the system can be considered self-willed, i.e., the ecosystem is able to maintain its basic functions and if left alone would continue to recover and evolve in complexity. The method is therefore intended to track recovery over periods of 5 to 30 years or more.

In April 2023 the method to calculate this index was accredited as a method for calculating Econd<sup>®12</sup> (AfN-METHOD-E-01) by Accounting for Nature<sup>®</sup> under their rigorous [method standard \(v4.1\)](#) for units of ecological accounting. The method is accredited for use in 38 European ecoregions<sup>13</sup> that co-evolved with megafauna and on lands where ecosystem condition has been degraded by human activities over time.

The Terrestrial Ecosystem Condition Index (V1.0) measures the condition of four higher-order natural processes that in interaction give rise to ecosystem integrity. Three are taken from Perino et al 2019<sup>14</sup> and we added a fourth, which we term niche occupancy, to provide a more complete picture of ecosystem integrity and to introduce a 'lag' or outcome process and metric into the index design. These are summarised in Table 1 and an overview of each metric is provided in section 2.3.

12 An Econd<sup>®</sup> (Environmental Condition Index) is a core metric used in the Accounting for Nature<sup>®</sup> Framework. It summarises complex scientific information into a single, easy-to-understand number between 0 and 100, where 100 represents the optimal condition of an environmental asset, and 0 represents a completely degraded state.

13 Those excluded are: xeric steppe and desert habitats, polar tundra ecoregions, oceanic islands, and topographically steep and complex coastal ecoregions. This is because they all have characteristics (e.g. homogeneous vegetation, openness, high topographic complexity) that might require adjustment to the accredited ECI and would require additional testing.

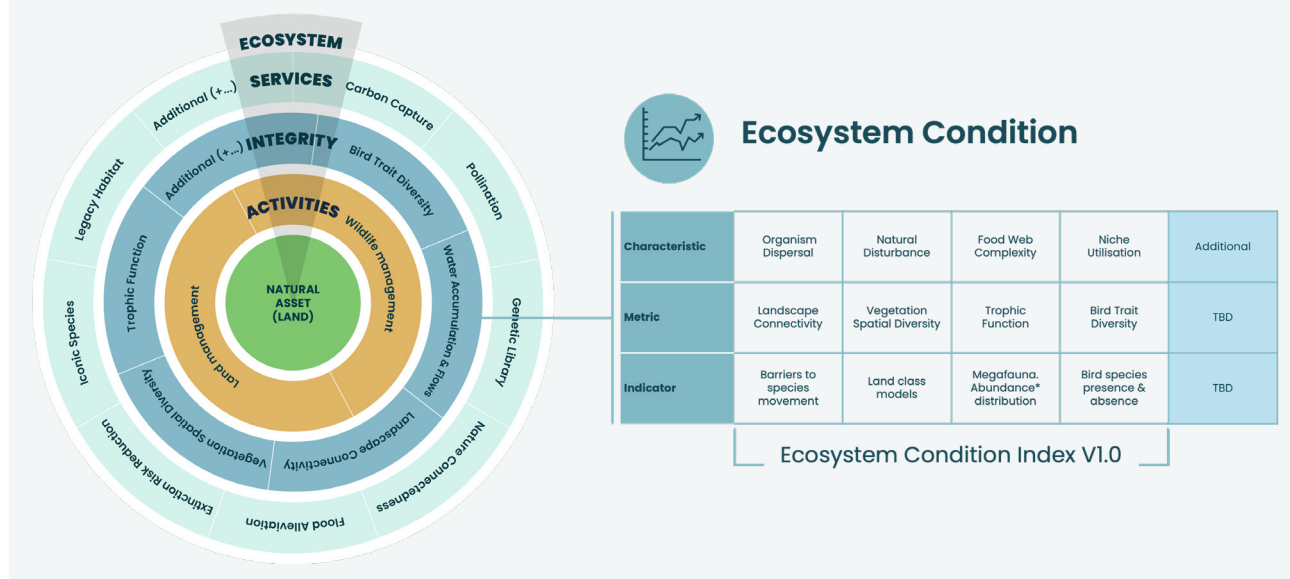
14 Perino, A., et al., 2019. [Rewilding complex ecosystems](#). Science, 364(6438)



**Table 2: Summary of processes and metric logic**

Natural Process	Role in Ecosystem Function	Justification for Metric Choice
<b>Dispersal</b>	Dispersal of organisms across landscapes supports processes such as seed and nutrient distribution, repopulation, and natural disturbance. It plays a critical role in maintaining genetic diversity, species persistence, and ecosystem resilience.	The <b>CreditNature Landscape Connectivity</b> metric measures the extent to which landscapes facilitate or impede the movement of focal species that contribute to various ecosystem processes.
<b>Natural Disturbance</b>	Natural disturbances create vegetation and microhabitat diversity. It prevents any one plant community from dominating, allowing for greater species coexistence, thereby enhancing ecosystem complexity and resilience.	The <b>CreditNature Vegetation Spatial Diversity</b> metric captures the spatial variability and intermixing of habitats, reflecting the degree to which natural disturbances shape the landscape.
<b>Trophic Cascades</b>	Trophic cascades create interactions among species at different trophic levels, affecting species abundance and diversity and distribution of biomass across the ecosystem. Top-down and bottom-up cascades are critical for creating food web complexity and shaping the structure and dynamics of ecosystems.	The <b>CreditNature Trophic Function</b> metric measures the diversity and dissimilarity of functional effects among megafauna, which have a disproportionate effect on trophic cascades and contribute to natural disturbance and dispersal.
<b>Niche Occupancy</b>	Niche occupancy involves the dynamic process of species occupying available niches, driving biodiversity and the emergence of complex biotic structures. This dynamic interaction is fundamental to ecosystem resilience and the continued evolution of ecological functions.	The <b>CreditNature Bird Trait Diversity</b> metric measures the diversity of avian adaptations, serving as indicators of niche availability and occupancy.

**Figure 1: The Ecosystem Condition Index Method Framework and the potential addition of other metrics.** These are a measure of the integrity of an ecosystem.



## 2.3. Summary of Metrics Used to Calculate the NARIA Terrestrial Ecosystem Condition Index

### 2.3.1. Natural Process of Dispersal

The **dispersal** of organisms across space supports processes such as seed<sup>15</sup> and nutrient dispersal<sup>16</sup>, repopulation<sup>17</sup>, and natural disturbance<sup>18</sup> leading to bioabundance and ecosystem resilience. Anthropogenic barriers (physical and land use) restrict these processes and have been shown to be a major cause of biodiversity loss<sup>19</sup>. Restoring high levels of connectivity underpins ecosystem integrity.

The CreditNature **Landscape Connectivity metric (LC)** is a measure of the extent to which landscapes facilitate or impede the movement of organisms. It is calculated using a permeability model that incorporates standard data on linear barriers and land use patterns. This model is further refined with taxonomies of barrier types and land use and their permeability specific to a set of ‘focal’ species representing the range of body size/agility present in an ecoregion. The attainable maximum (reference point for 100) for this metric is the theoretical maximum, as it is possible (and desirable) to have no barriers on a site.

**Table 3. The CreditNature Landscape Connectivity Metric in Brief**

How the Metric Works	What the Score Means	How the Score Can Be Increased	Accepted Data Inputs
A digital map of manmade barriers (e.g., fences, walls, roads etc.) that intersect the landscape feeds an algorithm that quantifies the probability that animals would meet if placed randomly across the landscape. Dispersal ability is assessed for 9 species groups.	Higher numbers mean that more land is openly connected for the species groups assessed such that more of them could interact with each other and express their functional effects on the land.	Removing barriers, particularly ones that most commonly affect species; removing or leaving gates open; removing all types of fences; providing crossing points for major roads, railways and deep drainage channels.	Landowner maps of linear infrastructure, national-level mapping, site-based surveys, satellite imagery.

### 2.3.2. Natural Disturbance

**Natural disturbances**, such as those caused by animal activities and geophysical processes, generate vegetation and microhabitat diversity, driving nutrient cycling and succession, and encouraging adaptation and evolution. Conventional land management practices restrict natural disturbance processes leading to simplified ecosystems.

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- 15 Couvreur, M., Christiaan, B., Verheyen, K. and Hermy, M., 2004. Large herbivores as mobile links between isolated nature reserves through adhesive seed dispersal. *Applied Vegetation Science*, 7(2), pp.229–236. <https://doi.org/10.1111/j.1654-109X.2004.tb00614.x>
- 16 Doughty, C.E., Wolf, A. and Malhi, Y., 2013. The legacy of the Pleistocene mega-herbivore extinctions on nutrient availability in Amazonia. *Nature Geoscience*, 6(9), pp.761–764. <https://doi.org/10.1038/ngeo1895>
- 17 Baguette, M., Blanchet, S., Legrand, D., Stevens, V.M. and Turlure, C., 2013. Individual dispersal, landscape connectivity and ecological networks. *Biological Reviews*, 88(2), pp.310–326. <https://doi.org/10.1111/brv.12000>
- 18 Wisdom, M.J., Vavra, M., Boyd, J.M., et al., 2006. Understanding ungulate herbivory—episodic disturbance effects on vegetation dynamics: Knowledge gaps and management needs. *Wildlife Society Bulletin*, 34(2), pp.283–292. [https://doi.org/10.2193/0091-7648\(2006\)34\[283:UUHDEO\]2.0.CO;2](https://doi.org/10.2193/0091-7648(2006)34[283:UUHDEO]2.0.CO;2)
- 19 Taylor, P.D., Fahrig, L., Henein, K., et al., 1993. Connectivity is a vital element of landscape structure. *Oikos*, pp.571–573. <https://doi.org/10.2307/3544927>



The CreditNature **Vegetation Spatial Diversity metric (VSD)** employs established techniques in landscape ecology<sup>20</sup> and measures the spatial variability and intermixing of habitats. The model reflects the extent to which a landscape exhibits natural variability and complexity, as opposed to the simplified, homogeneous environments resulting from traditional land management. It incorporates an ontology that penalises habitat (vegetation) classes that have exceeded a natural threshold and become a steady-state monoculture that suppresses or is resistant to natural disturbance processes. The reference point for 100 is the theoretical maximum of the metric capped to 80% to reflect established ecological theory that intermediate levels of disturbance<sup>21</sup> benefit ecosystem function and integrity.

**Table 4. The CreditNature Vegetation Spatial Diversity Metric in Brief**

How the Metric Works	What the Score Means	How the Score Can Be Increased	Accepted Data Inputs
The metric assesses the spatial complexity of vegetation communities at a landscape scale which is then 'penalised' where habitats are affected by overly dominant species.	Low scores indicate a simplified landscape with little vegetation diversity. Higher scores represent a landscape with complex vegetation patterns arising from animal and other natural disturbance processes.	Restorative management that leads to patchiness and diversity in the vegetation communities across the site, and/or reduces the area of monocultures particularly those that result from ecologically damaging land management, invasive species and sudden abandonment.	Habitat surveys, landowner records, classified remotely sensed imagery.

### 2.3.3. Trophic Cascades

A diversity of mega-herbivores and predators plays a keystone role in **trophic cascades** and the evolution of **food web complexity**. Human activities over the centuries have suppressed or amplified this role with negative ecological consequences. Restoring guilds of free-ranging large-bodied animals is an effective means to recover and accelerate ecosystem function and complexity<sup>22</sup>.

The CreditNature **Trophic Function metric (TFM)** extends and refines an earlier metric developed by iDiv<sup>23</sup>. It is a measure of the diversity and dissimilarity of functional effects among the types of wild and/or domestic large-bodied animals present (or that could be present) in a focal area. The model is refined by including carrying capacity and information on the 'natural' ratio of different herbivore families and/or species across the area of interest. This metric incentivises a renewed focus on land supporting varied populations of 'megafauna' (including domesticated breeds) with the characteristics to restore the complexity of high integrity ecosystems.

20 Gustafson, E.J., 2019. How has the state-of-the-art for quantification of landscape pattern advanced in the twenty-first century? *Landscape Ecology*, 34(9), pp.2065–2072.

21 See e.g. Moi, D.A., et al., 2020. Intermediate disturbance hypothesis in ecology: a literature review. In *Annales Zoologici Fennici* (Vol. 57, No. 1–6, pp. 67–78). Finnish Zoological and Botanical Publishing Board.

22 Svenning, J.C., Pedersen, P.B., Donlan, C.J., et al., 2016. Science for a wilder Anthropocene: Synthesis and future directions for trophic rewinding research. *Proceedings of the National Academy of Sciences*, 113(4), pp.898–906. <https://doi.org/10.1073/pnas.1502556112>

23 Fernández, N., Torres, A., Wolf, F., et al., 2020. Boosting Ecological Restoration for a Wilder Europe. <https://dx.doi.org/10.978.39817938/57>



The attainable maximum (score 100) for this metric is the theoretical maximum, due to the incorporation of the ideal herbivore composition.

**Table 5. The CreditNature Trophic Function Metric in Brief**

How the Metric Works	What the Score Means	How the Score Can Be Increased	Accepted Data Inputs
The algorithm quantifies the functional effect and diversity of the guilds of mega-herbivores and apex predators present in an area.	Higher scores mean more functional roles are present and large animal populations are within a 'natural' ratio and carrying capacity.	Fewer highly domesticated breeds, more 'wilded' breeds (e.g., Tauros), and carnivores where appropriate – all in numbers that the ecosystem can sustain.	Landowner records of domesticated species, driven surveys vantage point surveys, camera trap and aerial surveys, satellite-based counts of large species.

### 2.3.4. Niche Occupancy

The myriad of smaller species in an ecosystem create complex and diverse biotic processes and structures that contribute to ecosystem integrity. These processes are beyond the current focus of trophic cascade theory, so to capture this, we added the dimension and process of **niches becoming available and occupied** across different spatial scales. The diversity and turnover of niches in an ecosystem equates to the potential resources available to organisms. Species have evolved different traits to utilise available resources (niches), and a diversity of species traits generates system interactions that create and support ecosystem processes, structures and functions<sup>24</sup>.

The CreditNature **Bird Trait Diversity metric (BTD)** extends a bird community index<sup>25</sup> and measures changes in the diversity of avian adaptations present on a site. Birds are visible, mobile and have evolved morphological and behavioural traits to utilise the diversity of niches and resources present in historical ecosystems over space and time. As such they are good response indicators of i) the state and recovery of niche availability and occupancy in an area<sup>26</sup>, and ii) the relationship between biodiversity and ecosystem function and resilience<sup>27</sup>. The BTD is calculated from data on bird species presence and absence linked to tables of their functional traits. The reference point for 100 is calculated by adjusting a regional species pool (a terrestrial species list for the ecoregion or biome) to a realistic maximum based on records from a representative range of birding 'hotspots' in the region.

24 Cadotte, M.W., Carscadden, K. and Mirotnick, N., 2011. Beyond species: Functional diversity and the maintenance of ecological processes and services. *Journal of Applied Ecology*, 48(5), pp.1079-1087. <https://doi.org/10.1111/j.1365-2664.2011.02048.x>

25 O'Connell, T.J., Jackson, L.E. and Brooks, R.P., 1998. A bird community index of biotic integrity for the mid-Atlantic highlands. *Environmental Monitoring and Assessment*, 51, pp.145-156.

26 See e.g., Truchy, A., Angeler, D.G., Sponseller, R.A., Johnson, R.K. and McKie, B.G., 2015. Linking biodiversity, ecosystem functioning and services, and ecological resilience: Towards an integrative framework for improved management. *Advances in Ecological Research*, 53, pp.55-96. Academic Press.

27 See e.g., Elmqvist, T., Folke, C., Nyström, M., Peterson, G., Bengtsson, J., Walker, B. and Norberg, J., 2003. Response diversity, ecosystem change, and resilience. *Frontiers in Ecology and the Environment*, 1(9), pp.488-494.



**Table 6. The CreditNature Bird Trait Diversity Metric in Brief**

How the Metric Works	What the Score Means	How the Score Can Be Increased	Accepted Data Inputs
The traits of each bird species present in an ecosystem are collectively assessed to quantify the total trait space and thus the diversity of niche spaces available and occupied.	Higher scores indicate a wealth of niches are occupied, supporting a wide variety of birds and indicating high biodiversity.	Increasing the variety and complexity of habitats, food sources and biodiversity at all spatial scales. A move to restorative land management captures many of the required activities.	Formal bird surveys, community-populated bird databases, acoustic sensors, landowner and land manager records, organised community bird surveys.

**Case Study: Drumadoon Farm Ecosystem Condition Index**



Drumadoon is a 260-hectare farm located on Scotland’s west coast. Its striking landscape has drawn humans for thousands of years. The farm’s native Atlantic rainforests were cleared, livestock grazed on the slopes and higher areas, and crops grown on the flatter lands. Farming is no longer economically viable, and abandonment has resulted in large areas of bracken, heath, and gorse, creating nature-poor monocultures that will require active rewilding to restore biodiversity and ecosystem health.

The current owner envisions transforming Drumadoon into a nature-based enterprise, focused on restoring the historic Atlantic rainforests and mires. He aims to create a valuable asset for ecotourism, education, and research, contributing to the local island economy while serving as an inspirational destination and model for Scottish nature recovery and climate

adaptation. A ten-year programme of restorative land management was used to forecast the NARIA ECI, suggesting an improvement in ecosystem integrity, from a current score of 41 to 53.

The cessation of cattle grazing has reduced the variety of large-herbivore ecological effects negatively impacting the Trophic Function Metric and resulting in monocultures that lower the Vegetation Spatial Diversity metric. The lower niche diversity is reflected in the low Bird Trait Diversity metric score. Replanting Atlantic rainforest and removing old fencing, combined with the introduction of free-roaming primitive cattle and horse herds, will increase TFM, VSD, and LC metric scores and is forecast to lead to an uplift in bird species diversity reflected in an improved BTM score.



## 2.4. Extending the Ecosystem Condition Index

Physical environmental factors establish the conditions for natural processes that drive the evolution, structure, and function of ecosystems in a given region. The key factors typically include climate, sunlight energy (e.g., day length), topography, soils and geology, and water availability. The NARIA Ecosystem Condition Index (ECI) can be adjusted and configured to account for variations in the relevance of high-order natural processes across different ecoregions. Adjusting the ECI for different environmental contexts ensures it represents the processes crucial for ecosystem recovery and integrity in an assessment area, while preserving a standardised and comparable unit of ecosystem accounting across regions.

### Case Study: Extending the ECI to better represent hydrological processes



The ECI version described in the preceding section does not explicitly represent hydrological processes and river systems, which encompass the movement, distribution, and quality of water. Adopting our protocol, we considered these processes from a systems ecology perspective, recognizing that precipitation functions as both a resource and an energy input. It influences ecosystem dynamics through its interaction with terrain and water pathways. As water flows across landscapes, it generates natural disturbances and dispersal processes, creating topographic and microhabitat diversity – such as riffles, pools, washlands, nutrient gradients, and pathways for fish migration. Ecosystem engineers like beavers further enhance water retention by building dams that increase habitat diversity and ecosystem resilience, and this is already accounted for in the Trophic Function Metric.

In the NARIA framework, processes related to water retention and flow are indirectly represented through existing metrics like natural disturbance, dispersal, trophic function, and niche turnover. However, to capture the full impact of water dynamics on these natural processes we identified a set of refinements to existing metrics. These are as follows:

- Extending the **Landscape Connectivity Metric** to include human-engineered topographic features – such as dams, weirs, and drains – that disrupt natural river flows and the associated processes of natural disturbance and dispersal. By incorporating these features, the metric would better reflect and track the recovery of natural river dynamics arising from restorative land management.



- Potentially expanding the **Vegetation Spatial Diversity Metric** ontology to positively weight vegetation types that indicate water retention, such as peatlands and mires. This adjustment would require the development and testing of a new ontology that would extend the scope of the metric beyond representing natural disturbance to include the role of water accumulation in ecosystem processes and the creation of vegetation diversity and niche availability.
- Expanding the **Bird Trait Diversity Metric** into a **Species Trait Diversity Metric** by incorporating a **Benthic Macroinvertebrate Trait Diversity Metric**. This extension would improve the representation of niche turnover processes within river ecosystems, as macroinvertebrates are key indicators of water quality and habitat diversity, complementing the bird diversity metric.

The **NARIA framework** includes a rigorous protocol for adjusting the **Ecosystem Condition Index (ECI)** to account for variations in environmental contexts across different ecoregions. This protocol involves testing the relevance of existing natural processes (ecosystem characteristics) and associated metrics for a new assessment area. It begins with desk research and expert consultation to identify 'candidate' higher-order natural processes (HONPs) for the focal ecoregion or geography. Each candidate process is then assessed for how well it is represented by the existing HONPs and their metrics – either directly or indirectly.

If a candidate natural process is not adequately represented within the current 'jigsaw' of metrics we first assess whether an existing metric can be refined or extended. If this is insufficient, an additional metric may be introduced to represent the candidate natural process within the existing framework. If neither approach resolves the issue, a new ecosystem characteristic may be added, potentially requiring the development of a new metric.

When conducting an ecosystem assessment, the decision to use the standard Ecosystem Condition Index (ECI) or an adjusted version depends on the specific environmental context and natural processes of the assessment area. The standard ECI is applied when the existing metrics sufficiently capture the key natural processes and ecosystem characteristics relevant to the region. However, in areas where environmental factors (such as distinct hydrological dynamics, topography, or land use modifications) significantly influence natural processes and ecosystem function, an adjusted ECI may be used.



## Section 3:

# Ecosystem Management Rating (EMR)

### 3.1. Purpose and Value of the EMR

The Ecosystem Management Rating (EMR) within the NARIA framework adapts the familiar A–G energy rating approach, commonly used in the real estate and appliance sectors, to assess the impact of land management practices on ecosystem integrity. It serves as a quick, standardised, and accessible tool for market participants – including buyers of nature credits, institutional investors, landholders, government agencies, and the general public – to evaluate the ecological impact and effectiveness of existing and proposed land management activities.

The EMR connects the quality of land management practices with the Ecosystem Condition Index (ECI) by evaluating the impact of land management on the integrity of each natural process. It provides essential insights into whether land management strategies enhance or degrade overall ecosystem health. Additionally, the EMR assesses how practices that are aimed at defined ecosystem services influence broader ecosystem integrity, ensuring that improvements in certain services do not inadvertently harm the ecosystem's overall condition.

The EMR offers value across multiple dimensions. For buyers of nature credits and institutional investors, it provides critical due-diligence information, allowing them to assess the ecological quality of land management and the investment potential of projects with confidence. For landholders, the EMR offers a framework to model different scenarios, improve land value and attract investment through better management practices. Government agencies benefit from a standardised tool to evaluate and monitor conservation and restoration efforts, while the public gains insight into the environmental impact of these activities. By integrating this comprehensive rating system with the ECI, the NARIA framework ensures that financial investments lead to meaningful ecological outcomes and durable and resilient improvement in ecosystem condition.

### 3.2. Approach and Rationale

The EMR component of the NARIA framework blends a land-system science<sup>28</sup> and natural asset approach<sup>29</sup> with advances in socio-ecological systems thinking. At its core, the EMR seeks to quantify the impact of human land management activities on the natural processes that are essential for recovering, enhancing and maintaining ecosystem integrity. The NARIA approach recognises that human activities have long been a driving force in shaping ecosystems. Over time, human beings have increasingly assumed the role of 'hyper' ecosystem engineers.<sup>30</sup>

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28 See e.g., Turner, B.L., et al., 2007. The emergence of land change science for global environmental change and sustainability. *Proceedings of the National Academy of Sciences*, 104: 20666–20671. Verburg, P.H., et al., 2015. Land system science and sustainable development of the earth system: A global land project perspective. *Anthropocene*, 12: 29–41.

29 See Jepson, P.R., et al., 2017. Protected area asset stewardship. *Biological Conservation*, 212: 183–190.

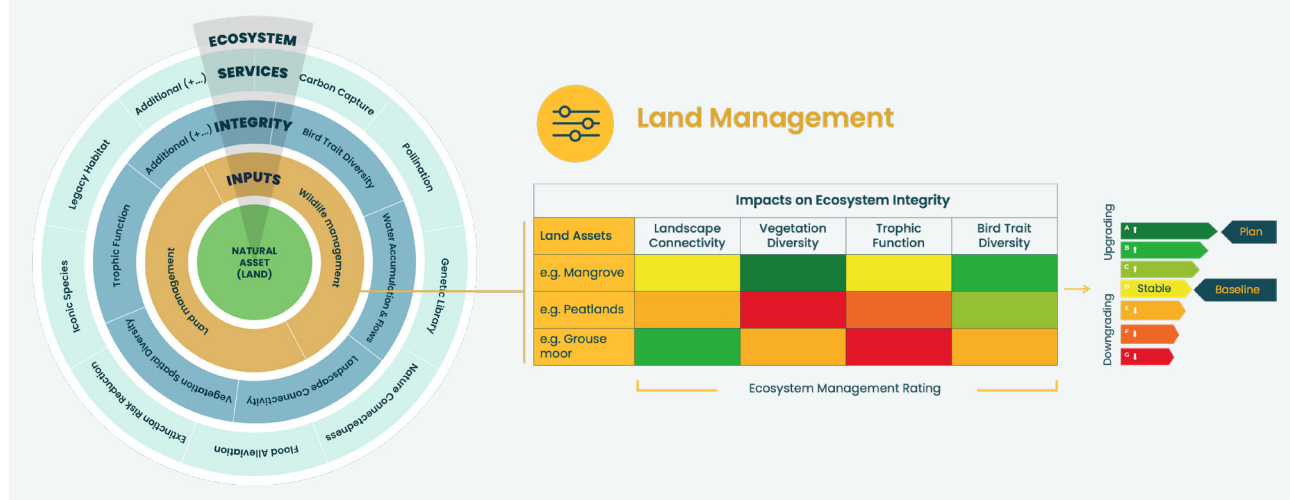
30 See Worm, B. and Paine, R.T., 2016. [Humans as a hyperkeystone species](#). *Trends Ecol. & evolution*, 31: 600–607.



dramatically reducing megafauna and reshaping land systems to meet immediate human needs – such as agriculture, urban development, and resource extraction. While these activities have driven economic growth and societal advancement, they have restructured landscapes and ecosystems, disrupting and constraining natural processes<sup>31</sup>. This has come at the cost of the ecosystems' capacity to support other life forms, deliver essential ecosystem services, and maintain the resilience and adaptability of our planet's life-support systems.

The EMR provides a strategic mechanism for transforming our role from being ecosystem engineers that have historically degraded natural systems into proactive architects of ecosystem recovery. By quantifying the impact of land management practices, the EMR makes visible whether these practices align with or counteract the natural processes that underpin ecosystem health, upon which our society and economy depend. This transparency allows land managers, investors, and policymakers to make informed decisions that prioritise the recovery and enhancement of ecosystem integrity. By guiding investment into land management towards practices that support rather than undermine natural processes, the EMR helps shift our collective actions towards a more sustainable, resilient future, where socio-economic and ecological objectives are mutually reinforcing rather than in tension.

**Figure 2: Ecosystem Management Rating (EMR) as an Assessment of the Impacts of Ecosystem Inputs and Management Activities on a Natural Land Asset**



### 3.3. Rating Methodology

The EMR rates land assets—such as environmental accounts and supply areas—based on the quality of their land management practices in relation to natural processes that are essential for recovering and maintaining ecosystem integrity. Unlike the familiar A–G energy rating, which uses a linear poor-to-good scale, the EMR adopts a more nuanced seven-point Likert scale.

The choice of a Likert scale over a simple ordinal scale is intentional. The Likert scale allows for a more granular evaluation of land management practices, capturing the subtleties of their effects on natural processes. This is crucial in the context of ecosystem management, where the

<sup>31</sup> Cardinale, B.J., Duffy, J.E., Gonzalez, A., Hooper, D.U., Perrings, C., Venail, P., Narwani, A., Mace, G.M., Tilman, D., Wardle, D.A. and Kinzig, A.P., 2012. Biodiversity loss and its impact on humanity. *Nature*, 486(7401), pp.59–67.



impact of human activities can vary significantly and requires more than just a binary or linear assessment.

By offering a mid-point ('D'), the Likert scale also accommodates practices that neither degrade nor improve existing ecosystem integrity, with A-C signifying practices that will improve ecosystem integrity (or sustain high integrity systems) and E-G signifying practices that downgrade ecosystem integrity.

The rating process is structured around this seven-point scale, where the impact of each land management practice on each Ecosystem Condition Index (ECI) natural process is systematically evaluated and assigned a position on the scale (Table 7). This assignment is conducted by an expert group, following evidence-based guidelines that define the criteria for each ECI natural process. As the NARIA framework continues to be applied and data on the relationship between land management practices and ECI metric responses accumulates, we anticipate that this rating process will become increasingly data-driven, further enhancing the accuracy and reliability of the EMR.

**Table 7. Scale for rating the impact of land management practices**

Rating	Criteria
<b>A (Exceptional Positive Impact)</b>	Practices that produce an <i>exceptionally positive</i> impact on natural processes, significantly enhancing ecosystem integrity. These practices not only support but actively promote key natural processes.
<b>B (Strong Positive Impact)</b>	Practices that <i>considerably improve</i> key natural processes but may be more moderate in scope or effectiveness compared to 'A'.
<b>C (Moderate Positive Impact)</b>	Practices that <i>moderately enhance</i> natural processes, with improvements that are positive but not yet transformative.
<b>D (Neutral Impact)</b>	Practices that have <i>no significant impact</i> on natural processes, neither enhancing nor degrading ecosystem integrity.
<b>E (Moderate Negative Impact)</b>	Practices that <i>moderately degrade</i> natural processes, causing some harm but with potential for recovery if mitigated.
<b>F (Strong Negative Impact)</b>	Practices that <i>significantly degrade</i> natural processes, causing notable harm to ecosystem integrity and function.
<b>G (Severe Negative Impact)</b>	Practices that <i>severely disrupt</i> or destroy natural processes, resulting in long-term or potentially irreversible ecosystem damage.

### 3.4 Categorising Land Management Practices

Underpinning the EMR is a classification system for land management that recognises humans commonly undertake groups of activities that collectively generate specific forms of value. These forms of value might include crops for sale, timber for harvest, or wildlife conservation, and importantly ecosystem restoration. By understanding and categorising these groupings, the NARIA framework provides a structured approach to planning and assessing the ecological impact of land management practices.

In the NARIA framework, these groups of activities are referred to as 'Value Generating Practices' (VGPs). A VGP represents a strategic approach composed of multiple activities that, together, produce land assets that generate desired outcomes and value. For instance, bracken control,



tree planting and deer management activities to support the VGP of establishing Atlantic rainforest on degraded land. An Atlantic rainforest rewilding area is an ecosystem asset capable of generating ecotourism and educational value. Achieving ecosystem restoration often requires the implementation of multiple VGPs (i.e. sub-projects) within a given accounting area to restore an ecosystem’s full functionality and value-generating potential.

We have developed a land and ecosystem asset classification system tailored for nature-positive investment, which integrates traditional land system classifications<sup>32</sup> with real estate investment classifications. Currently, the impact of land management activities on each ECI natural process is assessed and assigned at the VGP level (Level 4, as shown in Table 8) for each accounting/project area. The grouping of activities into VGPs and Land Asset types is done iteratively with each account assessed in combination with reviews of agricultural and forestry classifications and descriptions of conservation management practices. Classifications specific to ecosystem restoration and types of regenerative land management are still evolving, and as such, the NARIA framework is at the forefront of developing these classifications.

As with the EMR rating system, we anticipate that the classification process will become increasingly data-driven and supported by artificial intelligence as the number of NARIA accounts grows. This evolution will enhance the accuracy, efficiency, and scalability of our assessments, ultimately benefiting stakeholders by providing deeper insights and more robust data to guide investment and management decisions.

**Table 8. NARIA EMR Land Asset Classification**

<b>Level 1: Investment Sector</b>	
<b>Definition:</b>	Sectoral focus of investment in land assets.
<b>Purpose:</b>	To organise land assets into broad categories based on economic and environmental sectors, guiding strategic investment and resource allocation.
<b>Categories:</b>	Agriculture, Forestry, Natural Capital.
<b>Level 2: Land Asset Categories</b>	
<b>Definition:</b>	Land systems classified according to their primary economic and/or ecological functions and physical characteristics.
<b>Purpose:</b>	To group land assets by their main value orientation, facilitating targeted management and investment strategies.
<b>Categories:</b>	Croplands, Timberlands, Rangelands, Protected lands, Rewilding lands, Wetlands, etc.
<b>Level 3: Ecosystem Asset Types</b>	
<b>Definition:</b>	Distinct ecological systems characterised by their ecosystem attributes, management strategies, capacity to generate ecosystem services and value-generating purpose – cultural, economic or policy <sup>33</sup> .
<b>Purpose:</b>	To provide investors with a clear guide on the types of land assets available for investment, the value returns they can generate, the necessary ecological land management practices, and the associated costs and risks. Additionally, to empower land managers to effectively communicate this information to investors.

32 Specifically, Dou, Y., et al., 2021. A new European land systems representation accounting for landscape characteristics. *Landscape Ecology*, 36: 2215-2234.

33 This definition seeks to adapt the UN SEEA definition to finance, informed by Hien et al., 2016 [Defining Ecosystem Assets for Natural Capital Accounting](#). Plos 1. and Jepson et. al., 2017 [Protected Area Asset Stewardship](#). *Biol. Cons.* 212: 183-190



**Types (Examples):** Restored Peatland, Floodplain Rewilding, National Nature Reserve, Softwood Plantation, Regenerative Arable.

**Level 4: Value-Generating Practices (VGP)**

**Definition:** Management approaches and projects designed to maximise the ecological and/or economic value derived from specific types of land assets.

**Purpose:** To design, communicate and monitor land management practices that effectively enhance the value-generating capacity and potential of land assets. Additionally, to enable analysis of the impact of ecosystem condition of a land asset on the wider economy, society and culture.

**Types (Examples):** Natural Grazing, Broadleaf Woodland Management, Sheep Ranching, Barley Cultivation, Deer Stalking.

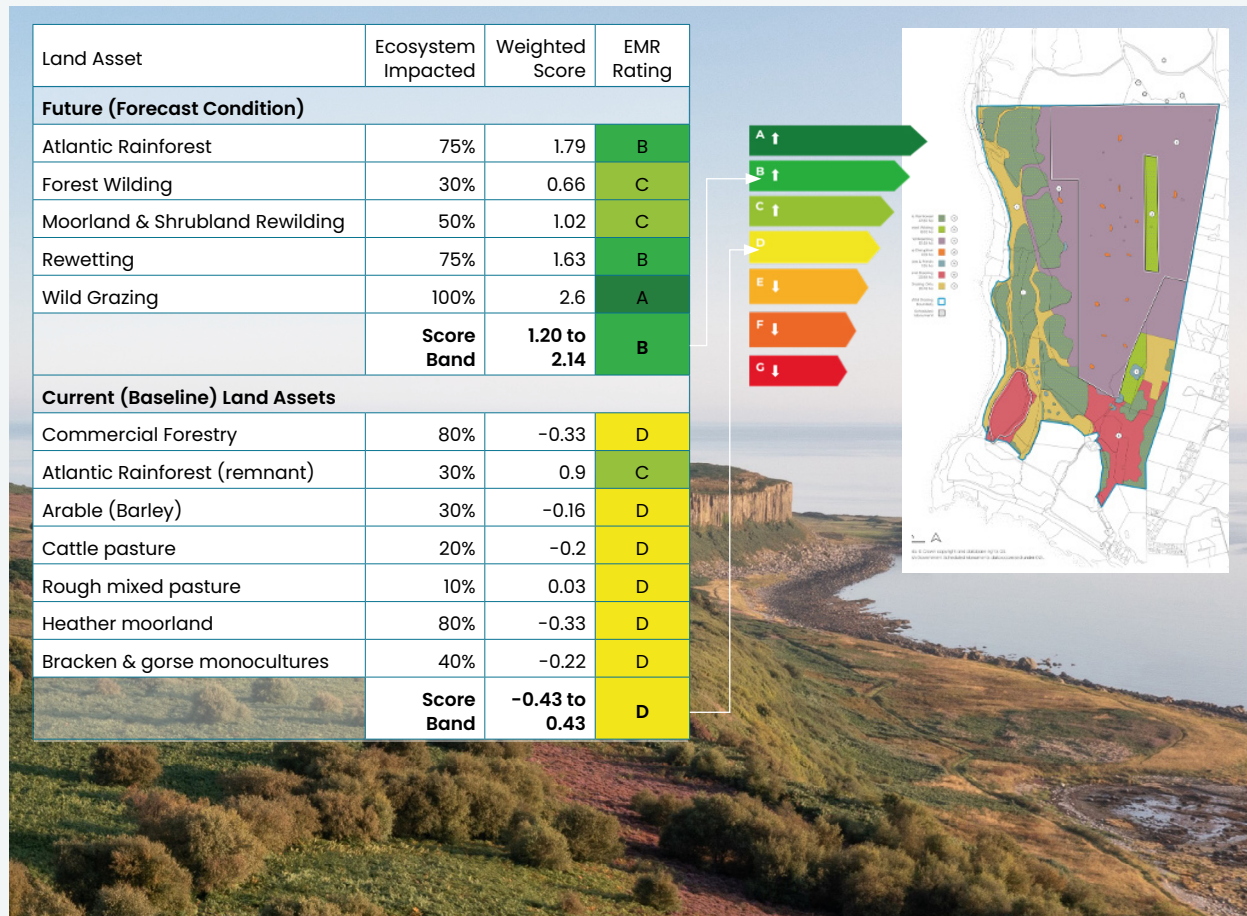
**Level 5: Land Management Activities**

**Definition:** Techniques or tasks carried out to implement value-generating practices effectively on the ground.

**Purpose:** To detail the operational actions required to realise the value potential of land assets, ensuring practical, in-context land management planning.

**Types (Examples):** Bracken Management, Tree Planting, Introduction of Functional Bovids, Pasture Reseeding, Drain Infilling.

**Case Study: Drumadoon Farm Ecological Land Management Rating**



Each land asset represents a set of value-generating practices each of which is scored against each natural process (shown here aggregated). The ecosystem impact column refers to the percentage of the total project area impacted by the land asset. Drumadoon is currently rated D.



## Section 4: Biodiversity and Ecosystem Services Metric Portfolio

### 4.1. Purpose

The Ecosystem Services Metric Portfolio is intended to supplement the Ecosystem Condition Index (ECI) by providing measures of defined ecosystem services that can help strengthen the business case for investing in the recovery and maintenance of ecosystem integrity. This portfolio offers an initial suite of ecosystem services and potential metrics and is included to initiate discussion and inspire further development.

### 4.2. Rationale

The availability, quality and efficacy of ecosystem services are directly dependent on the condition of ecosystems<sup>34</sup>, and ecosystem processes<sup>35</sup>. Healthy ecosystems generate a wide range of services that benefit different groups within society, including landholders, local communities, companies, and public service delivery agencies. The importance of these ecosystem services varies among beneficiaries, influencing their decisions to invest in the recovery and maintenance of ecosystem health.

Moreover, many ecosystem services and their benefits are a co-production between the ecosystem, land managers, and society. The value and utility of ecosystem services and benefits like natural flood management, pollutant filtering, wellness and cultural identity are closely tied to the interplay between natural processes and human interventions, as well as their geographic proximity to human populations, company operations, and local risk factors.

However, there can be trade-offs between restoring the condition of natural processes and delivering specific ecosystem services. For example, in wetland systems, managing water levels to optimise services like flood control and water filtration might conflict with efforts to restore natural processes that promote ecosystem complexity. Building levees or maintaining certain water levels might enhance specific services for human benefit but could hinder the natural dynamics that support broader ecosystem integrity. Deploying the three components of the NARIA framework helps to make these trade-offs clear ensuring the investment in ecosystem restoration optimises both ecological and human needs.

This component of NARIA identifies direct ecosystem services as outcomes that are material to the production of goods, the cost-effective delivery of commercial or public services, compliance with regulations, and/or the fulfilment of commitments. While some ecosystem services result from overall ecosystem integrity, others are more directly linked to specific aspects of biodiversity e.g. tree species that are particularly effective at removing atmospheric pollutants.

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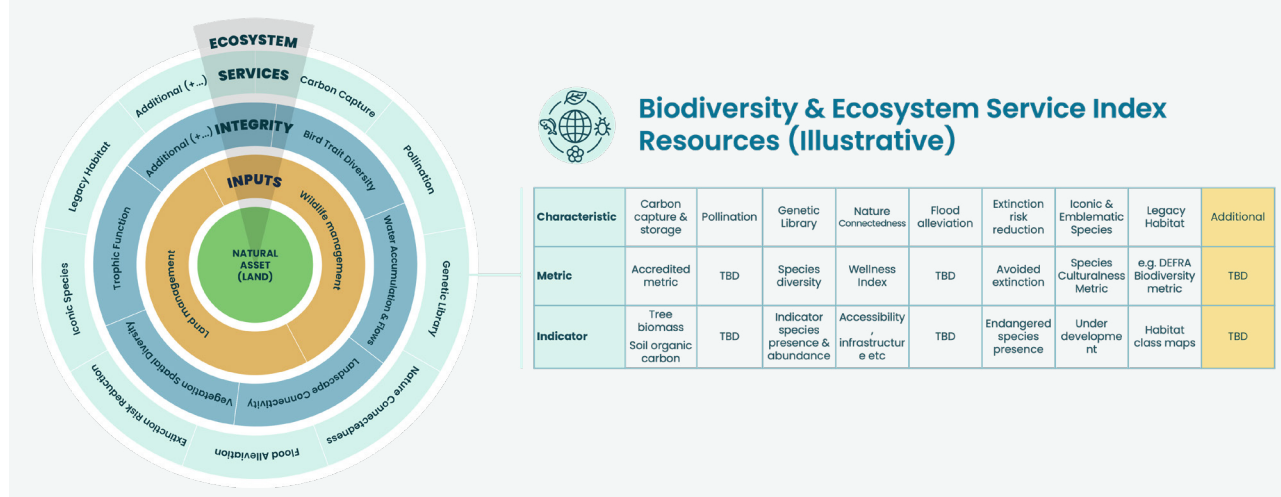
<sup>34</sup> See [UN System of Environmental Economic Accounting – Ecosystem Accounting](#)

<sup>35</sup> Fu, B., Wang, S., Su, C. and Forsius, M., 2013. Linking ecosystem processes and ecosystem services. *Current Opinion in Environmental Sustainability*, 5: 4-10.



For consistency, the measurement of ecosystem services mirrors the approach used in the Ecosystem Condition Index, but an ecosystem service rather than a natural process becomes the ecosystem dimension that is represented and quantified. NARIA ecosystem service metrics should always be reported in conjunction with both the Ecosystem Condition Index (ECI) and the Ecosystem Management Rating (EMR). This integrated reporting ensures that land management practices and ecosystem services are evaluated holistically, preventing the prioritisation of economic incentives over ecological integrity and mitigates the risks of greenwashing charges.

**Figure 3: Biodiversity and Ecosystem Service Metric Portfolio within the NARIA Framework as a Measure of Ecosystem Service Outputs and Outcomes**



### 4.3. A Portfolio of Ecosystem Services and Associated Metrics

This subsection identifies and describes ecosystem services that are material to commerce and policy, grouped into those arising from the ecosystem as a whole and those linked to specific components of biodiversity. As indicated earlier, this component of the NARIA Framework is in the early stages of development.

#### 4.3.1 Ecosystem Condition Services

##### 4.3.1.1. Carbon Capture and Storage

This service involves the process by which atmospheric CO<sub>2</sub> is absorbed and retained in long-term carbon pools within ecosystems, helping to mitigate climate change. Primary beneficiaries include entities committed to net-zero targets, such as companies, governments, and individuals, with this service often monetised through carbon credits. This service results from natural processes like photosynthesis and carbon sequestration in plants and soils. Existing carbon metrics<sup>36</sup>, predominantly measuring above-ground biomass, can quantify this service, though newer techniques aim to capture more comprehensive carbon stocks.

36 E.g. those included in standards endorsed by [ICROA](#) such as VERRA and GoldStandard



#### **4.3.1.2. Flood Alleviation**

Natural ecosystems like wetlands and forests reduce flood risks by absorbing and gradually releasing water, acting as buffers against heavy rainfall. This service is vital for communities, businesses, and municipalities in flood-prone areas. It works through processes like soil infiltration and vegetation interception, which slow water movement and mitigate flooding. The effectiveness of this service could be assessed using a Floodplain Ecosystem Condition Index that integrates existing ecosystem condition metrics (see Section 2.4.1).

#### **4.3.1.3. Water Purification**

Ecosystems such as wetlands and riparian zones naturally remove contaminants, ensuring clean water for various uses. This service is crucial for communities, utilities, and industries, particularly where water quality is regulated. Processes like soil filtration and vegetation interception drive this service, with water quality metrics from national agencies providing potential measurement methods.

### **4.3.2. Biodiversity Ecosystem Services**

#### **4.3.2.1. Extinction-Risk Reduction**

This service involves the protection and management of endangered species to meet legal and ethical responsibilities. Beneficiaries include government agencies, conservation charities, and society at large. It relies on processes that create and maintain habitats, supported by human interventions such as threat reduction. An Avoided Extinction Metric (AEM) could measure this service by assessing the effectiveness of conservation actions.

#### **4.3.2.2. Heritage Habitat Conservation**

This service preserves habitats that have emerged from traditional agricultural practices, and which provide cultural heritage, biodiversity protection and research benefits. The service arises from the continuation or replication of traditional agricultural practices and is important for conservation charities, government agencies, and developers required to deliver biodiversity net gain in planning. The service is delivered through habitat management and monitoring, with tools like [England's statutory biodiversity metric](#) used to assess habitat value and condition.

#### **4.3.2.3. Genetic Library**

This service preserves genetic diversity within species, providing resources for research, agriculture, and biotechnology. It is valuable for research institutions and industries reliant on genetic material. The service results from natural evolutionary processes, and standard taxon dissimilarity metrics could be used for its measurement.



#### **4.3.2.4. Pollination**

Pollination services are essential for food production and biodiversity, carried out by a variety of agents such as bees and birds. It supports agricultural productivity and food security, with beneficiaries including farmers and food companies. This service could be measured with a Pollinator Abundance & Diversity Metric or a Pesticide Application Metric.

#### **4.3.2.5. Nature Connectedness**

This service provides psychological and emotional benefits from engaging with nature, crucial for public health and well-being. It benefits health services, social care providers, and the wellness industry. The service is delivered through maintaining diverse natural areas and infrastructure for nature engagement: CreditNature has conducted initial development work on a wellness index that could be used to quantify this service.

#### **4.3.2.6. Iconic and Emblematic Species**

Certain species contribute to cultural identity and economic benefits through tourism and media. This service benefits conservation organisations, media companies, and tourism operators, though commercial mechanisms for payment are limited. The service is assured through species protection and management. CreditNature has conducted initial development work on a Species Culturalness Index to measure this ecosystem service.<sup>37</sup>

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<sup>37</sup> This implements conservation culturomics approaches that quantify the internet salience of species. See e.g. Correia, R.A. and Di Minin, E., 2023. Tracking worldwide interest in sustainable development goals using culturomics. *PLOS Sustainability and Transformation*, 2. p.e0000070.



## Section 5: NARIA Framework Investment, Business and Market Applications

The CreditNature Natural Asset Recovery Investment Analytics (NARIA) framework provides a consistent, scalable approach to baselining and forecasting gains in ecosystem and biodiversity condition resulting from restorative land management practices. It translates the complexity of ecosystems into standardised units for ecological reporting and accounting, ensuring robustness, credibility, and consistency.

The NARIA framework is designed to encourage and unlock private sector investment in the restoration, enhancement and maintenance of ecosystem integrity, resilience, and services. By providing a clear and consistent metric framework, it supports the development of credible nature finance instruments and corporate strategies, aligning with global initiatives like the Kunming–Montreal Global Biodiversity Framework (GBF), Taskforce on Nature–related Financial Disclosures (TNFD), and the EU Corporate Sustainability Reporting Directive (CSRD).

The NARIA framework offers evidence–based metrics and key performance indicators (KPIs) that allow corporations and financial institutions to assess, manage, and disclose their nature–related dependencies and opportunities. It enables the development of nature–positive strategies and supports the design of impact investment products that integrate ecosystem restoration KPIs, driving meaningful ecological outcomes.

### 5.1. Nature Credit Markets

CreditNature has developed a Nature Investment Certificate (NIC), representing a fractional stake in restorative land management programs. NICs yield Nature credits, calculated and forecasted using the NARIA Ecosystem Condition Index (ECI) in combination with the Ecosystem Management Rating (EMR). Additionally, Nature and Climate Impact Certificates bundle carbon credits, offering a premium product that integrates ecosystem and carbon stock management.

The flexibility of the NARIA framework supports various nature credit schemes, facilitating future developments and innovations in nature finance.

### 5.2. Corporate Sustainability Reporting and Disclosure

The EU Corporate Sustainability Reporting Directive (CSRD), in conjunction with the Taskforce on Nature–related Financial Disclosures (TNFD), is driving a transformative shift in how companies understand, assess, and report their interactions with nature. The CSRD requires companies to disclose their nature–related risks, dependencies, and opportunities, while the TNFD framework provides guidance on assessing and managing these risks and opportunities, helping businesses align their strategies with global biodiversity goals. Together, these initiatives push companies to integrate nature into their business models, accounting, and investment decisions.



The distinction between disclosing nature-related risks and dependencies and developing nature-positive strategies is increasingly vital. Disclosures under the CSRD and TNFD focus on understanding how a company's operations affect natural systems and rely on biodiversity, while nature-positive strategies require a proactive commitment to restoring and enhancing ecosystem integrity. Both aspects are interconnected, as businesses can use nature-positive strategies to mitigate long-term risks identified in their disclosures, enhance brand reputation, and develop new business opportunities.

Both the CSRD and TNFD are driving the shift from narrative-based sustainability reporting to a more quantitative, data-driven, and auditable approach. By providing scientifically robust and standardised ecological metrics, the NARIA framework helps companies ensure credibility, consistency, and transparency in corporate reporting, protecting them from allegations of 'greenwashing' and enabling reputational benefits from their investment in ecosystem restoration.

### **5.3. Bonds**

Nature performance bonds<sup>38</sup> are innovative debt instruments offering relief on interest or principal when agreed nature-based outcomes are achieved. The NARIA framework provides a scalable method for validating the ecological performance of these bonds through KPIs, supported by Nature Impact Certificates, ensuring transparency and accountability in ecosystem outcome delivery.

### **5.4. Risk Management and Disclosure**

With the rise of ESG, there is a global imperative to shift financial flows from nature-negative impacts to nature-positive outcomes. The NARIA framework aligns with the goals of the Kunming-Montreal GBF, TNFD, and Science Based Targets for Nature (SBTN), offering a cost-effective approach to assessing risks and tracking progress toward science-based targets across geographies.

### **5.5. Investment Ratings**

The NARIA framework provides a reliable and understandable method for identifying and risk-rating investment opportunities across diverse land assets and geographies, supporting informed decision-making and investment strategies.

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<sup>38</sup> See e.g. F4B [Nature Performance Bonds](#), FAQ.



# Glossary of Terms

**Bioabundance** – a quantity that describes the number of individuals within each species within in an area of interest (Encyclopaedia of Environmetrics, 2013).

**Biodiversity** – the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (Convention on Biological Diversity)

**Biome** – “a biotic community finding its expression at large geographical scales, shaped by climatic factors and characterised by physiognomy and functional aspects, rather than by species or life-form composition” (Mucina, 2019). (para. 3.62)

**Biodiversity intactness** – the extent to which a habitat is untouched and/or unharmed by factors that diminish its area and/or the variety of species it contains.

**Biodiversity resources** – the diverse biological elements and their genetic, species, and ecosystem-level variations that support both everyday human sustenance and livelihoods, and the development, manufacture, and delivery of products, services, and research and development in fields such as agriculture, medicine, and engineering (P. Jepson, CreditNature).

**Carbon capture/drawdown** – the process of sequestering carbon dioxide from the atmosphere.

**Carbon retention/persistence** – the long-term storage of carbon within organic matter and soils.

**Eco-parcel** – a method of distinguishing between areas based upon current and past land use with ecological aspects.

**Ecoregion** – an area defined by its natural features and environment. (WWF)

**Ecosystem** – “a dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit” (Convention on Biological Diversity).

**Ecosystem Asset** – a defined area characterised by its ecosystem attributes, management strategies and capacity to generate ecosystem services and financial returns (P.Jepson)

**Ecosystem complexity** – the patterns of and interactions between the abiotic and biotic components of a system.

**Ecosystem Characteristics** – system properties of an ecosystem and its major abiotic and biotic components (e.g. water, soil, topography, vegetation, biomass, habitat and species), (UN SEEA glossary)

**Ecosystem condition** – the quality of an ecosystem measured in terms of its abiotic and biotic characteristics (UN SEEA glossary).

**Ecosystem downgrading** – a decline in ecosystem integrity, characterised by a loss of structure, functioning and biodiversity.

**Ecosystem engineering** – the process by which organisms, including humans, actively shape and modify their environment, influencing both the abiotic (non-living) and biotic (living) components (Hastings et. al. 2007 Ecology Letters)



**Ecosystem function** – the movement of energy and materials through a system governed by ecological processes.

**Ecosystem infrastructure** – a form of civic infrastructure that involves restoring, managing, and/or engineering natural ecosystems – such as wetlands, forests, grasslands and coastal areas – to enhance societal resilience and economic adaptability to environmental changes and other challenges (P. Jepson, CreditNature).

**Ecosystem integrity** – an ecosystem’s capacity to maintain its characteristic composition, structure, functioning and self-organisation over time within a natural range of variability (UN SEEA glossary).

**Ecosystem services** – the contributions of ecosystems to the benefits that are used in economic and other human activity (UN SEEA glossary).

**Ecosystem structure** – the living and non-living components that make up an ecosystem.

**Ecosystem uplift** – an increase in ecosystem integrity, characterised by a recovery of structure and functioning leading to more biodiversity.

**Functional trait** – survival, development, growth and reproduction attributes that have evolved to optimise an organism’s survival and their impact on their ecosystem.

**Habitat** – the area and resources used by a particular species (the habitat of a species) or an assemblage of animals and plants together with their abiotic environment (European Environment Agency)

**Mega-herbivore** – generally refers to animals over 40kg in weight.

**Natural asset** – all living and non-living components of an ecosystem or area from which we can derive, and potentially monetise, ecosystem value.

**Natural disturbance** – events that create local changes in ecosystem structure often leading to greater microhabitat variety that leads to increased biodiversity.

**Nature-finance-related KPI** – a metric that assesses the impact of financial instruments tied to environmental outcomes. These KPIs incentivise progress toward nature-positive objectives by influencing financial terms such as interest rates, coupon rates, or access to capital.

**Nature Performance Bond** – a debt instrument that ties the financial terms, such as interest rates or repayment amounts, to achieving specific environmental or nature-related outcomes (Nature Finance)

**Nature-related risk** – the economic risk to an organisation associated with the degradation of the nature it depends on.

**Niche** – the conditions required for survival and interactions with other organisms.

**Nature-based solutions** – Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. (European Commission)

**Real Estate** – the land and any permanent structures, like a home, or improvements attached to the land, whether natural or man-made (Investopedia).



**Rewilding** – an open-ended approach to ecosystem restoration that foregrounds the recovery of natural processes and non-human autonomy often involving the restoration of large-herbivore guilds and apex predators.

**Trophic level** –the location of an organism on the food chain for that ecosystem. A trophic level is typically divided into five levels with Level 1 being a primary producer, Level 2 being a primary consumer, Level 3 being a secondary consumer, Level 4 being tertiary consumers, and Level 5 consisting of the apex predator (Higley et al, 2023)

**Trophic Function** – the role that organisms play in the flow of energy and nutrients through an ecosystem, primarily from one level to another in food webs.



# Annex

## Alignment with International Frameworks and Initiatives

Our framework for assessing ecosystem uplift is designed to support the design and delivery of international biodiversity targets and regulatory nature finance initiatives.

### I. Kunming–Montreal Global Biodiversity Framework

The NARIA framework facilitates the delivery of **Goal A** and **Target 2** of the landmark Kunming–Montreal Global Biodiversity Framework (GBF), agreed upon at the 15th meeting of the Conference of Parties in December 2022. This international agreement envisions a future where the integrity, connectivity, and resilience of ecosystems are enhanced by 2050. In alignment with **Target 2**, which seeks to restore at least 30% of degraded terrestrial, inland water, and marine ecosystems by 2030, the NARIA framework – through its Ecosystem Condition Index (ECI) and Ecosystem Management Rating (EMR) – provides the tools needed to strategically plan, manage, and measure ecosystem restoration efforts effectively.

The NARIA framework also directly supports the financial mobilisation efforts outlined in **Target 19**, which aims to secure \$200 billion annually for biodiversity-related activities. By offering a scalable and scientifically robust ecosystem accounting approach, NARIA enables the development of financial mechanisms based on quantifiable changes in ecosystem condition, such as nature credits, nature performance bonds, and nature recovery investment funds.

Uniquely, NARIA bridges financial mobilisation (**Target 19**) with corporate governance (**Target 15**), which governs the practices of corporations and financial institutions in their biodiversity initiatives. By providing credible, data-driven metrics for tracking ecosystem uplift across geographically defined areas, the framework supports the development of nature-positive strategies tailored to the specific needs of corporations and investors, integrating quantitative impact measurement into sustainable business practices.

### II. Taskforce on Nature-Related Financial Disclosures

The Taskforce on Nature-related Financial Disclosures (TNFD) builds on efforts initiated in the 1990s to recognise the dependencies of economic activities on nature, now estimated at \$44 trillion per year. This global, market-led initiative aims to develop and deliver a comprehensive risk management and disclosure framework, enabling companies, investors, and lenders to adequately account for nature-related risks and opportunities linked to these dependencies in their decision-making processes.

The NARIA framework enhances TNFD-aligned reporting by providing an evidence-based approach to assessing risks associated with the loss of ecosystem integrity. Importantly, it offers a structured method for companies to consider the long-term risks tied to historical ecosystem degradation and to identify strategic opportunities that arise from investing in ecosystem restoration. These opportunities range from unlocking new business models and enhancing

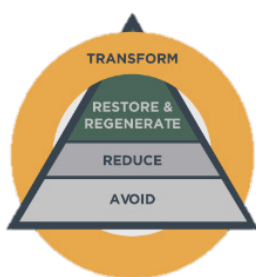


corporate reputation, to improving employee recruitment and retention, and ensuring the long-term resilience of their customer base.

The NARIA framework provides a scientifically robust solution for quantifying and reporting on both nature-related risks and opportunities. Through standardised metrics such as the Ecosystem Condition Index (ECI) and Ecosystem Management Rating (EMR), companies and financial institutions can effectively assess the impacts of ecosystem degradation and identify the potential uplift from restoration activities. This allows organisations to integrate nature-related risks and opportunities into their reporting and decision-making processes, offering a clear path toward sustainable and nature-positive business practices that align with the TNFD and emerging regulations such as the EU Corporate Sustainability Reporting Directive. By adopting NARIA, companies can ensure that their investments are measurable, transparent, and contribute to long-term ecological, financial and societal resilience.

### III. Science-Based Targets for Nature

The Science-Based Targets Network (SBTN) is one of four components of the Global Commons Alliance (GCA), which brings together some of the world's most influential organisations in business, advocacy, science, and philanthropy. The SBTN framework provides guidance on setting science-based targets that help organisations chart a safe and just pathway for humanity. This is done through setting measurable, time-bound targets that align with global efforts to protect nature and biodiversity.



**Figure 4: SBTN AR3T Action Framework<sup>39</sup>**

The SBTN framework is built around the terms 'goals' (high-level ambition statements), 'targets' (specific, time-bound objectives), and 'indicators' (metrics used to track progress). The NARIA framework is designed to align seamlessly with this hierarchy, offering practical tools such as the Ecosystem Condition Index and Ecosystem Management Rating (EMR), which supports the development of nature recovery goals and the

creation of measurable, time-bound targets. These targets are directly linked to indicators of ecosystem integrity and biodiversity, enabling companies to track and report on their progress in a clear, data-driven manner.

In addition, the NARIA framework's rewilding science heritage is closely aligned with the **SBTN AR3T Action Framework**, which includes steps to **Avoid, Reduce, Restore, Regenerate**, and **Transform** ecosystems. NARIA's structure is designed with these restoration and regeneration principles in mind, making it a practical tool for companies aiming to achieve ambitious environmental goals. Moreover, NARIA's Ecosystem Condition Index assessment and EMR components fully support the five-step process outlined in the latest SBTN guidelines, helping companies to assess risks, set science-based targets, and forecast the potential uplift that can be achieved through strategic nature-based actions.

<sup>39</sup> [Overview – Science Based Targets Network](#).



## IV. The EU Taxonomy for Sustainable Economic Activities

The EU Taxonomy provides a common classification system to ensure that economic activities contribute significantly to environmental objectives, using science-based criteria. It aims to harmonise and streamline reporting and disclosure requirements, particularly under the EU **Corporate Sustainability Reporting Directive (CSRD)**, allowing businesses and investors to make informed decisions on sustainable practices.

The taxonomy outlines six key climate and environmental objectives that economic and investment activities must address to qualify as environmentally sustainable:

1. Climate change mitigation
2. Climate change adaptation
3. Sustainable use and protection of water and marine resources
4. Transition to a circular economy
5. Pollution prevention and control
6. Protection and restoration of biodiversity and ecosystems.

To qualify as environmentally sustainable under the taxonomy, activities must meet four overarching conditions:

1. Make a significant contribution to at least one of the six environmental objectives
2. Do no significant harm to any of the other five objectives
3. Comply with minimum safeguards
4. Fulfill the technical screening criteria set out in the Taxonomy delegated acts.

Restorative economic and investment activities focused on ecosystem integrity not only meet these conditions but also qualify for multiple environmental objectives beyond biodiversity and ecosystem restoration. The NARIA framework plays a critical role in this context by offering a quantitative tool to measure and verify the impact of land management and investment activities under the EU taxonomy. The NARIA Ecosystem Condition Index (ECI) and Ecosystem Management Rating (EMR) allows businesses and investors to accurately assess their contributions to sustainability objectives, ensuring they align with the stringent requirements of the EU taxonomy. This framework not only supports compliance but also strengthens the credibility of nature-positive investments by providing data-driven validation of ecosystem recovery outcomes.

## V. Sustainable Development Goals

The Sustainable Development Goals (SDGs)<sup>40</sup> are a central pillar of international efforts to achieve a development model that promotes peace and prosperity for both people and the planet, now and into the future. The NARIA framework provides a scientifically grounded approach that contributes to several key SDGs, supporting both environmental restoration and socio-economic well-being.

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40 United Nations. (2022) *The 17 Goals*. <https://sdgs.un.org/goals>

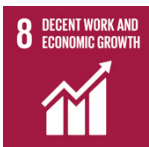




**SDG 3** 'Ensure healthy lives and promote well-being for all at all ages'. Land assets with higher levels of ecosystem integrity offer greater opportunities for nature connection, nature-based activities, and exposure to beneficial microbiota, all of which are linked to improved mental health and well-being (**Target 3.4**). Studies confirm the positive impact of natural environments on human health, making NARIA's focus on restoring ecosystem integrity a key contributor to this goal<sup>41</sup>.



**SDG 6** 'Ensure availability and sustainable management of water and sanitation for all'. The recovery of ecosystem integrity directly enhances natural hydrological processes, including water infiltration and flow reduction, which are essential for sustaining water-related ecosystems (**Target 6.6**) and improving water quality (**Target 6.3**). By applying the NARIA framework to land management, organisations can expand the area of functioning water ecosystems, contributing to sustainable water resource management.



**SDG 8** 'Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all'. The NARIA framework promotes nature-based economies by embedding rewilding principles<sup>42</sup> into land management, supporting industries such as sustainable tourism and the development of premium products tied to natural capital. This fosters economic growth while aligning with **Target 8.9**, which emphasises sustainable tourism and employment opportunities in harmony with nature.



**SDG 13** 'Take urgent action to combat climate change and its impacts'. Through ecosystem restoration and rewilding, the NARIA framework contributes to making ecosystems more resilient to climate change (**Target 13.1**). Additionally, NARIA's Ecosystem Condition Index represents natural processes that improve the capacity of ecosystems to sequester and store carbon in the long term<sup>43</sup>.



**SDG 15** 'Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss'. Land assets managed under the NARIA framework directly support the achievement of this goal by committing to measurable improvements in ecosystem integrity and biodiversity. NARIA provides tools to track and report on the restoration and sustainable management of land, helping to combat land degradation and biodiversity loss in line with **Targets 15.1** and **15.5**.

41 Martin, L., White, M.P., Hunt, A., et al., 2020. Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology*, 68, p.101389. <https://doi.org/10.1016/j.jenvp.2020.101389>  
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42 Rewilding Europe. (2022) *Rewilding Principles* [Online]. Available at: <https://rewilding-europe.com/rewilding-principles/> (Accessed: 14 April 2022)

43 Malhi, Y., Lander, T., le Roux, E., et al., 2022. The role of large wild animals in climate change mitigation and adaptation. *Current Biology*, 32(4), pp.R181–R196. <https://doi.org/10.1016/j.cub.2022.01.041>



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