



Brief: EO Opportunities for Biodiversity Monitoring

March 30th, 2023

Findings

This brief describes the potential for Earth observation data to support biodiversity impact monitoring, as well as difficulties firms may face when developing related EO data-based products. This brief is based on discussions with experts at the intersection of biodiversity and EO.

EO data’s potential to support biodiversity impact monitoring

There is growing pressure on market actors to report their biodiversity impacts. Increasing awareness of humanity’s impact on biodiversity is leading to growing general concern about this issue. In response, governments and other organizations are developing rules and regulations to minimize biodiversity impacts. Market actors are experimenting with different ways to report on and minimize their biodiversity impacts, and biodiversity impact reporting is becoming more common in environmental, social, and corporate governance (ESG) reporting.

- One notable initiative is the Convention on Biological Diversity. At its most recent conference, COP 15, delegates committed to “30 by 30” – protecting 30% of land and 30% of coastal and marine areas by 2030. Another notable project is the Taskforce on Nature-Related Disclosures (TNFD), an international initiative developing a risk management and disclosure framework regarding “nature”, defined as “the diversity of living organisms... and their interactions among themselves and with their environment”.

Today’s biodiversity impact reporting initiatives are mostly voluntary, but ultimately they will likely be superseded by reporting requirements and credit trading schemes. To date, voluntary initiatives are numerous and disparate. But ultimately, they will likely consolidate. And when consolidation occurs, this will enable impact reporting requirements with which market actors can comply. Authorities that will likely impose such requirements are governments and financial institutions. Requirements will in turn probably lead to imposed limits on net biodiversity impact per market actor, spurring the creation of biodiversity impact credit schemes.

Much of the narrative about biodiversity reporting conceptualizes it as “emissions reporting 2.0”. Climate, like biodiversity, is an Earth system-level environmental issue that is being significantly affected by human activity. Though it took time, a dominant narrative ultimately emerged that carbon dioxide emissions are a key indicator of individual market actors’ impact on climate. Consensus about this indicator led to reporting requirements regarding carbon dioxide emissions and paved the way for trading schemes. Many believe biodiversity impact reporting is following a similar trajectory as emissions reporting, though at an earlier stage of development.

- Many biodiversity impact reporting initiatives take cues from emissions reporting initiatives. TNFD, for instance, is modeled on the Taskforce on Climate-Related Financial Disclosures (TCFD). Moreover, for many of the firms that are developing products and services to monitor biodiversity impact, they also work on emissions monitoring.



Earth observation data plays a critical role in emissions reporting and credit trading schemes, and it seems likely to play a similarly important role in biodiversity monitoring. For both climate and biodiversity, it is important to be able to see each phenomenon on a global scale, and sensors on satellites are in a unique position to collect such information. To be clear, EO data does not supplant the importance of other data sources. But it allows data from many sources to be weaved together into grand narratives about human activity's effect on the Earth system.

There is significant excitement about the business potential of developing EO data-based products and services to monitor biodiversity impacts. Though it may not be readily apparent to outsiders, when one delves into this business area it quickly becomes clear that a “rush” is occurring – many firms are spending significant effort to develop such products and services. The firms doing this are various – firms of different sizes (e.g. startups and multinationals), firms with different emphases (e.g. geospatial, financial, or ecological), and firms in different markets. As is the case with any rush, it seems likely most of these firms will fail. This rush seems to be premised on two beliefs: 1) developing such tools is morally important and improves the sustainability of humanity's relationship with the Earth system; and 2) there is a significant amount of money to be earned by developing such tools, since it appears there will shortly be high demand for them.

The difficulties facing EO data-based biodiversity monitoring

Several issues problematize EO-based biodiversity monitoring, first and foremost: it is unlikely that a single “king metric” will emerge for biodiversity as has happened for climate. Carbon dioxide emissions have become the “king metric” for measuring market actors' impact on climate. It seems improbable that any single metric will be similarly used to measure biodiversity impact. There are many views (some of which oppose each other) on why biodiversity resists simplification, including: “biodiversity” is a term whose very definition is subject to debate; biodiversity can be measured at various levels (e.g. genes, species, and biomes); the complexity of biodiversity resists forecasting; and the perceived value of biodiversity depends greatly on the circumstances (e.g. an “invasive” species in one context is an “endangered” species in another).

- Most experts agree that biodiversity impact is unlikely to be reduced down to a single market actor-level indicator as carbon dioxide emissions has emerged for climate impact. More viable is a suite of biodiversity indicators, a subset of which will be used in any particular context. The so-called “essential biodiversity variables” (EBVs) is one prominent conceptualization of such a suite-of-indicators approach. The Group on Earth Observations Biodiversity Observation Network (GEO BON) is developing 20 such EBVs.
- The lack of consensus about relevant indicators – or more accurately put, about simplified indicators which readily inform market actors' decision-making – poses a risk to firms developing products or services defined by certain indicators: if their preferred indicators turn out to have little currency, then those firm will have wasted their time and money.

Firms working on EO data-based biodiversity monitoring should be aware of three issues that pose reputational risk: controversial outcomes; faulty credits; and exacerbation of inequality. All three of these issues, which are in fact intertwined, mar satisfaction with today's emissions credit schemes. It is entirely probable that these issues could similarly mar satisfaction with future biodiversity credit schemes. Companies associated with these issues (e.g. those perceived as exacerbating inequality) face the prospect of reputational blowback and business difficulties.

- **Controversial outcomes:** Credits do not incentivize market actors to reduce their impact, but simply to reduce their net impact. For emissions, this means a firm may, for example, keep emitting a significant amount of carbon dioxide but simply pay someone else to not cut down trees that were going to be harvested. For biodiversity, a parallel scenario would be a firm killing a species in one ecosystem but paying to preserve a species elsewhere.
- **Faulty credits:** There are many doubts about emissions credits in terms of whether they are in fact "as advertised". For emissions, for instance, common questions are: Was there hype about what logging's impact would have been without intervention? Did the decision to not cut down trees result from incentives created by credit schemes?
- **Exacerbation of inequality:** A common view is developed countries are disproportionately responsible for human-caused changes to the Earth system. And reporting requirements and trading schemes add costs to doing business and also present opportunities to generate wealth. So, if poor countries bear a disproportionate amount of the new added costs of doing business, and if rich countries earn a disproportionate amount of new wealth generated from impact monitoring, then this is seen as unfairly exacerbating inequality between countries (and destabilizing the international system).

Besides the above issues, firms developing EO-based biodiversity monitoring products will also face all the more general difficulties that bedevil firms developing a wide variety of EO data-based products. EO sensors provide a wide variety of data in terms of the type of imagery (e.g. SAR, optical, hyperspectral). They moreover vary in terms of temporal and spatial resolution and in terms of the extent to which they are pre-processed. All of this variation makes it difficult to blend data from different sources. Licensing requirements for different data sources also raise costs and make it difficult to have unfettered access to the best combinations of data sources.

Lastly, EO data expertise alone is insufficient; to create useful products that overcome the difficulties described above, product developers should incorporate data from other sources and collaborate with individuals who have expertise in relevant fields. Whatever the consensus is about which indicators matter, data for those indicators will almost certainly come from multiple sources. There will continue to be value in boots-on-the-ground fieldwork and aerial surveys, for instance. There is also a variety of emerging technologies that may provide useful data – eDNA and bioacoustics, for example. And whatever combination of sources provide the data, expertise in various fields (e.g. ecology and finance) will be necessary for translating the data into scores that allow for comparing various market actors' impacts. Such comparability is crucial for market actors – it lets them plan how to compete and how to comply with regulations.

