Nature Intelligence: Europe's Infrastructure for Regeneration

How shared nature measurement builds trust,
scales nature markets, and enables investment in regeneration

FUTURE FOREST Initiative

Executive Summary

Europe faces the challenge not only of protecting nature, but of actively regenerating it. Technologies, policy frameworks and investment willingness are in place, yet a critical element is missing: a shared infrastructure that enables nature to be measured reliably and comparably, assessed consistently, and integrated into decision-making.

Today, nature data is fragmented, measurement approaches compete, and real-world outcomes often remain unclear. Without a shared measurement logic, trust and investability cannot emerge and new nature markets cannot scale.

With the EU Nature Restoration Regulation (NRR), a binding, Europe-wide assessment framework has been established for the first time, based on the universally applicable metric Ecosystem Condition (EC). To unlock its full potential, however, more than indicators are required: an infrastructure that connects measurement logic, governance and implementation. This white paper therefore proposes the development of a *Nature Intelligence Infrastructure*, built on two pillars:

1. Rules and Quality Infrastructure: an open, neutral framework in which EC-based measurement logics are operationalised, standards are defined, and European requirements are translated into practical, usable guardrails for land management, public administration and the financial sector.

2. Practice and Testing Infrastructure: a network of Living Labs (Resilience Nodes) in which methods, indicators and decision models are tested, validated and further developed under real-world conditions. These labs generate the evidence needed to establish robust rules and procedures that can be applied consistently across Europe.

Together, these two pillars create comparability, market trust, investability and scalable regeneration.

For business and finance, this infrastructure provides a robust foundation for risk management, investment decisions and the development of new nature-based business models. For land managers and public authorities, decision pathways become clearer and data can be reused across multiple purposes. For research and technology, it lays the groundwork for innovation with real-world impact.

The transition towards regeneration will not be achieved through isolated initiatives, but through a system that connects data, decisions and practice. With this white paper, we invite actors from policy, business, research and civil society to jointly build this infrastructure — as the foundation for a resilient, nature-based future for Europe.

Nature as Critical Infrastructure for Europe

Events such as the drought summers between 2018 and 2022, the 2021 flood disaster in the Ahr Valley, and the increasing incidence of wildfires have disrupted supply chains, placed entire economic sectors under strain, and caused economic losses amounting to billions of euros. These events clearly demonstrate that nature is not a backdrop, but critical infrastructure: its condition determines harvests, energy supply, raw material availability, and quality of life.

This white paper outlines how a trusted foundation for investment in nature - and for the scaling of emerging nature markets - can be established. Such a foundation of trust is essential to move ecosystem regeneration from a niche concern to a central economic and societal priority, and to mobilise the capital required to regenerate Europe's ecosystems.

Our perspective is explicitly practice-oriented. Drawing on the work of the **Future Forest Initiative (FFI)** - a do-tank operating at the interface of practice, research and policy - we derive concrete approaches for how nature measurement and nature-based solutions can work together to measure, manage and build resilience and regeneration.

Forests exemplify the dual role that nature will play in the coming decade: they are simultaneously a source of raw materials and a regeneration system, a production factor and a protective shield. Without healthy forests, there will be no resilient bioeconomy - no timber as a sustainable material, no clean water, no fertile soils, and no reliable climate regulation. Forests are not merely part of the solution; they are a prerequisite for solutions to work at all. Their example illustrates what the emerging bioeconomy is fundamentally about: an economy built on living systems, strengthening them through adaptive management rather than exhausting them.

For Europe, the ideas presented here open up significant opportunities. If nature, and forests in particular, is understood as critical infrastructure - measurable, regenerative and investable over the long term - the bioeconomy can evolve from a sectoral trend into a strategic pillar of a resilient economy.

The New Imperative of Nature Measurement

The ability to understand, measure and regenerate nature is becoming a core competence of modern economies and a foundation of economic stability. Worldwide, initiatives are emerging to make dependencies on nature and biodiversity visible. This is an important step, but measurement alone is not sufficient: knowledge must translate into action.

However, complex systems such as nature cannot be deliberately controlled or engineered by humans. They respond adaptively, through feedback loops and often unpredictably. Nature is not a system to be controlled, but one that must be understood, observed and strengthened. This requires a paradigm shift: regeneration must no longer mean designing nature's future like an architect, but creating the conditions in which nature can shape itself. Humans must move from planners to partners - enabling nature to unfold, experiment, learn and adapt. In this way, systems emerge that stabilise themselves, increase in complexity and become more resilient.

How complex systems become governable and investable can be illustrated by the energy sector. Electricity grids, smart meters, market rules and regulatory institutions have created shared measurement logics, suitable governance frameworks and reliable market rules. For nature, a comparable infrastructure backbone has yet to be established. Now is the

right moment to do so, as political momentum, economic incentives and unprecedented technological capabilities are converging.

Political and Regulatory Drivers: From Protection to Regeneration

With the *EU Nature Restoration Regulation (NRR)*, Member States are required to implement restoration measures on at least 20% of degraded land and sea areas by 2030 and to define binding ecological target states. The Regulation also provides a methodology for assessing ecosystem health, establishing for the first time a Europe-wide, mandatory, harmonised and indicator-based measurement logic that can serve as a shared foundation for nature measurement. In addition, the European Commission's *Roadmap towards Nature Credits* (2025) lays the groundwork for making the restoration of ecosystem functions measurable and investable through private finance.

Frameworks such as *TNFD* and *SBTN* support the systematic identification of nature-related risks, dependencies and opportunities. Through *CSRD* and *ESRS*, these approaches are being embedded in corporate reporting, making nature-related disclosures subject to mandatory assurance. The publication of *ISO 17298* at the end ▶

of 2025 further introduced a practice-oriented standard to help organisations assess their dependencies and impacts on biodiversity and nature.

Financial market regulation reinforces this trajectory. From the mid-2020s onwards, requirements for transparency and comparability of nature-related risks and impacts increase significantly. Under the EU Taxonomy Regulation and the **Sustainable Finance Disclosure Regulation (SFDR)**, pressure is growing to disclose alignment with the EU's environmental objectives. The year 2026 marks a key transition phase, as the gradual extension of the Taxonomy to all six environmental objectives - including biodiversity - raises demands for data availability and comparability. More comprehensive and binding disclosure obligations for financial market participants are expected from 2027 onward as the SFDR evolves.

The **EU Bioeconomy Strategy** published at the end of 2025 describes the nature-based economy as the "strategic opportunity of the 21st century". It highlights missing data, heterogeneous standards and fragmented classifications as central investment barriers and innovation bottlenecks. In doing so, the EU confirms that reliable nature measurement is not merely an environmental policy concern, but a core economic mechanism for Europe's competitiveness.

Economic Drivers: Nature as a New Asset Class

Alongside political developments, economic logic is shifting. Companies increasingly recognise that nature loss is not an isolated environmental issue, but a direct business risk. Production disruptions from extreme weather, rising insurance premiums, supply-chain instability and location insecurity are direct consequences of degraded ecosystems. At the same time, nature-based business models are emerging that depend on reliable data - ranging from biodiversity and water credits to parametric insurance products and new forms of risk hedging[1]. As a result, corporate strategies are moving from reactive damage avoidance to proactive resilience building, and ultimately towards regeneration as a value-creation strategy.

Forestry as a Key Actor

Few sectors can serve this emerging economic logic as directly as forestry. Regenerative forest management increases forests' capacity to retain water, buffer heat and absorb disturbances. This not only enhances ▶

[1] for example through the development of parametric nature-based insurance products based on real vegetation or drought indices (e.g. Swiss Re, Munich Re, AXA XL); through nature-risk-adjusted credit portfolios and biodiversity-linked loans, as currently being piloted by institutions such as HSBC, Credit Suisse and the Landwirtschaftliche Rentenbank; or through nature-based site and supply-chain assessments used by companies such as Nestlé, Unilever and Holcim.

forest resilience, but also positions forests as solution providers for companies seeking to reduce nature-related risks. Forestry thus evolves from a traditional supplier of raw materials into a central actor in Europe's regeneration and bioeconomy.

Technological Drivers: From Static Observation to Dynamic Management

Technological progress is expanding the scope of nature measurement and transforming it fundamentally. Technologies such as LiDAR, hyperspectral remote sensing, eDNA analysis, AI-based bioacoustics and model-driven early-warning systems enable high-resolution, near-continuous observation of ecological conditions. As a result, MRV solutions (Monitoring, Reporting & Verification) reach a new level of maturity:

- Monitoring becomes more timely, precise and scalable.
- Reporting enables comparability through maps, dashboards and reports.
- Verification creates legitimacy through independent, auditable review processes.

The building blocks of a modern nature infrastructure are therefore already in place. What remains missing is their coherent integration into a shared system.

Why Nature Markets Fail to Scale

Measurement creates trust. Trust enables financing. Financing enables scale. Scale enables regeneration.

This positive cycle only emerges when rules, measurement logics and practice are integrated within a shared infrastructure - one that makes nature-related data as reliable as energy grids or financial reporting already are. Today, however, reality is dominated by a self-reinforcing negative cycle of uncertainty, methodological competition and investment reluctance.

## Loss of Trust Due to Missing Outcome Measurement

Many actors in emerging nature markets remain locked into the logic of traditional conservation programmes: payments are made for activities rather than for measurable results. This leads to problematic outcomes. In EU-funded projects such as those on the Estonian island of Hiiumaa, even interventions with negative ecological effects, such as the clearance of near-natural forests, were classified as "climate protection" measures because measurement logic and governance were insufficiently defined. As long as impacts are not transparently demonstrated, accusations of greenwashing remain a structural risk. As a result, nature-based markets lack the currency they need most: trust.

Fragmented Measurement Systems and the *"War of Indicators"*

Even when measuring results is part of programmes or interventions, a fundamental question remains: what exactly should be measured? For decades, science has grappled with the seemingly simple task of assessing biodiversity and ecosystem condition. The answer is complex, and the resulting measurement landscape is highly fragmented. New MRV systems, certification schemes, private-sector solutions, national monitoring programmes and international frameworks such as the **UN SEEA EA** coexist - but rarely in a coherent way. The result is the use of similar terms with very different meanings. Tree species diversity, for example, can be assessed via satellite imagery, LiDAR, eDNA analysis or field surveys - each with distinct scales, accuracies and cost structures. For practitioners, this creates the illusion of comparability without genuine compatibility. ▶
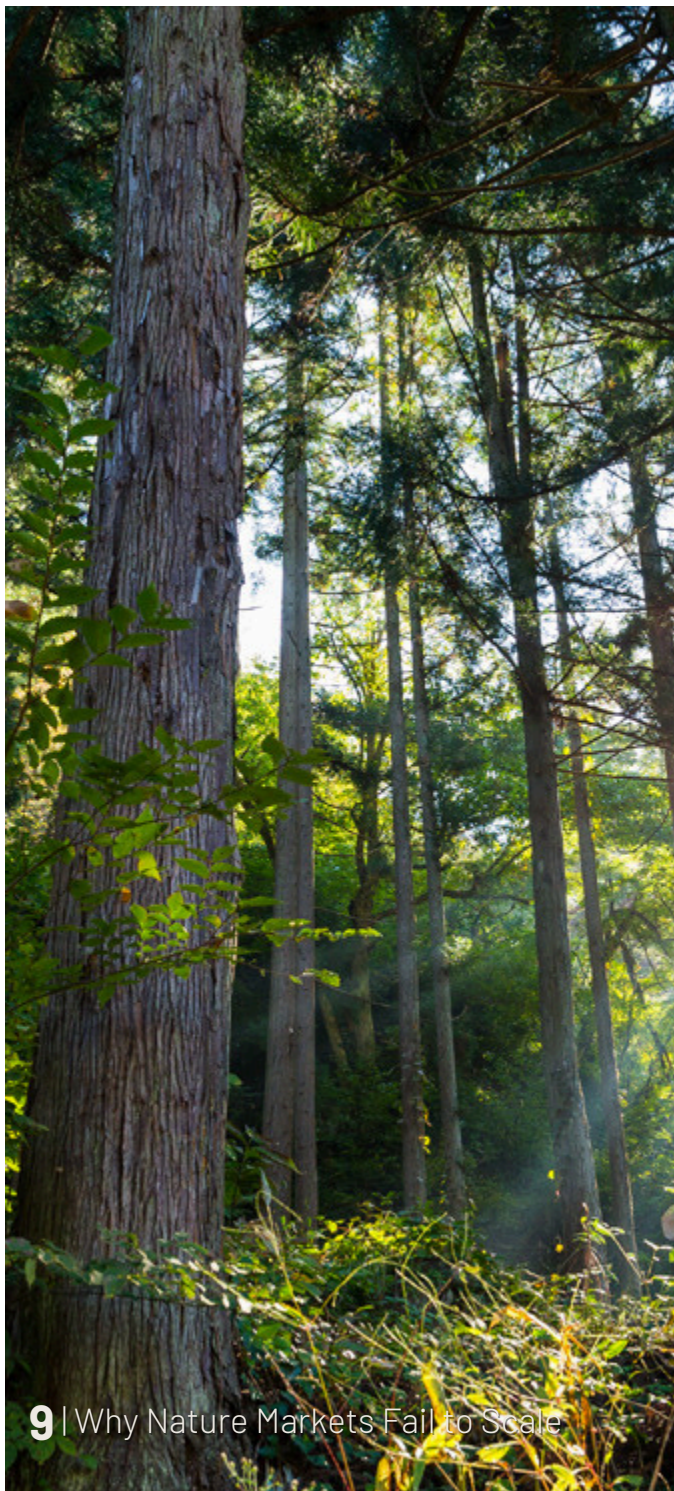
The more actors develop their own indicators, assessment logics or scoring systems, the further the goal of shared quality recedes. A "war of indicators" looms: competition for interpretive authority instead of cooperation. This prevents scaling and blocks market mechanisms before they can take hold. The European Commission explicitly warns of the consequences of such fragmentation in its Bioeconomy Strategy.

Missing Actionability: From Data to Decisions

Once decisions about which indicators to measure - and how - have been made, an even more critical challenge arises: what follows from the diagnosis? Sector expert Eric Wilburn captures this succinctly:

> »THE NEXT FRONTIER FOR NATURE TECH ISN'T IDENTIFYING RISK—IT'S TELLING US WHAT TO DO ABOUT IT.«

Today, many solutions already capture nature- and climate-related risks, biodiversity trends or ecosystem services. Yet they rarely translate data into concrete, site-specific actions. What should a forest enterprise, a company or a municipality do when indicators signal deterioration?
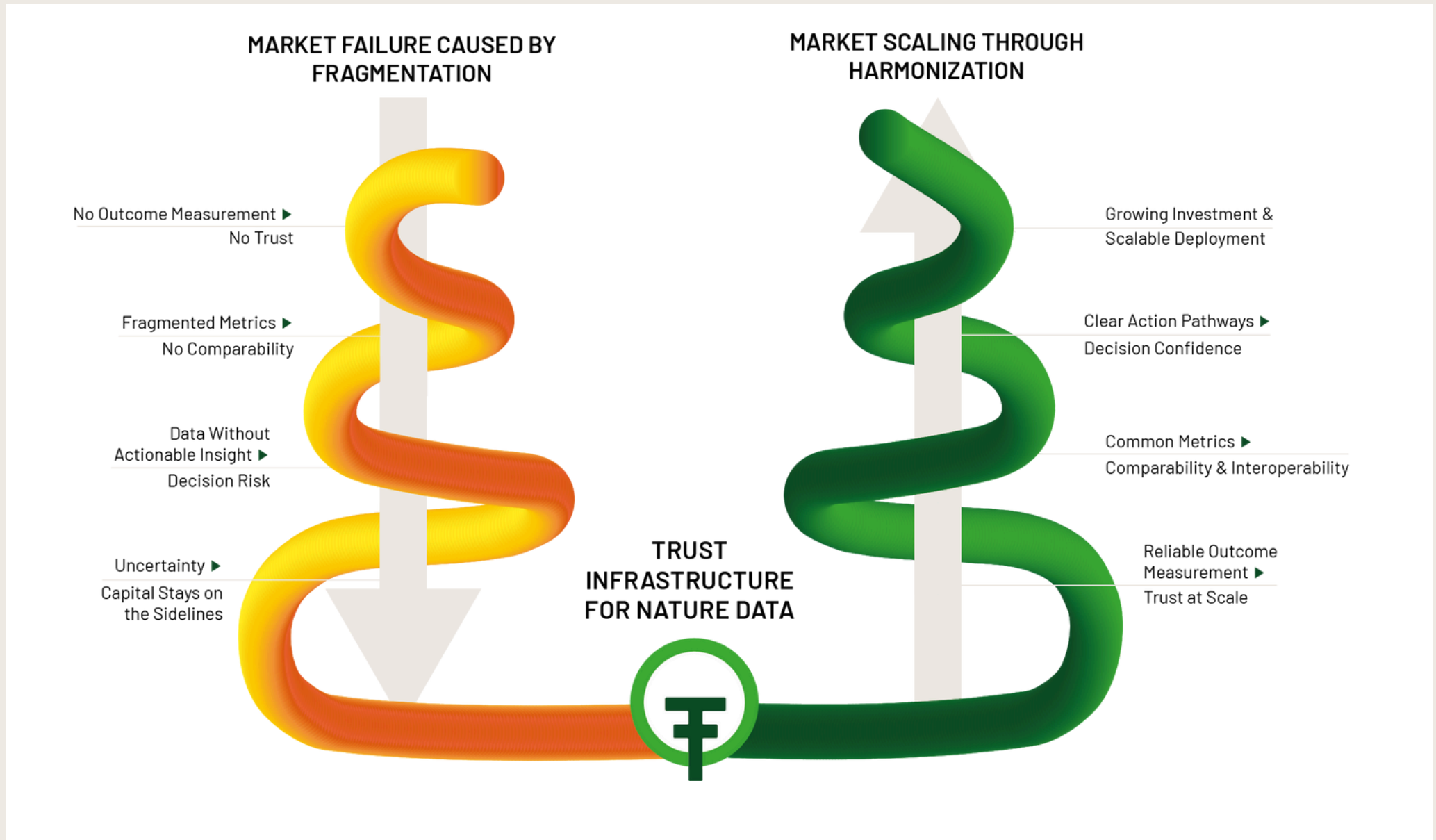
In complex systems such as forests, trade-offs are inevitable. Should water retention or timber production be prioritised? When is ecological non-intervention preferable to active management? Which measures are ecologically sound, economically viable and socially legitimate? Without clearly defined processes that make such trade-offs transparent and traceable, uncertainty emerges - not from bad faith, but from a lack of orientation. The result is a paradox: more data, but less clarity; more transparency, but no trust.

Breaking the Cycle

For nature-based markets to function and scale, this self-reinforcing cycle of uncertainty must be broken. What is needed is a system - across regions, sectors and actor groups - that establishes trust in data, methods and decisions.

Why Nature Markets Fail and How They Can Work

MARKET FAILURE CAUSED BY FRAGMENTATION

No Outcome Measurement ▶
No Trust

Fragmented Metrics ▶
No Comparability

Data Without
Actionable Insight ▶
Decision Risk

Uncertainty ▶
Capital Stays on
the Sidelines

MARKET SCALING THROUGH HARMONIZATION

Growing Investment &
Scalable Deployment

Clear Action Pathways ▶
Decision Confidence

Common Metrics ▶
Comparability & Interoperability

Reliable Outcome
Measurement ▶
Trust at Scale

TRUST INFRASTRUCTURE FOR NATURE DATA

A Trust Infrastructure for Nature Data

As with the energy transition, the same principle applies: infrastructure comes first - only then can trust and markets emerge. In the energy sector, electricity grids, smart meters, market rules and regulatory institutions created a shared foundation for measurement, billing and transparency, enabling trust in data and prices. Translated to the nature sector, this means we need:

- a neutral quality assurer that, together with relevant stakeholders, defines standards, moderates trade-offs and builds trust;
- a shared, interoperable measurement baseline as the lowest common denominator across sectors and nature markets;
- Living Labs as validation spaces in which methods, indicators and market logics are jointly tested, validated and further developed.

But how can the building blocks of such a trust infrastructure be designed in practice?

Ecosystem Condition as a Shared Measurement Baseline

Harmonising and scaling nature markets requires a shared measurement logic that is open and modular enough to integrate new requirements - such as biodiversity markets or reporting obligations. To minimise measurement effort, the guiding principle should be *M.O.R.E. – Measure once, report everywhere.*

A single, quality-assured measurement can serve multiple purposes simultaneously: public reporting obligations, corporate sustainability strategies, and new forms of ecological remuneration such as biodiversity credits or other nature markets.

Ecosystem Condition frameworks provide a robust foundation for a shared measurement baseline, as they systematically integrate biotic and abiotic characteristics to reflect ecosystem health and functionality. Their objective is to make ecological change traceable, support regenerative management and link ecological states to societal value. The metric *Ecosystem Condition (EC)* combines multiple indicators and typically integrates four dimensions:

- Structure (e.g. canopy cover, biomass),
- Function (e.g. soil activity, water balance),
- Composition (e.g. species diversity),
- Landscape (e.g. connectivity, habitat mosaics). ▶
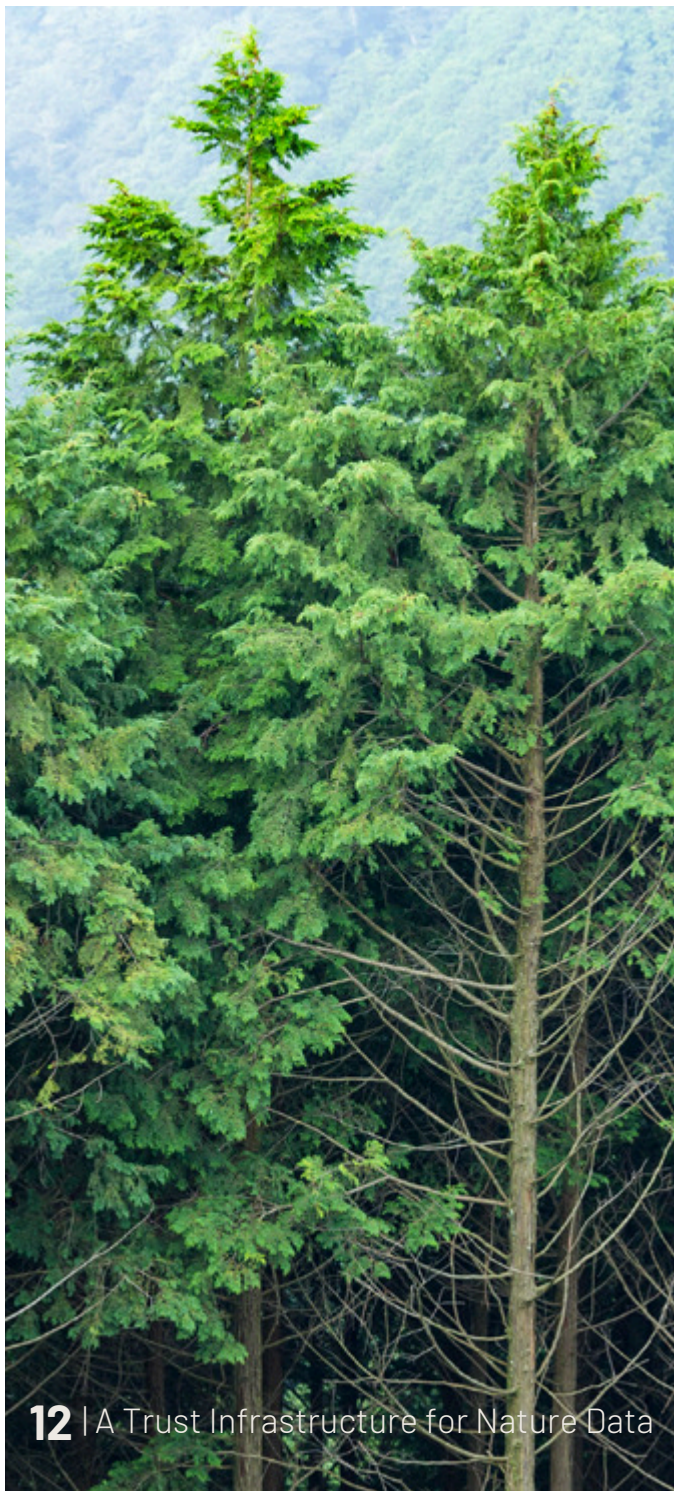
The internationally authoritative framework is the United Nations' **System of Environmental-Economic Accounting – Ecosystem Accounting (SEEA EA)**. It anchors Ecosystem Condition as a central assessment metric, enabling ecological data to be consistently integrated into policy, economic and planning decisions. Complementary approaches such as **Ecological Quality Assessment (EQA)**, as well as analytical models like the **DPSIR** framework of the European Environment Agency (EEA) and the United Nations Environment Programme (UNEP), demonstrate that EC-based assessments can be flexibly combined with other evaluation and decision logics - from national monitoring programmes to regional restoration projects.

With the **EU Nature Restoration Regulation (NRR)**, this approach has, for the first time, been operationalised in a legally binding manner across Europe. In the context of forests, the Regulation defines eight indicators to capture Ecosystem Condition. This establishes a Europe-wide, politically and scientifically accepted foundation for a shared measurement baseline in a market of around 450 million people. The methodology anchored in the NRR therefore represents a natural reference point for harmonising nature-related data.

Living Labs as Workshops of Regeneration

For a jointly developed theoretical framework to be effective, places are needed where it can be practically tested, validated and further developed. Living Labs fulfil this role by bringing together practitioners, public authorities, researchers and technology developers to test and advance indicators, measurement methods and assessment logics under real-world conditions.

> »LIVING LABS ENABLE SOCIETAL INNOVATION LEARNING - AND WITHOUT THAT, TRANSFORMATION WILL NOT SUCCEED.«
>
> *- Maja Göpel*

Living Labs are workshops of trust: data is not generated against one another, but together. Their concrete tasks include:

- comparing new technologies - such as hyperspectral analysis, bioacoustics or AI-based data evaluation - with established methods; ▶

- testing measurement systems for practical applicability, cost and scalability;
- reviewing assessment logics in terms of ecological validity and decision relevance.

The new EU Bioeconomy Strategy explicitly highlights the need for practice-oriented testing environments. It calls for regulatory experimentation clauses, testbeds and demonstration infrastructures in which solutions can be evaluated and scaled in real application contexts. In doing so, the EU confirms the Living Lab approach: testing, validating and integrating innovation in real landscapes and existing systems.

Future measurement methodologies need to evolve in cycles: Living Labs test, independent bodies anchor standards, and updates are rolled out in versioned form. This keeps standards stable while remaining open to innovation. The bottom-up processes enabled by Living Labs are also well suited to translating regulatory requirements - such as the EU Nature Restoration Regulation - into applicable procedures. In sectors such as forestry, this becomes particularly evident: Living Labs demonstrate how nature-based forest management and measurement systems interact, linking risk management, biodiversity conservation and new nature markets into an integrated future model for land use.

From Data Quality to Data Culture

Trust depends not only on data quality, but also on how data is governed and used. An open data governance approach ensures that data is collected according to shared standards, quality-assured and - where appropriate - shared. Key principles include:

- data sovereignty remains with local actors;
- standards ensure comparability and interoperability;
- documentation makes methods transparent;
- shared platforms facilitate exchange and reuse.

This fosters a data culture in which nature measurement is not perceived as a control instrument, but as a foundation for cooperation and collective learning across regions and sectors.

At the European level, pressure is also increasing to harmonise nature-related data, standards and quality criteria, as reflected in the EU Bioeconomy Strategy and the opinion Designing Nature Credits of the European Committee of the Regions. ▶

From Fragmentation to Regeneration

The combination of these approaches - a shared measurement logic, Living Labs as workshops of trust, and governance that treats nature data as a commons - enables the transition: from fragmentation to comparability, from mistrust to investability, and from isolated projects to scalable structures.

The concept of ***the commons*** - resources shared and governed collectively - was developed by economist Elinor Ostrom, who received the Nobel Prize in 2009 for her work on collective resource management. Ecosystem services such as clean water, fertile soils or stable climate systems are classic commons.

The same applies to much of the data that makes their condition visible, especially when data is publicly funded or generated through joint programmes. Only if those who protect and regenerate nature can also participate economically in its stability can a new balance emerge between public benefit and private responsibility. A trust infrastructure for nature data should therefore integrate this commons logic from the outset.

Why This Infrastructure Works: Benefits for Practice

Nature measurement is not a bureaucratic end in itself. In a world that understands nature as critical infrastructure, measurement becomes a lever for securing ecological, economic and societal stability and for enabling value creation.

Business & Finance: From Risk Awareness to Investability

Water, soils and biodiversity are becoming central determinants of corporate resilience. A shared measurement logic makes progress transparent and comparable - similar to carbon accounting in the climate domain - and enables active risk management across value chains. Those who understand and reduce their dependencies strengthen their competitiveness. Nature measurement thus evolves from a compliance obligation into a management instrument.

For the financial sector, a reliable valuation framework emerges. Banks and funds can link loans and investments to measurable improvements in ecosystem condition. Insurers can respond to actual ecological states rather than statistical averages. Requirements under the EU Taxonomy, CSRD and TNFD become operational and verifiable.

Today, the primary economic value for business and finance lies in reducing material risks, preventing damage and safeguarding long-term assets. Nature therefore does not primarily become an object of speculation, but a prerequisite for investability in an increasingly risk-sensitive economy. Over time, additional products with direct financial benefits will emerge -from biodiversity and water credits to nature-based participation models and fund strategies explicitly focused on regeneration. Examples include land and habitat banking models developed by actors such as the Landbanking Group, as well as financing programmes offered by public institutions like the Landwirtschaftliche Rentenbank in Germany.

Land Use & Public Administration: From Compliance Burden to Room for Action

For forest owners and other land managers, a shared measurement logic means that data no longer needs to be collected multiple times. Instead, quality-assured results can be reused across contexts - from subsidy schemes and supply-chain requirements to nature-based markets. Those who improve the condition of their land can credibly demonstrate progress▶
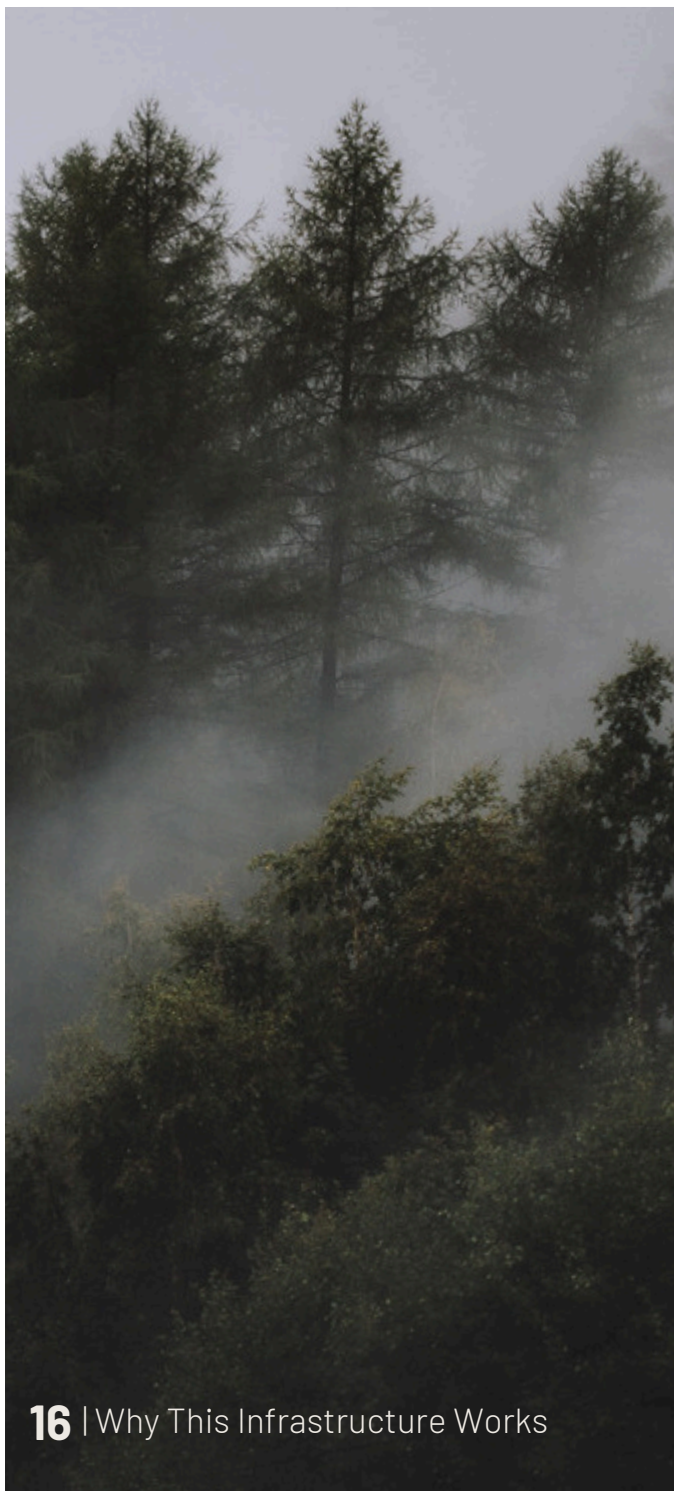
and negotiate confidently around funding, risk-sharing arrangements, certificates or nature credits.

Public administration and policymakers also benefit. Living Labs translate regulatory requirements - such as the EU Nature Restoration Regulation - into procedures that work in practice. This supports a learning administration that can make decisions more quickly, more accurately and more transparently on the basis of improved data, thereby strengthening the legitimacy of policy choices.

Innovation & Research: From Isolated Initiatives to Shared Infrastructure

Start-ups, technology providers and researchers develop the tools that make nature measurement operational: sensors, remote sensing, eDNA, AI-based analytics and MRV software solutions. Open interfaces, shared standards and a common measurement baseline prevent siloed solutions and provide the foundation for scalable business models in high-integrity nature markets – and thus create demand for innovative solutions.

Foundations, strategic partners and public financial institutions can play a catalytic role. Through targeted seed funding, they can support open standards and Living Labs—shifting support from isolated projects towards the development of shared infrastructure that benefits many.

Building a Nature Intelligence Infrastructure for Europe

The transition towards regeneration has reached a point where technologies for nature measurement exist, political objectives are defined, and capital is available. Yet major transformations rarely begin with technology alone; they begin with the infrastructure that enables and sustains it. This is where the Future Forest Initiative comes in.

The Two Pillars of the Nature Intelligence Infrastructure

Our objective is to establish an "alliance of the willing" to jointly develop a Nature Intelligence Infrastructure. This infrastructure is built around two complementary pillars whose interaction ensures coherence, practical relevance and scalability:

Pillar 1: Rules and Quality Infrastructure, where standards, measurement logics and decision guardrails are developed.

Pillar 2: Practice and Testing Infrastructure, where these rules are tested, refined and validated under real-world conditions.

The Rules and Quality Infrastructure

The Rules and Quality Infrastructure brings together science, public administration, technology, land use, finance and civil society, and provides:

- A shared, interoperable measurement baseline grounded in the Ecosystem Condition indicators of the EU Nature Restoration Regulation;
- shared guardrails for trade-offs and decision-making processes ("What follows from a measurement?");
- regularly updated standards that are scientifically robust, practically applicable and aligned with regulatory requirements.

The Testing Infrastructure: Resilience Nodes of Implementation

To ensure that rules do not remain abstract, Living Labs are required in which theoretical assumptions are tested and further developed under real-world conditions. When multiple Living Labs are connected through shared standards, Resilience Nodes emerge: the operational backbone of the *Nature Intelligence Infrastructure.*

Resilience Nodes go beyond traditional Living Labs. They integrate practice, technology, public administration, research and finance, and fulfil functions that become fully effective only in combination: ▶▶

Nature Intelligence Infrastructure as a moderated participatory process
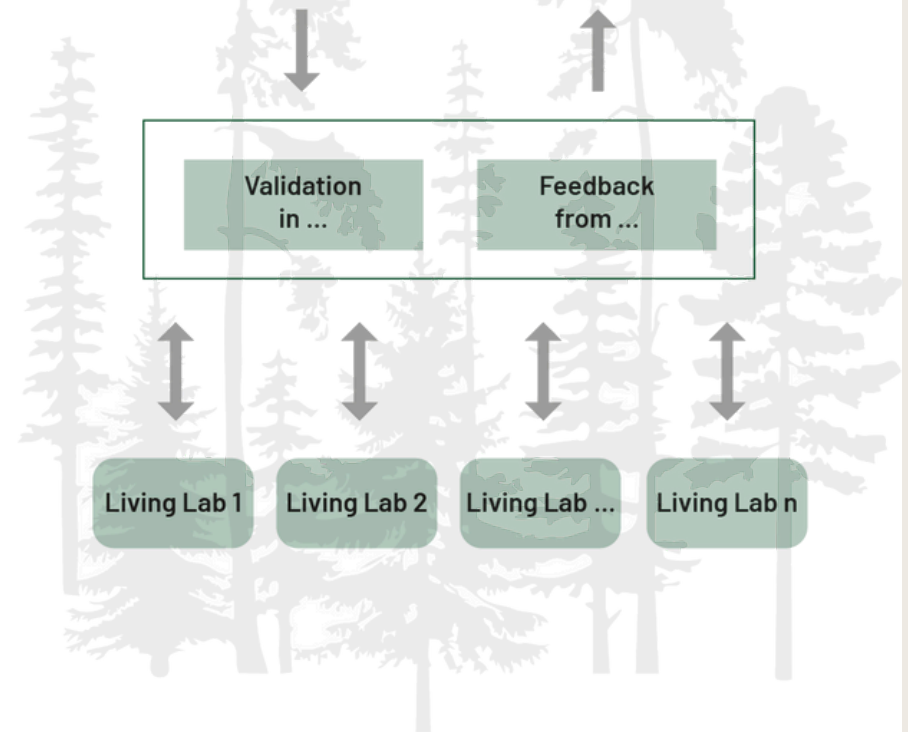

Pillar 1

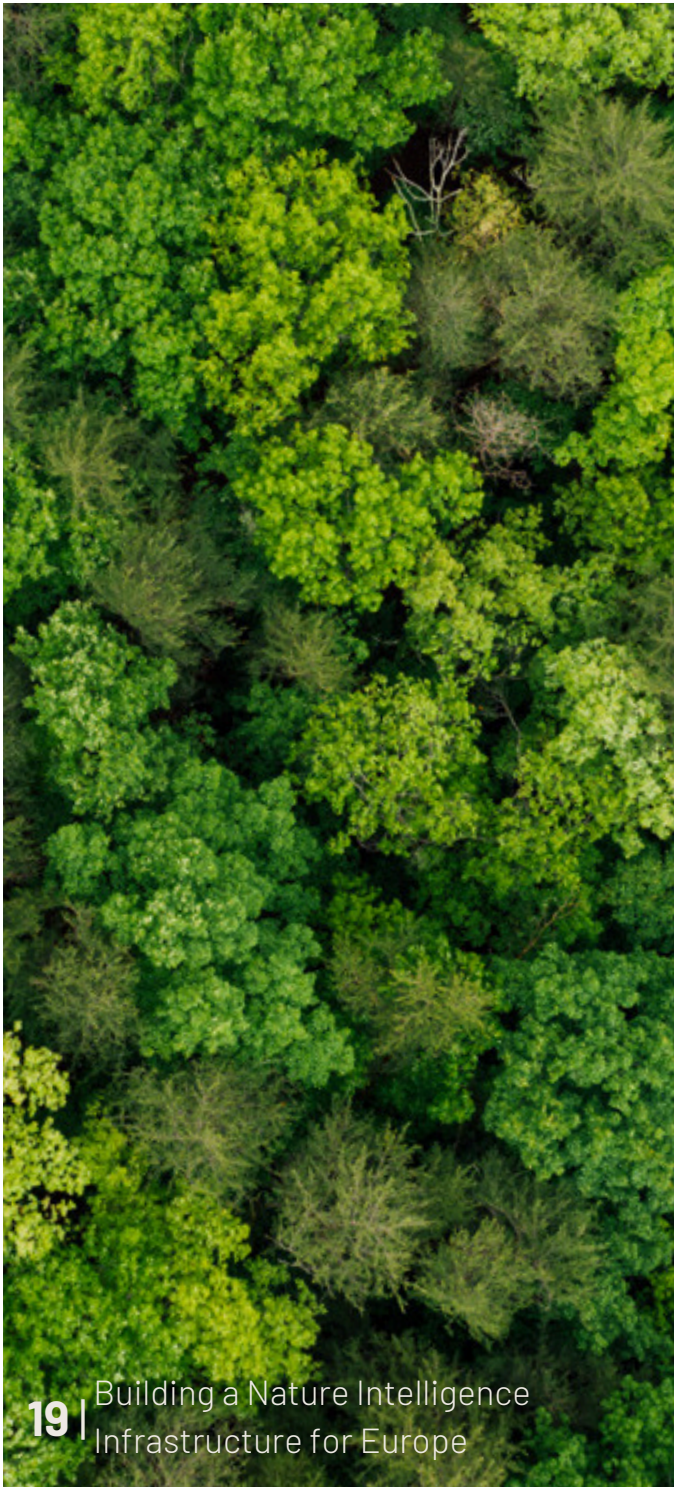THE EUROPEAN BACKBONE:
Unified Rules & Quality Infrastructure

Harmonized Metrics

Common Decision Rules

Versionable Standards
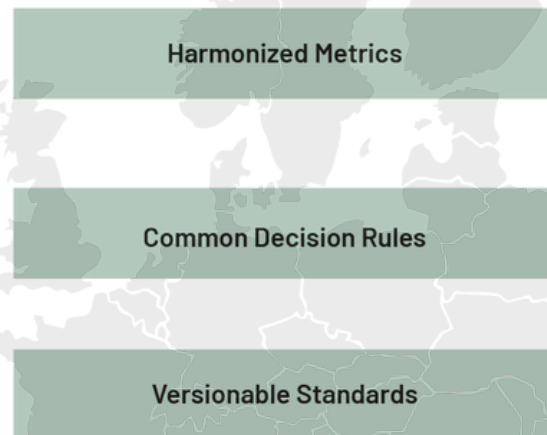
EVIDENCE-DRIVEN
CONTINUOUS
IMPROVEMENT

Pillar 2

NETWORK OF EUROPE-WIDE LIVING LABS
As Real-World Validation Infrastructure

Validation in ...

Feedback from ...

Living Lab 1

Living Lab 2

Living Lab ...

Living Lab n

1. Systematic validation of methods and indicators across sites

Resilience Nodes assess not only whether a method works locally, but how consistent and transferable results are across different locations.

2. Regional translation of decision guardrails

Resilience Nodes test whether and how the shared rule set functions across different landscape and forest types.

3. Feedback and continuous improvement of the rule set

Resilience Nodes generate empirical evidence, document methodological limitations and develop proposals for adjustment. This feedback flows directly back into the Rules and Quality Infrastructure, making standards adaptive, learnable and versioned.

Through the interaction of the "Rules and Quality Infrastructure" with "Resilience Nodes as the Practice and Testing Infrastructure", a learning *Nature Intelligence Infrastructure* emerges - one that overcomes fragmentation, enables investment, and makes regeneration measurable, manageable and scalable. The result is locally adapted solutions that remain globally comparable.

Through its Biodiversity Residency, the Future Forest Initiative works with innovators to test new methods of nature measurement directly in practice. The format demonstrates how modern MRV solutions can already capture key indicators of forest ecology and integrate them into existing forest inventories.

Call for Collaboration

Building a *Nature Intelligence Infrastructure* is a collective task. The Future Forest Initiative invites policymakers, companies, investors, technology providers, land managers and other stakeholders to actively engage in its development.

The Future Forest Initiative does not seek ownership of this infrastructure, but acts as a neutral facilitator - bringing partners together to build an open, practice-oriented and interoperable European network. Only through collaboration can isolated projects evolve into a reliable system, and fragmented data into a foundation for sound, evidence-based decisions.

Glossary

BIODIVERSITY MARKETS
Emerging nature-based markets in which measurable ecological improvements - such as species diversity, water quality or ecosystem functions - are made tradable. High-quality, verified nature data is a prerequisite. Biodiversity markets are a subcategory of ↘ *Emerging Nature Markets.*

BIOECONOMY
An economic system based on renewable biological resources and nature-based production processes. Its objective is to reduce dependence on fossil resources and lower environmental pressures. The EU Bioeconomy Strategy identifies the bioeconomy as a strategic economic pillar and highlights harmonised nature data as a key prerequisite.

COMMONS (NATURE DATA ALS COMMONS)
A governance approach in which shared resources - such as nature data - are made openly accessible, quality-assured and fairly usable. Enables cooperation instead of competition over data ownership.

CSRD (CORPORATE SUSTAINABILITY REPORTING DIREC-TIVE)
EU directive requiring companies to disclose nature and climate-related information. Nature data thereby becomes a mandatory and auditable component of corporate governance.

DPSIR (DRIVERS-PRESSURES-STATE-IMPACT-RESPONSE)
An analytical framework used to describe environmental states and causal chains. Frequently applied as a structuring tool for nature-related assessment systems.

ECOSYSTEM ACCOUNTING (SEEA EA)
International UN standard for ecosystem accounting. It establishes Ecosystem Condition as a central assessment metric and links ecological data with economic decision-making.

ECOSYSTEM CONDITION (EC)
A scientifically grounded assessment framework for the state of ecosystems. EC integrates biotic and abiotic indicators into a coherent overall picture and serves as a core measurement basis for regulatory and market-based applications (including the EU Nature Restoration Regulation).

EQA (ECOLOGICAL QUALITY ASSESSMENT)
An approach to assessing ecological quality, frequently used in national monitoring programmes. Serves as a complementary tool for deriving EC indicators.

ESRS (EUROPEAN SUSTAINABILITY REPORTING STAN-DARDS)
EU-defined reporting standards specifying how companies must disclose nature-, climate- and social-related information. ESRS operationalise the CSRD and make nature data - including EC indicator-based information - a mandatory part of corporate reporting.

EU ROADMAP TO NATURE CREDITS
A strategic document by the European Commission outlining the development of trusted European markets for nature-based outcomes. The Roadmap emphasises the need for harmonised standards, interoperable data and shared measurement logics as the foundation for biodiversity credits and other nature markets.

EU TAXONOMY
An EU classification system defining which economic activities are environmentally sustainable. It increases requirements for transparency and data availability for financial market participants and companies, in interaction with CSRD and SFDR.

EU NATURE RESTORATION REGULATION (NRR)
EU legislation introducing mandatory assessment and restoration of key ecosystems. It operationalises Ecosystem Condition across Europe for the first time and establishes systematic data collection.

FRAGMENTATION
A condition characterised by competing measurement systems, indicators and assessment logics. Leads to lack of comparability, uncertainty and loss of trust - one of the core problems addressed by this white paper.

IBECA (INTERNATIONAL BIODIVERSITY & ECOSYSTEM CONDITION ASSESSMENT)
An international framework for assessing biodiversity and ecosystem condition that is closely aligned with EC-based logics. Strengthens global comparability.

ISO 17298
An international standard published in October 2025 titled "Biodiversity - Considering biodiversity in the strategy and operations of organizations - Requirements and guidelines". It supports organisations in systematically integrating biodiversity into strategy, management and operational processes. ▶

MEASURE ONCE, REPORT EVERYWHERE (M.O.R.E.)

A principle for increasing the efficiency of nature measurement: a single, quality-assured measurement is conducted once and then reused for multiple purposes - such as the EU Nature Restoration Regulation, CSRD/ESRS reporting, new nature markets or internal management. The principle reduces duplication, improves data quality and creates coherence across sectors.

MRV (MONITORING, REPORTING & VERIFICATION)

Technologies for monitoring, reporting and verification of nature-related data. Includes remote sensing (e.g. satellite, LiDAR, hyperspectral), eDNA analysis, bioacoustics, sensors, AI-based data processing and modelling. MRV technologies enable precise, scalable and auditable nature measurement.

NATURE INTELLIGENCE INFRASTRUCTURE (NII)

The Nature Intelligence Infrastructure (NII) refers to the overarching framework proposed in this white paper, consisting of a Rules and Quality Infrastructure and a Practice and Testing Infrastructure (Living Labs). The NII enables ecological states, changes and impacts to be systematically measured, compared and integrated into decision-making. It connects shared measurement logics, standards and verification mechanisms with real-world application. The NII forms the backbone for trust, governance capability and investment decisions in managing Nature as Critical Infrastructure, and underpins new nature markets, regulatory implementation and a resilient, nature-based economy.

NATURE-BASED SOLUTIONS (NBS)

According to the IUCN, nature-based solutions are actions to protect, sustainably manage and restore natural or modified ecosystems that effectively and adaptively address societal challenges while simultaneously providing benefits for biodiversity and human well-being.

They leverage ecosystems' capacity to deliver services such as climate regulation, flood protection, water retention or biodiversity conservation, and are designed to be ecologically effective, socially equitable and economically viable (IUCN, 2016/2020).

NATURE MARKETS

An overarching category of market mechanisms based on measurable ecological state variables - such as biodiversity, water balance, carbon storage or resilience. New Nature Markets form a subset, focusing specifically on tradable ecological outcomes. Nature markets link ecological and economic objectives.

NATURETECH

Technologies and digital solutions that measure and analyse ecological states and support nature-based solutions. Technologies include remote sensing, sensors, eDNA, bioacoustics, AI-based analytics and MRV software.

NATURAL CAPITAL

An economic concept referring to ecosystems and the services they provide (e.g. water filtration, cooling, pollination). Natural capital can be measured, valued and integrated into economic decision-making.

EMERGING NATURE MARKETS

Emerging market mechanisms in which measurable ecological improvements - such as biodiversity, water balance, ecosystem functions or resilience - are economically valued, remunerated or made tradable. They rely on quality-assured nature data, clear measurement logics and independent verification (MRV), and enable the financing of ecological outcomes rather than activities.
In contrast to traditional conservation programmes, new nature markets are outcome-based, focusing on verified results rather than project inputs. They connect public objectives (e.g. EU restoration and biodiversity targets) with private investment logics and create incentives for regenerative land-use and management practices.
Emerging Nature Markets include, among others:
- biodiversity and water credits,
- nature-based insurance and risk models,
- ecological performance contracts (outcome contracts),
- nature-based assets within the bioeconomy.

Their growth is accelerated by regulatory trends (CSRD, TNFD, EU Taxonomy, EU Nature Restoration Regulation) and technological advances in nature measurement. Their credibility depends on a shared infrastructure that connects data, standards and practice and builds trust in ecological outcomes.

LIVING LABS

Experimental and development spaces in which new approaches to nature measurement, land use and governance are tested under real-world conditions. They form the basis for practice-oriented standard development.

REGENERATION

The restoration and long-term stabilisation of ecosystems' self-organising capacity and functional integrity. The goal is to strengthen ecological processes so that ecosystems can independently maintain, adapt and further develop their structure, biodiversity and services.

RESILIENCE NODES

Networked Living Labs that systematically test, translate and further develop EC-based methods, indicators and decision logics. They form the operational backbone of the Nature Intelligence Infrastructure.

SBTN (SCIENCE-BASED TARGETS FOR NATURE)

A science-based framework providing guidance for companies on setting nature-related targets. Increasingly relies on EC-compatible measurement logics.

SFDR (SUSTAINABLE FINANCE DISCLOSURE REGULATION)

EU Regulation (EU) 2019/2088 requiring financial market participants and advisers to disclose sustainability risks and impacts of financial products in order to increase comparability and prevent greenwashing.

TNFD (TASKFORCE ON NATURE-RELATED FINANCIAL DISCLOSURES)

A framework for companies and financial institutions to identify and disclose nature-related risks, dependencies and opportunities. Based on scientific metrics and EC-compatible data.

TRUST INFRASTRUCTURE

A system of rules, standards, procedures and institutions ensuring that nature data is credible, comparable and decision-relevant. It forms the foundation for functioning nature markets, risk management and investments in regeneration. It relies on shared measurement logic (EC), independent verification, open-data principles and Living Labs.

WAR OF INDICATORS

A situation characterised by competing measurement logics, indicators and assessment frameworks in nature and biodiversity measurement. Leads to pseudo-comparability, methodological competition and loss of trust. The "war of indicators" is considered one of the central barriers to scalable nature markets.

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ABOUT THE FUTURE FOREST INITIATIVE (FFI)

The Future Forest Initiative (FFI) is an independent innovation hub operating at the intersection of forest practice, science and technology. Based at Schloss Blankenburg in the Harz region, Germany, it connects actors who understand nature as a central prerequisite for societal and economic resilience.

FFI develops Living Labs, open standards and data-driven tools to make natural processes measurable, comparable and investable. Through Biodiversity Residencies, regional Resilience Nodes, startup programmes and collaborative field trials, it brings together nature measurement, technological innovation and practical implementation. As part of the German Federal Government's Digital Hub Initiative, FFI works with forest enterprises, research institutions, startups, investors and public authorities to test and scale solutions for climate- and biodiversity-resilient landscapes.

FFI sees itself as a bridge builder for a regenerative economy, developing the infrastructure needed to make nature a reliable foundation for decisions and investments.

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