

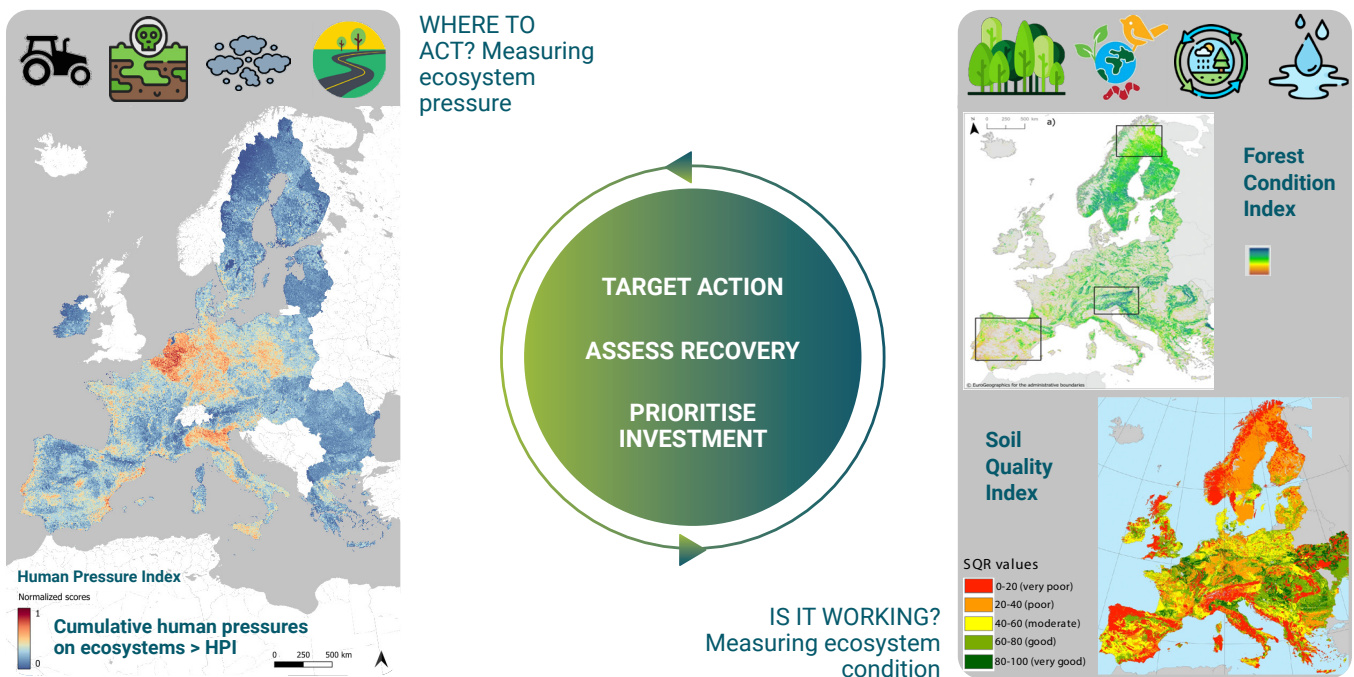


# Measuring What Matters: A Minimum Set of Ecosystem Condition Indicators for EU Environmental Policy

From pressure reduction to ecosystem recovery

## Highlights

- 81% of EU habitats remain in poor condition despite decades of environmental policy [1].
- EU legislation increasingly requires evidence of ecological recovery, following implementation of measures.
- Pressure reduction does not automatically translate into ecosystem recovery due to ecological thresholds and time lags [2].
- A harmonised minimum set of ecosystem condition indicators enables comparable, transparent and policy-relevant monitoring across Member States.
- Combined with pressure metrics such as the Human Pressure Index, condition indicators allow the EU to track recovery from environmental action (Fig. 1).



**Figure 1. Complementary roles of pressure and condition indicators in EU environmental governance.** Pressure metrics (i.e., the Human Pressure Index [3, 4]) identify **where action is needed**, while ecosystem condition indicators measure ecological status and recovery, enabling **evaluation of policies**. Examples include the Forest Condition Index [5] and the Soil Quality Index [6].

# What are ecosystem condition indicators?

- Ecosystem condition indicators measure the **intrinsic natural state, integrity and functional capacity of ecosystems**, assessing whether ecosystems maintain their structure, biodiversity and resilience over time. In contrast, pressure indicators measure the human stressors affecting ecosystems (e.g., land-use change, pollution or fragmentation).
- They provide the **evidence required to determine whether environmental policies are delivering measurable ecological recovery**.

## The scientific evidence

A systematic literature review [7] and expert assessment identified structural weaknesses in current ecosystem condition monitoring across the EU:

- **Wide variability** in indicators and methodologies across ecosystem types and EU Member States.
- **Frequent reliance on pressure proxies** rather than direct measures of ecosystem condition.
- **Persistent biodiversity and ecosystem functioning data gaps** limiting ecological depth and comparability.

These limitations constrain EU-wide reporting and weaken policy evaluation.

## Defining harmonised minimum sets of ecosystem condition indicators

To address the currently fragmented and inconsistent monitoring, the SELINA project identified a minimum set of ecosystem condition indicators for eight major ecosystem types (Box 1). The proposed sets:









- Are aligned with the **SEEA-Ecosystem Accounting framework** [8], ensuring evidence-based decision-making, policy coherence, transparency and comparability.
- Build upon existing EU initiatives, including the **Mapping and Assessment of Ecosystems and their Services (MAES)** [9], reinforcing continuity of existing efforts rather than duplication.
- **Were selected based on three core criteria:**
  - **Policy relevance:** Alignment with EU legislation
  - **Scientific robustness:** Sensitivity to ecological change and repeatability
  - **Feasibility:** Data availability and realistic monitoring potential at the **EU scale**

These sets are not intended to represent a definitive list of indicators, but rather a **minimum operational baseline** that can support consistent monitoring across EU Member States.








## Why these indicators matter

- **Standardisation:** Enables comparable assessments across EU Member States, supporting EU-wide policies like the Nature Restoration Regulation and Biodiversity Strategy 2030.
- **Targeted action:** Helps identify where restoration efforts will be most effective (e.g., wetlands with poor water quality, forests with low biodiversity).
- **Policy evaluation:** Provides a baseline to measure progress toward EU environmental targets, ensuring accountability and transparency (Box 2).

### Box 1. Examples of ecosystem condition indicators and data gaps.

Ecosystem type	Core condition indicators	Key data gaps
 <b>Forests</b>	Tree cover density, Soil Organic Carbon (SOC), Forest bird diversity, Canopy height.	Soil biodiversity.
 <b>Agroecosystems</b>	SOC, Farmland bird diversity, Crop diversity, Bumblebee diversity.	Pollinator diversity.
 <b>Urban ecosystems</b>	Tree cover density, Share of green/blue space, Connectivity to semi-natural areas.	Bird, plant, and insect diversity.
 <b>Wetlands</b>	Soil bulk density, soil C/N ratio, Percentage of wetland species with good population status.	Vegetation moisture.
 <b>Heathlands and Shrublands</b>	Minimum annual Soil Wetness Index, SOC, Connectivity index of semi-natural areas.	Fire regime indicators.
 <b>Grasslands</b>	SOC, Bumblebee diversity, Connectivity index of semi-natural areas.	Plant and invertebrate diversity.
 <b>Rivers and Lakes</b>	Dissolved oxygen, Fish diversity, Connectivity index of semi-natural areas.	Chlorophyll-a concentration.
 <b>Marine ecosystems</b>	Dissolved oxygen, Bird abundance, Spawning stock biomass of commercially important fish species.	Fish biodiversity.

### Box 2. How the minimum set of indicators for ecosystem condition supports key EU environmental policies.

Policy	Application	Example
<b>Nature Restoration Regulation</b>	Demonstrate compliance with legally binding restoration targets.	 <b>Wetlands:</b> verify measurable biodiversity and soil recovery following restoration investments towards 2030 milestones.
<b>Biodiversity Strategy 2030</b>	Prioritise areas where ecological recovery is lagging despite reduced pressures.	 <b>Alpine forests:</b> identify sites with poor resilience or declining biodiversity for targeted conservation.
<b>Common Agricultural Policy</b>	Link EU payments to measurable ecological outcomes.	 <b>Agroecosystems:</b> relate CAP-funded practices to improvements in soil organic carbon and bird diversity.
<b>Water Framework Directive</b>	Assess ecological status of water bodies alongside pressure data.	 <b>Danube Basin:</b> assess whether the improved water quality translates into biological recovery.
<b>Marine Strategy Framework Directive</b>	Assess effectiveness of marine protection measures.	 <b>Mediterranean Sea:</b> track biodiversity and spawning stock biomass to evaluate the fisheries management impact.
<b>SEEA – Ecosystem Accounting</b>	Strengthen accountability and comparability of reporting.	 <b>EU-wide forests:</b> harmonise forest condition indicators to support transparent ecosystem accounts.
<b>EU Soil Strategy for 2030</b>	Monitor soil health and restoration progress.	 <b>Agroecosystems and grasslands:</b> track soil organic carbon and soil biodiversity to assess improvements in soil health.

# Policy recommendations

## Primary recommendation

Adopt the harmonised minimum sets of ecosystem condition indicators at EU level as a shared baseline framework, to be progressively implemented, periodically reviewed, and applied alongside complementary pressure metrics such as the Human Pressure Index (see SELINA report D3.2 Policy Brief 1 [4]). This framework should function as an operational starting point rather than a definitive or exhaustive system, and should be progressively strengthened through pilot application, targeted efforts to close key data gaps, and ongoing scientific refinement.

## Supporting actions

### 1 Pilot condition indicators assessment alongside the Human Pressure Index

- Test the harmonised indicator sets in 3–5 representative regions to assess operational feasibility and policy relevance prior to EU-wide deployment, ensuring coherence with complementary pressure metrics where relevant. LIFE and Horizon Europe funding can support these pilot phases.

### 2 Progressively integrate the condition indicators into EU monitoring systems

- Incorporate the minimum set into existing EU monitoring and reporting mechanisms (e.g., restoration monitoring, Natura 2000 reporting, SEEA–Ecosystem Accounting) to strengthen comparability and policy coherence across Member States.

### 3 Address priority data gaps

- Prioritise investment in biodiversity and ecosystem functioning indicators, and long-term monitoring, leveraging Copernicus services, existing monitoring networks, and relevant EU funding instruments.

### 4 Establish iterative governance

- Create an EEA-led technical working group to update the indicators every five years, assess performance, and refine the minimum condition sets as knowledge and data improve, in coordination with SEEA–Ecosystem Accounting developments in EU Member States.

## References

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