Biodiversity data and ongoing monitoring: Eyes on the ground and in the sky

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Monitoring biodiversity loss is hindered by current data sources. The B-Cubed project, funded by Horizon Europe, aims to create harmonised, policy-ready indicators to support evidence-based decisions on biodiversity, climate, pollution, and land use, aiding the Green Deal objectives

There's growing political momentum to address biodiversity loss, but we still can't see the problem clearly. Despite years of effort, our capacity to monitor biodiversity across large spatial and temporal scales remains limited. The indicators we use to track progress are often based on patchy, taxonomically biased datasets. We're trying to measure change using information that's fragmented, outdated, and often inaccessible.

The result? We struggle to provide decision-makers with the timely, reliable evidence they need to design and implement effective biodiversity policy.

Remote sensing alone isn't enough

Earth observation has transformed environmental monitoring. Satellites and other remote sensing technologies now give us near-real-time data on land cover, vegetation productivity, and ecosystem structure. Programmes like Copernicus provide open access to high-quality environmental data at continental scales, helping us track climate and land-use changes with increasing precision.

But remote sensing has its limits. As spatial and temporal resolution improve, taxonomic resolution remains weak. These systems show us where ecosystems are changing, but not which species are affected, nor how.

Critical biodiversity metrics, such as species abundance, population health, or behavioural shifts, often remain invisible from space. To truly understand ecological change, remote sensing must be paired with on-the-ground observations and biological surveys.

Biodiversity data are rich, but biased and sparse

Conversely, biodiversity data, like that delivered through the Global Biodiversity Information Facility (GBIF), offers remarkable taxonomic and ecological detail. It helps us understand the what and why behind biodiversity change. But it tends to be spatially and temporally uneven, biased toward accessible or well-studied areas and species groups, and difficult to scale. Indeed, uncertainty maps are needed to visualise such gaps and biases, guiding better data use and prioritising areas for new sampling.

Much of biodiversity data also remains underused. Data access barriers, fragmented systems, slow publishing pipelines and restrictive licensing slow progress. And these challenges mirror those in the remote sensing world.

Integration is hard, but necessary

Combining these two data streams is technically and culturally difficult. Remote sensing and biodiversity data differ in scale, resolution, and structure. The communities that generate them often use different standards, tools, and terminology.

But we'll never get a complete picture until we link them.

That's where the B-Cubed (Biodiversity Building Blocks for policy) project comes in. Funded through the EU's Horizon Europe programme, B-Cubed was launched under a call aiming to support efforts that contribute towards unleashing the potential of environmental, biodiversity, and climate data through dedicated European data spaces. The project works to make such data more accessible, interoperable, and usable, particularly to support evidence-based policy and deliver public value.

B-Cubed is building biodiversity data cubes that can be used to integrate in situ biodiversity observations with other Earth observation data. The aim is to produce harmonised, policy-ready indicators that reflect the strengths of both sources. In doing so, it contributes directly to the goals of the Green Deal: enabling evidence-based decisions on biodiversity, climate, pollution, and land use.

We need everyone at the table

This kind of integration is not just a technical challenge; it's a collaborative one. We need ecologists who understand the messiness of species data. Remote sensing scientists who can work with terabytes of imagery. Developers, modellers, and policymakers who can turn that information into useful insights.

We also need infrastructure that supports this collaboration: open data platforms, common standards, and long-term funding to maintain systems like GBIF, Copernicus, and the emerging Destination Earth initiative.

Toward a smarter biodiversity infrastructure

The future of biodiversity monitoring depends on breaking down silos. Projects like B-Cubed point the way forward, helping connect biodiversity knowledge with the tools that can scale it. They show how field-based observations and satellite data, used together, can support better indicators, better models, and ultimately, better policy.

We don't see the Green Deal Data Space as a single platform or product, but as an environment. One where collaboration across disciplines, sectors, and data domains becomes not only possible, but expected. We want it to be a place where projects like B-Cubed can connect biodiversity and Earth observation data in ways that directly support

policy. If we can build that kind of shared infrastructure – flexible, open, and grounded in real-world use cases – it could finally allow us to act on biodiversity with the clarity and urgency the crisis demands.

The B-Cubed Project is currently exploring case studies that demonstrate how integrated data might transform biodiversity governance, from identifying invasive species risks in real time, automating aspects of the Habitats Directive reporting, and assessing biodiversity conditions in protected areas. While many of these use cases are still under development, they point to a future where biodiversity data are richer and far more usable by those making decisions on the ground.

Final thoughts

The biodiversity crisis demands more than political will; it requires better data, better integration, and better collaboration. Field surveys and satellite feeds will never replace one another, but together, they can give us the kind of visibility we need to make informed, effective decisions.

If we want to protect nature, we need to see it clearly. That means having eyes on the ground from both the surface and the sky, and bringing those perspectives together.

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