Integrating biodiversity into investment decisions

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Abstract

This paper summarises our findings on the data tools available for biodiversity investing, which we believe are relevant to investors interested in the field. We categorise the available tools, document areas of improvement, and provide recommendations to biodiversity data solution providers, on ways to improve their products to better support investors looking to identify the risks and opportunities related to biodiversity loss.

More specifically, we:

1. Provide our view on the materiality of biodiversity investing, look at the opportunities for investors, explain why biodiversity investing is complex, examine the parallels with climate investing1, and assess the importance of the whole value chain;
2. Offer an analysis and a classification of the various third-party solutions that are available, including footprinting services, scorecards and topic-specific datasets, and sensor-based approaches;
3. Suggest a flowchart for approaches to biodiversity investing based on the investor's capabilities (fundamental vs. quantitative), the data tools available (related to the analysis and classification of third-party solutions covered in point 2 above), and the portfolio's goals (related to the materiality of biodiversity investing covered in point 1 above);
4. Discuss guidelines on selecting one or multiple solutions, comparing vendors, and leveraging biodiversity data;
5. List improvements we would like to see in existing and future solutions.

Key findings:

1. Corporate biodiversity disclosure is sparse and, when existing, difficult to interpret. Data solution providers can already help investors, but the market is not as mature as the one for climate and we are bound to see more product development.
2. Biodiversity impact intensity (based on footprinting models) allows for comparisons across sectors and shares similarities with the carbon intensity of climate investing. However, there are two issues. First, footprinting metrics, such as Mean Species Abundance (MSA) or Potentially Disappeared Fractions of species (PDF), are not as generally accepted as certain carbon metrics for climate investing. And second, current footprinting implementations are too dependent on revenues-based extrapolation, which might cause issues beyond reporting purposes.
3. There is a strong rationale for leveraging scorecards focusing on better documented biodiversity subsets or high-impact sectors.
4. There are multiple use cases beyond portfolio alignment, such as European Union (EU) and national regulations, EU Sustainable Finance Disclosure Regulation (EU SFDR) Principal Adverse Impacts (PAIs), and better corporate engagement.
5. There is a good momentum behind biodiversity investing (for example, the United Nations Biodiversity Conference, COP15), and we believe that improved reporting standards, regulations, and satellite imagery will contribute to making the existing solutions more accurate. However, identifying opportunities will still likely require specific capabilities on the investors' side (such as fundamental research and corporate engagement).




[1] For the purposes of this paper, climate investing is a shorthand reference to a broad range of investment strategies including strategies that evaluate financially material climate risks and opportunities and strategies that are designed to meet certain sustainability goals.

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Introduction

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This paper summarises our findings on the data tools available for biodiversity investing, which we believe are relevant to investors interested in the field. We categorise the available tools, document areas of improvement, and provide recommendations to biodiversity data solution providers, on ways to improve their products to better support investors looking to identify the risks and opportunities related to biodiversity loss.

With momentum building around biodiversity investing, we wanted to take the time to ask ourselves again about the rationale behind it. How is it financially material? The parallels with climate investing are multiple, but we also discuss to what extent biodiversity investing is comparable to climate investing (Section 1). The main difficulty with biodiversity investing seems to stem from the fact that biodiversity loss is more the collection of multiple localised problems of different nature, and thus measuring impacts is difficult. With multiple types of solutions available, we propose a system of classification and discuss the complementarity of different solutions (Section 2). Based on these findings, we suggest a flowchart to help the new biodiversity investor select appropriate data tools (Section 3) and share our experience on points to consider when selecting a data solution provider (Section 4). We finally share our views on the current data landscape and offer some suggestions to solution providers to help them better service their clients (Section 5).

Throughout the paper we will discuss in more details our key findings:

1. Corporate biodiversity disclosure is sparse and, when existing, difficult to interpret. Data solution providers can already help investors, but the market is not as mature as the one for climate and we are bound to see more product development.
2. There are multiple use cases beyond portfolio alignment, such as EU and national regulations, EU SFDR PAIs, and better corporate engagement.
3. Biodiversity impact intensity (based on footprinting models) allows for comparisons across sectors and shares similarities with the carbon intensity of climate investing. However, there are two issues. First, footprinting metrics, such as Mean Species Abundance (MSA) or Potentially Disappeared Fractions of species (PDF), are not as generally accepted as certain carbon metrics for climate investing. And second, current footprinting implementations are too dependent on revenues-based extrapolation, which might cause issues beyond reporting purposes.
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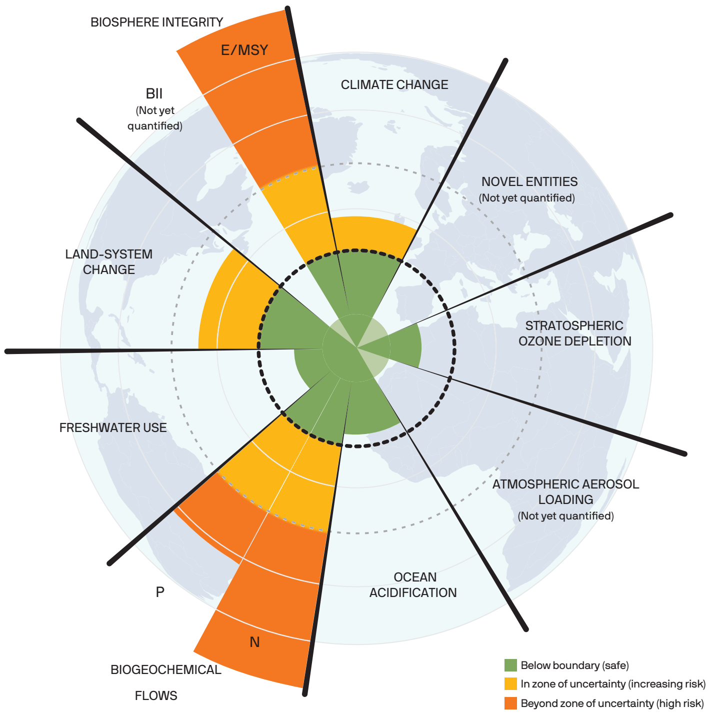
1. Biodiversity investing

1.1. Importance of biodiversity

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) defines biodiversity as "the variability among living organisms from all sources including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part. This includes variation in genetic, phenotypic[2], phylogenetic[3], and functional attributes and changes in abundance and distribution over time and space within and among species, biological communities, and ecosystems."

Biodiversity loss is the decline in the variety of species in an ecosystem. It can be caused by a variety of factors (or environmental pressures), such as land transformation, pollution, or the introduction of invasive species. Biodiversity loss can have serious consequences for the health and stability of ecosystems, the people directly depending on them for their livelihood, for the world economy, and individual companies. The Organisation for Economic Co-operation and Development (OECD) estimates that USD 44 trillion of economic value generation (over half of global GDP) is moderately or highly dependent on nature and that from 1992 to 2014, the value of natural capital stocks per head declined by 40%, owing to unsustainable rates of natural resource extraction, environmental degradation and pollution.[4] Scientific quantification of biodiversity loss and its impacts is still a work in progress, but the initial consensus already points towards the recognition of some high-risk areas (see **Exhibit 1**).

Exhibit 1: The planetary boundaries framework[5]



Source: Stockholm Resilience Centre, Stockholm University, J. Lokrantz/Azote based on Steffen et al. (2015).
BII: Biodiversity Intactness Index, an assessment of change in population abundance as a result of human impacts.
E/MSY: number of extinctions per million species-years, a measure of extinction rates.

2 **Phenotypic**: relating to the observable characteristics of an organism resulting from the interaction of its genotype with the environment.
3 **Phylogenetic**: relating to the evolutionary development and diversification of a species or group of organisms, or of a particular feature of an organism.
4 "Biodiversity, Natural Capital and the Economy: A Policy Guide for Finance, Economic and Environment Ministers", OECD Environment Policy Papers, No. 26, OECD Publishing, Paris (2021) https://doi.org/10.1787/1a1ae114-en.
5 J. Lokrantz/Azote based on Steffen et al. (2015).

1. **Biodiversity investing** continued

Biodiversity is a key theme for sustainable growth and recognition of the risks attached to its loss is gaining momentum. In December 2022, the United Nations Biodiversity Conference (COP15) resulted in the adoption of the Kunming-Montreal Global Biodiversity Framework (GBF), which sets targets to support the reversal of biodiversity loss.

Global Biodiversity Framework (GBF) targets for 2030[6]

- Effective conservation and management of at least 30% of the world's lands, inland waters, coastal areas and oceans, with emphasis on areas of particular importance for biodiversity and ecosystem functioning and services. The GBF prioritises ecologically-representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation, recognising indigenous and traditional territories and practices. Currently 17% and 10% of the world's terrestrial and marine areas respectively are under protection.
- Have restoration completed or underway on at least 30% of degraded terrestrial, inland waters, and coastal and marine ecosystems
- Reduce to near zero the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity
- Cut global food waste in half and significantly reduce overconsumption and waste generation
- Reduce by half both excess nutrients and the overall risk posed by pesticides and highly hazardous chemicals
- Progressively phase out or reform by 2030 subsidies that harm biodiversity by at least USD 500 billion per year, while scaling up positive incentives for biodiversity's conservation and sustainable use
- Mobilise by 2030 at least USD 200 billion per year in domestic and international biodiversity-related funding from all sources – public and private
- Raise international financial flows from developed to developing countries, in particular least developed countries, small island developing states, and countries with economies in transition, to at least USD 20 billion per year by 2025, and to at least USD 30 billion per year by 2030
- Prevent the introduction of priority invasive alien species, and reduce by at least half the introduction and establishment of other known or potential invasive alien species, and eradicate or control invasive alien species on islands and other priority sites
- Require large and transnational companies and financial institutions to monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity through their operations, supply and value chains and portfolios

[6] "COP15: Nations Adopt Four Goals, 23 Targets for 2030 in Landmark UN Biodiversity Agreement", Official CBD (Convention on Biological Diversity) press release, Montreal (19 December 2022). https://www.cbd.int/article/cop15-cbd-press-release-final-19dec2022

1. Biodiversity investing continued

1.2. Why biodiversity investing?

Biodiversity investing is concerned with the natural capital overconsumption and biodiversity destruction that are limiting economic growth and generating systemic external costs. Because of potential supply chain disruptions and new regulations, these issues can also directly impact the performance and risk exposure of investee companies.

The definition of biodiversity investing covers a broad range of investment strategies, including strategies that evaluate financially material risks associated with biodiversity loss and look to identify opportunities, and strategies that are designed to meet certain sustainability goals.

Biodiversity investing is not charity. When thinking about biodiversity investing, investors should look at its double materiality (the impact of corporates on biodiversity, and the impact of biodiversity loss on corporates). This double materiality implies that biodiversity investing can be used to identify opportunities and to mitigate risk:

- **Opportunities**: Biodiversity solution companies that support other companies in mitigating or offsetting their impacts are bound to expand their markets and to capture more investor interest in the future.
- **Risk management**: As biodiversity loss is better measured, we can expect regulators to force companies to demonstrate that they follow industry best practices to mitigate their impacts on biodiversity, and to regulate the most harmful activities. Biodiversity loss is a source of multiple risks, such as reputational, legal, transition, and physical risks. There is also an investment rationale to underweight companies that perform poorly from this point of view, as the regulatory friction is likely to be greater for these companies.

Because this research focuses on the data landscape for biodiversity investing, which itself is more focused on risk[7], we will focus more on the risk management part of the double materiality. We believe that identifying opportunities will be a key component of the growing field of biodiversity investing, but this statement can hardly be proved with structured datasets. Also, an important portion of these opportunities currently lies within private markets, while we expect our readers to mostly be public markets practitioners.

1.3. Standard setting and reporting requirements

Internationally, the COP15 target setting agenda (discussed in Section 1.1) will likely give further momentum for more regulation. There are also corporate initiatives, such as the Taskforce on Nature-related Financial Disclosures (TNFD)[8], which was created in 2020 under the model of the Taskforce on Climate-related Financial Disclosures (TCFD). The TNFD provides a disclosure framework that has influenced several data solution providers discussed in this publication and is a coordinating force for better corporate disclosures on natural capital consumption, biodiversity and natural capital usage.

Biodiversity investment interacts with regulatory initiatives that range from sub-national to global in scope. Many existing regulations focus on a subset of biodiversity or a particular ecosystem, such as Section 404 of the United States Clean Water Act, which implements a "no-net-loss" policy for wetlands.[9]

[7] Because opportunities present themselves in a less structured manner, they require more of a judgement call to identify.
[8] About the Taskforce on Nature-Related Financial Disclosures: https://tnfd.global/about
[9] United States Environmental Protection Agency (EPA), "Mitigation Banks Under Clean Water Act (CWA) Section 404". https://www.epa.gov/cwa-404/mitigation-banks-under-cwa-section-404

1. **Biodiversity investing** continued

Regulation explicitly targeting biodiversity and biodiversity investing are less common. However, this situation has begun to change in the last several years as regulators begin to formalise an approach to biodiversity. The global push to include natural capital in national economic statistics may provide additional information sources to aid biodiversity investing. For example, in early 2023 the United States launched its *National Strategy to Develop statistics for Environmental-Economic Decisions*.[10] The strategy will leverage existing frameworks, chiefly the United Nations System of Environmental Economic Accounting (SEEA) methodology[11], to create a system of natural capital accounting that integrates into existing national economic accounts. Many other national governments are pursuing similar expansions to core economic statistics, with well-developed initiatives existing in Canada[12] and Australia[13].

The natural capital frameworks proposed address key themes relevant in a biodiversity context, such as ecosystem assets and services, and have substantial overlap with existing biodiversity assessment frameworks[14]. While national economic statistics that are inclusive of natural capital may not have an immediate impact on biodiversity investing today, a harmonised system of environmental and economic statistics will doubtlessly standardise and influence the way in which the financial system assimilates environmental data in the future.

The European Union Sustainable Finance Disclosure Regulation (EU SFDR) addresses biodiversity in the context of the adverse sustainability indicators as listed in the annex to the EU SFDR Regulatory Technical Standards (RTS) and has implications for the treatment of the theme by investors and data providers. While the EU SFDR attempts to formalise environmental, social and governance (ESG) disclosure and reporting across sustainable investment products, adverse sustainability indicators are prescribed to be used on a product level in the context of the "do no significant harm" assessment of "sustainable investments" and at the level of legal entity and product level reporting of Principal Adverse Impacts (PAIs).[15]

With respect to biodiversity, the EU SFDR requires financial products, asset managers and fund managers, and investors to disclose if investee activities negatively impact "biodiversity-sensitive areas" and the proportion of investments allocated to firms that both negatively impact biodiversity and lack a plan to redress such impact. A further set of biodiversity requirements are applicable to real estate investments.[16] The EU SFDR has stimulated the need for biodiversity reporting tools among the investment community and many ESG data providers have created or repurposed biodiversity products in response.[17]

10 "National Strategy to Develop Statistics for Environmental-Economic Decisions: A US System of Natural Capital Accounting and Associated Environmental-Economic Statistics", Office of Science and Technology Policy, Office of Management and Budget, Department of Commerce (January 2023). https://www.whitehouse.gov/wp-content/uploads/2023/01/Natural-Capital-Accounting-Strategy-final.pdf

11 System of Environmental Economic Accounting: https://seea.un.org

12 Canadian System of Environmental-Economic Accounts – Ecosystem Accounts: https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5331

13 Australian Bureau of Statistics, Environmental Management: https://www.abs.gov.au/statistics/environment/environmental-management

14 System of Environmental Economic Accounting – Ecosystem Accounting: https://seea.un.org/ecosystem-accounting

15 "EU SFDR Explained: A Guide to the EU Sustainable Finance Regulation for Investors", J.P. Morgan Asset Management (1 January 2023). https://am.jpmorgan.com/us/en/asset-management/institutional/investment-strategies/sustainable-investing/understanding-SFDR/

16 "Commission Delegated Regulation (EU) 2022/1288 of 6 April 2022 supplementing Regulation (EU) 2019/2088 of the European Parliament and of the Council with regard to regulatory technical standards specifying the details of the content and presentation of the information in relation to the principle of "do no significant harm", specifying the content, methodologies and presentation of information in relation to sustainability indicators and adverse sustainability impacts, and the content and presentation of the information in relation to the promotion of environmental or social characteristics and sustainable investment objectives in pre-contractual documents, on websites and in periodic reports". Official Journal of the European Union L 196, Volume 65 p.1-72 (25 July 2022). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022R1288

17 "Guide on Biodiversity Measurement Approaches (2nd Edition)", Finance for Biodiversity Pledge, Annex on Assessing Impact to Pledge Guidance (October 2022). https://www.financeforbiodiversity.org/wp-content/uploads/Finance-for-Biodiversity_Guide-on-biodiversity-measurement-approaches_2nd-edition.pdf

1. **Biodiversity investing** continued

The EU Taxonomy Regulation, adopted in 2020, provides a list of environmentally sustainable economic activities based on four overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable.[18] The EU Taxonomy Regulation's six environmental objectives include the "protection and restoration of biodiversity and ecosystems". While additional legislative acts have already been adopted for the two climate-related environmental objectives of the EU Taxonomy Regulation, such detailed additional regulation is still pending for the remaining four objectives, including the one on biodiversity. On 30 March 2022, the Platform on Sustainable Finance (PSF) published its final recommendations to the European Commission on the technical screening criteria (TSC) for the four remaining environmental objectives in the EU Taxonomy Regulation, but the response of the European Commission is still pending. It is likely, however, that the additional detailed rules, once finalised and published, will further increase the attention on these topics.

In addition to the EU SFDR, a complementary set of EU and EU member state legislation focuses on combating biodiversity loss. As of June 2022, the European Commission adopted a draft Nature Restoration Law that sets ecosystem recovery targets for marine and terrestrial ecosystems. The law intends to incrementally roll out restoration objectives to cover 20% of the EU's marine and terrestrial ecosystems that are in need of restoration by 2030, and 100% of eligible ecosystems by 2050.[19]

Within the EU, France has taken a pioneering role in biodiversity legislation. In 2016, France adopted the "law for the restoration of biodiversity, nature and landscapes" that created a no-net-loss biodiversity objective, banned certain consumer and wholesale goods, such as cosmetics with plastic microbeads and neonicotinoid-bearing pesticides, and ratified the Nagoya Protocol on genetic resources.[20] In 2021, France extended its biodiversity ambitions directly to the investing community with the ratification of Article 29, which mandates investors operating in France to disclose climate- and biodiversity-related risks. Article 29 also requires financial institutions to describe plans for reducing their biodiversity impact.[21]

Further afield, legal initiatives, such as the "Rights of Nature" movement, may have implications for biodiversity investing. The Rights of Nature movement is a legal theory that seeks to assign personhood or legal standing to an ecosystem. Once assigned legal standing, the ecosystem can ostensibly use the court system, via a trust or guardianship, to seek protection. Ecosystems have been successfully awarded Rights of Nature legal status in several countries including Ecuador and New Zealand, and have resulted in multiple legal actions, although the results are unclear.[22]

Regulatory efforts relevant to biodiversity investing will likely increase in number and scope over the next several years. The EU SFDR represents the tip of the iceberg for the formalising of ESG reporting and disclosure, biodiversity included. Other governments may move to follow the EU's lead or develop their own reporting standards.[23] Legislative pathways for tackling biodiversity loss may also expand, echoing the EU's draft Nature Restoration Law, which carry implications for investee companies and investors. Investors will need to adapt to a dynamic regulatory landscape and ensure they have access to the relevant domain expertise and data needed to achieve compliance.

[18] "EU Taxonomy for Sustainable Activities: What the EU is Doing to Create an EU-Wide Classification System for Sustainable Activities", European Commission. https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en

[19] "Nature Restoration Law: The Commission has Proposed a New Law to Restore Ecosystems for People, the Climate and the Planet", European Commission. https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-law_en

[20] "Biodiversity: France's Positions and Actions", France Diplomacy, Ministère de L'Europe et des Affaires Étrangères (May 2020). https://www.diplomatie.gouv.fr/en/french-foreign-policy/climate-and-environment/the-preservation-of-biodiversity/article/biodiversity-france-s-positions-and-actions

[21] Beate Triantafilidis, "France's Article 29: Biodiversity Disclosure Requirements Sign of What's to Come," Global Canopy, Insight (17 March 2021). https://globalcanopy.org/insights/insight/frances-article-29-biodiversity-disclosure-requirements-sign-of-whats-to-come

[22] Tiffany Challe, "The Rights of Nature – Can an Ecosystem Bear Legal Rights?" Columbia Climate School, State of the Planet, 22 April 2021. https://news.climate.columbia.edu/2021/04/22/rights-of-nature-lawsuits

[23] "Public Input Welcomed on Climate Change Disclosures", US Securities and Exchange Commission Statement (15 March 2021). https://www.sec.gov/news/public-statement/lee-climate-change-disclosures

1. Biodiversity investing continued

1.4. Relationship to climate investing

Among the various environmental impacts sustainable investing aims to tackle, climate change is likely the most advanced area in terms of metrics and data (carbon exposures, science-based targets, implied temperature rises, climate value-at-risk, etc.). In terms of reporting requirements, climate change is certainly a more mature field.[24] Consequently, now that biodiversity investing is gaining momentum, it is only natural for investors to look back at climate investing to learn the lessons from the past and hope that the development of reporting standards will be a shorter journey.

However, while biodiversity loss and climate change might share some common root causes, the underlying physical mechanisms are different and so are the consequences. As a result, climate investing can be a good starting point for thinking about biodiversity investing but is not sufficient to provide all the answers. In this section we discuss the main differences and similarities between the two fields of climate investing and biodiversity investing, and also show how they can be complementary.

1.4.1. Metrics

While there are many contributory factors to what is colloquially called climate change, such as land use changes, the term usually refers to the more recent (since the mid-20th century) global warming phenomenon compared to pre-industrial times that is attributed to anthropogenic greenhouse gas (GHG) emissions.[25] While GHG emissions encompass multiple gases, carbon dioxide is the most prevalent among GHGs originating from human activity (estimated to be around 75% in 2019 according to the Intergovernmental Panel on Climate Change (IPCC)[26]), so it is common to measure a country's, or an industry's, or a company's GHG emissions in tons of carbon dioxide equivalent (noted CO_2e or CO_2-eq). GHG emissions as measured in CO_2e have become a convenient metric for policymaking and climate investing.

[24] Greenhouse Gas Protocol: https://ghgprotocol.org/about-us

[25] Allen, M.R., O.P. Dube, W. Solecki, F. Aragón-Durand, W. Cramer, S. Humphreys, M. Kainuma, J. Kala, N. Mahowald, Y. Mulugetta, R. Perez, M.Wairiu, and K. Zickfeld, "Chapter 1: Framing and Context" in "Global Warming of 1.5°C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty", Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.). Cambridge University Press, Cambridge, UK and New York, NY, USA, p.49-92 (2018). https://doi.org/10.1017/9781009157940.003.

[26] SPM.1: Figure 1 of the Summary for Policymakers in "Global Warming of 1.5°C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty", Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.). Cambridge University Press, Cambridge, UK and New York, NY, USA, p.6 (2018). https://doi.org/10.1017/9781009157940.001.

1. Biodiversity investing continued

When it comes to agreeing on an equivalent metric to CO_2e for biodiversity investing, multiple footprinting metrics have been developed, but a consensus has yet to be reached. Means Species Abundance (MSA) and the Potentially Disappeared Fraction of Species (PDF) seem to be gaining traction but are not recognised to the level of CO_2e in climate investing. We will discuss these two metrics more thoroughly in section 2.1.3, but put simply, they are attempts to estimate the impact on biodiversity coming from environmental pressures due to human activity. The lack of consensus on biodiversity metrics can be illustrated by the fact that, during our research, the data vendors we spoke to were developing implementations for one or the other, or sometimes both: we did not observe the hegemony of a single metric. The existence of competing metrics is likely healthy and is more symptomatic of the lack of maturity in the biodiversity investing field rather than model shortcomings. Both MSA and PDF provide the great convenience of allowing for comparison of varying sources of impact (water usage, land transformation, marine acidification, climate change, etc.) on nature. However, as the metrics become more defined, the link between biodiversity and financial returns might become weaker. While it is generally accepted that CO_2e is an important metric for measuring transition risk because of carbon taxes, it is less likely that MSA or PDF will be used by governments to preserve biodiversity.

1.4.2. Considering time and space

Quantifying the drivers of biodiversity loss and their impacts is difficult. We have just established that there is no real equivalent to CO_2e for biodiversity. Biodiversity loss is caused by more diverse factors (such as deforestation, land transformation, freshwater eutrophication, etc.) than climate change. To complicate the matter, biodiversity loss is the aggregation of a multitude of local problems whereas climate action initiatives target how humans are changing the chemical composition of the atmosphere specifically. In practice, this means that while we can roughly accept that 1 ton of CO_2e emitted in a given region is equivalent (in terms of climate change impact) to another ton of CO_2e emitted in another region, biodiversity investing does not benefit from this kind of accounting convenience. Many biodiversity problems are purely local and efforts to reduce human impact on one side of the planet might not necessarily help preserve natural habitats elsewhere. For this reason, unlike CO_2e, it will be more difficult to make the claim that the impact on river flows and their dependent habitats of the use of $1m^3$ of water in one river is the same in rivers everywhere. For instance, a wetland might already be heavily at risk, and further stress could prove the tipping point for local biodiversity.

Climate change plays on multiple timescales. For instance, the impacts of rising temperatures on sea levels will differ from the impacts on extreme weather events. There are also several tipping points (points past which recovery is impossible within short spans). Similarly, biodiversity loss also plays on multiple timescales. It does not take the same amount of time to regrow a forest as it does to let a body of water recover its prior acidity level, or for the local fauna and flora recover from losses (if at all). This makes comparing companies from a biodiversity loss perspective tricky. In the previous paragraph, we explained that the use of $1m^3$ of water was not equal in impact to the use of $1m^3$ of water elsewhere. We now posit that the use of $1m^3$ of water is not equivalent to the use of $1m^3$ of water even from the same water source at a different date, as environmental pressures do not impact biodiversity linearly. This fact also influences mitigation policies. For instance, a restoration effort will not have the same impact as a preservation effort.

1. **Biodiversity investing** continued

1.4.3. Scope 3 is still critical but more complex

The GHG protocol designed a framework to allow companies to report their emissions systematically and consistently.[27, 28] Scope 1 emissions, or direct emissions, are emissions occurring from company-owned or controlled sources, such as manufacturing on company facilities and operating vehicles. Scope 2 emissions are indirect emissions related to consumption of acquired electricity, steam, heat, or cooling. And Scope 3 emissions are other emissions not included in Scope 1 and 2 emissions but that the company indirectly affects, such as emissions caused by other agents of the value chain.

Operational emissions (Scopes 1 and 2) are usually reported with a higher degree of precision than Scope 3 (indirect emissions), but focusing solely on the former can be heavily misleading. Scope 3 emissions are even more critical in a world in which varying business models compete (fully integrated companies tend to generate more Scope 1 emissions). For some companies, Scope 3 accounts for the majority of their emissions – not reporting or holding them accountable to these emissions could undermine decarbonisation, as these companies would not be incentivised to change their business models.

Breaking down GHG Emissions by scope can help better assess companies based on their control and tracking of supply chains and the impact of their finished products. Put simply, Scope 3 provides a fuller picture.

Biodiversity investors should integrate the notion of scopes as much as climate investors. Given that manufacturing is not a natural-capital-intensive activity (compared to agriculture or forestry), most industries could report low but accurate Scope 1 biodiversity figures.[29,30] However, similar to climate investing, for which it would be too naïve to merely shift the blame of emissions on energy companies, we should not solely put the burden of responsibility on primary industries. Manufacturing and services companies can still manage their Scope 3 impacts through better sourcing, resource use efficiency, more sustainable product end use management, and other mitigation efforts.

Ideally, as much as data solutions permit, investors may want to assess a company's complete impact, including those coming from their value chains. This assessment is another key distinction, and difficulty, compared to climate investing, as critical direct and indirect impacts on biodiversity can more often be generated by actors that are small scale, and occur in the context of grey or black markets.[31,32,33] For instance, deforestation is barely captured at the Scope 1 level for developed markets large-cap indexes.

[27] Greenhouse Gas Protocol Abut Us: https://ghgprotocol.org/about-us

[28] "Corporate Value Chain (Scope 3) Accounting and Reporting Standard: Supplement to the GHG Protocol Corporate Accounting and Reporting Standard", World Resources Institute and World Business Council for Sustainable Development, Greenhouse Gas Protocol (2011). https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf

[29] Public minutes of the Technical Workshop on Biodiversity Accounting Approaches for Business, European Business@Biodiversity Platform and UN Environment World Monitoring Centre, 26-27 March 2019, Brussels.

[30] See Mean Species Abundances charts in section 2.1.3.

[31] "Developing Forest-Smart Artisanal and Small-Scale Mining (ASM) Standards", World Bank (2021). https://documents1.worldbank.org/curated/en/099235104252220988/pdf/P1722450cd79500c30bca0078f7496c1e66.pdf

[32] "Illegal, Unreported and Unregulated (IUU) Fishing", Food and Agriculture Organization of the United Nations, (2022). https://www.fao.org/iuu-fishing/fight-iuu-fishing/en/

[33] "Illegal Logging and Deforestation", United States Agency for International Development. https://www.usaid.gov/biodiversity/illegal-logging-and-deforestation

1. Biodiversity investing continued

Exhibit 2: Examples of GHG emission sources and biodiversity loss drivers for a car manufacturing company

	Climate	Biodiversity
Scope 1	On-site manufacturing processes	Land used for manufacturing
Scope 2	Purchased electricity (share of renewables)	–
Scope 3	Purchase of goods to be transformed (metals, plastics, manufactured parts) Use of sold products (electric vehicles vs. internal combustion engines) Distribution and transportation	Purchase of goods to be transformed: metals and mining (land used, water used, waste management) Use of sold products (impact of end of life of lithium batteries vs. impact of oil drilling)

Source: J.P. Morgan Asset Management.

1.4.4. Complementary solutions

We are still in the first section of our paper and have already put forward that biodiversity investing is complicated because of three main reasons:

- Biodiversity loss comes from multiple sources that are not easily comparable. Although MSA and PDF help by simplifying the multifactorial nature of biodiversity loss, these metrics are more model-dependent and give us a less elegant accounting solution than CO_2e for climate investing.
- The same environmental pressures we exert do not have the same biodiversity impacts based on time and space.
- For many companies, the biodiversity impact is mostly caused by their supply chain, over which there is typically less traceability, transparency, and control.

So here comes the first piece of good news: climate investing and biodiversity investing are complementary, and if you are doing some of the former you probably are already doing a bit of the latter too.

First, climate change is a key vector of biodiversity loss, a characteristic confirmed by its presence as a component of footprinting models (see Section 2.1.3). Climate change, through its physical impacts (extreme weather, droughts and floods, sea level changes, etc.) can destroy a variety of ecosystems. Climate change, through temperature rise for instance, can accelerate biodiversity loss.

Second, the causality can be reversed too. There is a positive relationship between what is good for biodiversity and what is good for climate. Resource usage efficiency can be a mitigator for both fields. Carbon offsets can present themselves as conservation and reforestation efforts.

There is a two-way street between biodiversity investing and climate investing, and most actions taken for one could support the other. Climate investing has helped elevate consciousness about environmental externalities and we think that certain climate strategies should accelerate that positive effect on biodiversity.

2. The tools: The biodiversity investing data landscape

2.1. Proposed classification

For this research project, we have reviewed the offering of a dozen data solution providers[34, 35], and analysed six publicly accessible datasets and frameworks.[36] The origins, methodologies, scopes, and aims of the solutions are quite diverse and can make for difficult comparisons. For this purpose, we propose a classification and will discuss the interaction between the different solutions. However, the reader can already note that these categories can be fuzzy – the scope of each category might not be as sharply outlined as we imply.

Exhibit 3: Summary of biodiversity investing data solutions

Category	Coverage	What is measured	Limitations
Sustainability datasets	Large, but varying depending on the metrics	Environmental pressures, impact mitigators	Limited comparability across industries and regions, quality of mitigator assessment might be low
Thematic scorecards	Low, but issues might be specific enough that most important actors are covered	Impact mitigators	Focused on one or two sub-themes, often focused on company policies rather than impacts, low coverage
Footprinting solutions	Large	Impacts, but underlying data can be accessed	Currently heavily model-driven (depends more on revenue segmentation rather than hard data on pressures and impacts generated by individual companies)
Remote sensing-based solutions	Low when impact is measured, large when exposure is measured	Impacts, exposures	**For impacts**: More adapted for specific parts of the value chain but can be scaled up **For exposures**: Mostly based on location data and introduction of qualitative elements is limited

Source: J.P. Morgan Asset Management.

34 Including solution providers for corporates.
35 With some providers offering more than one solution.
36 ENCORE (Natural Capital Finance Alliance), Forest 500 (Global Canopy), SPOTT (Sustainable Palm Oil Transparency Toolkit), Palm Oil Scorecard (World Wide Fund for Nature, WWF), Ocean Health Index, Nature Benchmark (World Benchmarking Alliance).

2. The tools: The biodiversity investing data landscape continued

2.1.1. Sustainability datasets

This first category of data solutions is not, per se, biodiversity-specific, but it probably constitutes the starting point for most investors interested in biodiversity. While less targeted, efforts to measure biodiversity impact and risk are almost as old as the field of sustainable investing. For instance, the Sustainability Accounting Standards Board (SASB) framework[37] identifies multiple general issues that are closely related to biodiversity and natural capital: Ecological Impacts; Water & Wastewater Management, Waste & Hazardous Materials Management, Materials Sourcing & Efficiency; and Supply Chain Management. Most off-the-shelf and in-house ESG scores integrate some elements that address biodiversity within their models, such as leveraging data on corporate land use and other biodiversity-related metrics.

Exhibit 4: SASB Materiality Map Excerpt

Dimension	General Issue Category	Health Care Delivery	Non-Alcoholic Beverages	Electric Utilities & Power Generators	Advertising & Marketing	Auto Parts	Metals & Mining
Environment	GHG Emissions						
	Air Quality						
	Energy Management						
	Water & Wastewater Management						
	Waste & Hazardous Materials Management						
	Ecological Impacts						

Source: Sustainability Accounting Standards Board.

Sustainability datasets are not biodiversity-specific solutions, but rather contain some relevant subsets for biodiversity. Because of this lack of specialisation, the first issue the investor will encounter when leveraging this type of dataset is that the product is not shipped with a manual. Certainly, all vendors will provide some necessities, such as a data dictionary, but there is no real guidance as to whether land use should matter more than water use, for instance.

We do not expect the reader to know how to answer this question as, unlike climate investing and carbon emissions, biodiversity investing aims to tackle multiple localised problems rather than one global challenge. ESG materiality matrixes are typically two-dimensional (a weight value is associated to all industry-metric couples), but building a weighting system for biodiversity comes with the added difficulty of requiring an additional dimension to be complete: geography. Unfortunately, as the impacts come in great part from the value chain, we cannot solely utilise the locations of corporate headquarters.

[37] Sustainability Accounting Standards Board (SASB) Standards Materiality Finder: https://www.sasb.org/standards/materiality-finder

Exhibit 5: Stages of disclosure and examples

Disclosure level	Illustration
Bad	The company does not disclose data on the surface of land it transformed through its activities despite being part of an industry for which land transformation is under strong scrutiny by local communities, policymakers, investors, and consumers.
Limited	The company repurposed **x km²** of land surface.
Good	The company repurposed **y km²** of land surface in *country A*, and repurposed **z km²** of land surface in *country B*.
Better	The company repurposed **y km²** of land surface in *area a*, and repurposed **z km²** of land surface in *area b* (with degrees of latitude and longitude and qualitative comments).
Best	Same as above plus full information on supply chain.

Source: J.P. Morgan Asset Management.

This approach to data analysis comes with a few disadvantages:

- Data points are not perfectly comparable: $1m^3$ of water used is not equivalent in terms of biodiversity impact to any another $1m^3$ of water used.
- Users must design their own materiality matrix, which requires specific knowledge about biodiversity loss mechanisms and ideally is backed by access to asset-level localisation data.
- Because the results are reliant on disclosures, coverage will vary depending on the metrics (and can be low); corporates might use varying methodologies to report similar metrics (non-comparability); and there is no guidance on how to estimate or penalise in case of non-disclosure.
- There is no assessment of mitigators, with datasets that provide information on whether a company has some biodiversity policies set in place, for instance, often not providing an assessment of the quality of these policies.
- The data can be used to assess risk but there is limited information that would permit the assessment of opportunities.

Despite all these limitations, we still think that sustainability datasets could be leveraged for high-level decisions. While precision and localisation are more crucial for biodiversity investing than for climate investing, it is still reasonable to assume that outliers within the same industries are likely to be the best and worst corporate actors in terms of natural resources usage. Given that most investors have onboarded various sustainability solutions, this is also a good way to get started without added data costs.

Please note that at the time of writing, about half of the sustainability dataset vendors we spoke to also had biodiversity-specific products, which we will comment on too, and that we are bound to see even more generalists propose specialised solutions as the demand from investors increases.

2.1.2. Thematic scorecards

All sustainability investors are familiar with scorecards, with one of the most famous of them being the ESG scorecard. Of course, multiple variations exist but all scorecards have in common a certain configuration: letter-level scores (environmental, social, governance), which themselves are based on a group of metrics sometimes called "general issues". GHG emissions, or climate, is commonly one of these general issues, and so is biodiversity.

2. The tools: The biodiversity investing data landscape continued

Biodiversity scorecards are similar to ESG scorecards, but more specialised – most likely, to the point of focusing on one or two sub-themes within biodiversity rather than on biodiversity itself. This focused approach is motivated by the fact that, as mentioned already, biodiversity loss is a collection of multiple issues rather than one unique problem. The causes and impacts are different for all sub-themes, so it is easier for scorecard providers to specialise in one area.

A common example is the World Wide Fund for Nature (WWF) Palm Oil Buyers Scorecard. Palm oil is the most consumed vegetable oil in the world.[38] It is a favourite of food product manufacturers because it improves food texture, is odourless, tasteless, and colourless (making it extremely versatile). Palm oil also acts as a natural preservative, while maintaining its properties even under high temperature. However, according to the WWF, the "rainforest and habitat loss caused by oil palm expansion is a key threat to at least 193 endangered species."[39] Also, because palm oil production is more land-efficient than most other oils,[40] replacement is not a straightforward strategy (see section 1.3.2.). As a comparison, soybean oil is estimated to require 7.7x more land surface for equivalent yields, and sunflower oil 5.5x.

This situation has motivated the WWF to monitor some of the 227 largest buyers of palm oil. The scorecard rates companies based on their commitments (to sourcing from deforestation-free palm oil), certifications and reporting, supplier accountability and traceability, and "on the ground" actions. A transparent methodology is published[41] and the WWF sends questionnaires to companies that have not already disclosed the relevant information as part of their sustainability reports or other relevant communications. The scorecard is freely accessible by anyone and can help both consumers make more informed decisions, and support concerned investors who want to engage with companies and limit the biodiversity impact of their portfolios.

Exhibit 6: Excerpt from the WWF Palm Oil Buyers Scorecard

Company and Total Palm Oil Volumes reported (MT)	Sector	Commitments Out of 4	Sustainable Palm Oil Purchasing Out of 11	Super accountability Out of 3	Sustainablity platforms Out of 2	On the ground action Out of 4	Total score Out of 24
Coop Switzerland 2,033 MT	Retail	3.5	10.64	2.25	2	4	22.39
John Lewis Partnership 2,252 MT	Retail	4	9.82	2.5	2	4	22.33
Ferrero 220,570 MT	Maufacturing	3	9.96	2.75	2	4	21.71

Source: World Wide Fund for Nature. Data are as of March 9, 2023.

[38] "More facts", European Palm Oil Alliance: https://palmoilalliance.eu/facts-on-palm-oil
[39] WWF About Palm Oil: https://palmoilscorecard.panda.org/#about
[40] Meijaard, Erik; Garcia-Ulloa John; Sheil, Douglas; Wich, Serge A.; Carlson, K.M.; Juffe-Bignoli, Diego; Brooks, Thomas M. "Oil Palm and Biodiversity: A Situation Analysis by the IUCN Oil Palm Task Force", International Union for the Conservation of Nature (2018). https://portals.iucn.org/library/node/47753
[41] WWF Palm Oil Scorecard Methodology: https://palmoilscorecard.panda.org/methodology

Scorecards can provide information that is often not available in sustainability datasets. They probably are one of the few tools that allow the biodiversity investor to also assess a company's positive impact (if any) on biodiversity. However, they tend to have low coverage across companies, as the goal for the organisations that manage these scorecards is more to increase accountability of the main actors within a certain theme rather than to sell a data product. For instance, the WWF Palm Oil Buyers Scorecard covers 227 corporates, while Forest 500 covers 500 of the most influential companies driving tropical deforestation. While investors may leverage and appreciate the efforts of these non-governmental organisations (NGOs), the coverage issue, combined with the lack of comparability among types of impact, can make it tricky to form definitive conclusions from biodiversity scorecards, let alone use them to guide systematic investment decisions.

2.1.3. Footprinting solutions

The expression "footprinting solutions" refers to models that produce aggregate biodiversity impact metrics that allows for comparisons of companies through multiple environmental pressures across different sectors. The more common impact metrics we have encountered are Mean Species Abundances (MSA) and Potentially Disappearing Fractions of species (PDF).

Footprinting solutions typically consist of multiple linked models that facilitate relating supply chain, environmental, and commodity data. The chaining of multiple models allows footprinting solution providers to estimate the biodiversity impact of a company even with limited information. There are roughly four steps to this process, which can be broken down as following.

1. Estimate a company's commodity consumption (including water) and emissions based on revenue segmentation data. The value chain impacts (Scope 3) of the company's consumption are also estimated, with supply chain mapping supported by input-output tables, such as Exiobase.[42] As an example, when assessing a poultry firm that generates revenues from the sale of eggs, the solution provider estimates how much corn was used as feed for layer chickens.

2. Estimate environmental pressures attributed to direct and indirect commodity consumption. To continue with the above example, in order for the poultry company's chickens to consume corn, another company, or multiple companies, had to produce the corn. The solution provider would therefore estimate the surface of land area transformed to grow crops.

3. Estimate the biodiversity impact from environmental pressures in terms of species abundance or potentially disappeared fractions of species. In our poultry company example, this would mean estimating how much the transformation of land for agriculture has reduced the species abundance of biodiversity in a certain area, by a certain percent.

4. Aggregate all impacts from all environmental pressures to generate footprinting metrics (Scope 1 and Scope 3 values). For example, how much has the impact of a company's on-site activities combined with the impact attributed to suppliers within its value chain reduced the species abundance of biodiversity in a certain area, by a certain percent.

[42] More details on the Exiobase methodology can be found at https://www.exiobase.eu

2. The tools: The biodiversity investing data landscape continued

We should add two comments to make the process described above more representative of the solutions we have encountered.

- At each step, inputs can be injected (from disclosures or alternative models) in order to yield more accurate outputs. For instance, going back to our poultry company example, the amount of corn purchased to be fed to chickens could come from the company's disclosures rather than estimated with the input-output table. However, within the samples of solutions reviewed, we observed only a limited number of cases in which the injection of new data was achieved. This issue is a concern that vendors are aware of and reflects the fact that most products are still new. Multiple vendors have mentioned starting, or being about to start, this process of data injection for the most exposed sectors as a first step.
- Solution providers might present a slightly different process by adding normalisation or intermediary review steps, achieved by integrating additional regional differentiators, etc. The above is representative of the minimal number of steps to make a footprinting solution functional.

Exhibit 7: Comparison of Potential Disappearing Fraction of Species (PDF) and Mean Species Abundances (MSA) biodiversity metrics

	PDF	MSA	Comments
Measurement[43]	Share of potentially disappeared species is measured.	Overall ecosystem intactness is measured.	
Example	In a given area over a given period, species A has disappeared, species B is 50% less abundant, and species C has been untouched and is thriving naturally. PDF is (1+0+0)/3 = 1/3	In a given area over a given period, species A has disappeared, species B is 50% less abundant, and species C has been untouched and is thriving naturally. MSA is (0+0.5+1) / 3 = 0.5	PDF seems to be a more conservative measure (once a species is estimated to have disappeared, it is difficult to improve the score over the time frame) while MSA is more sensitive to mitigating actions taken by corporates. Also see note on units below.
Pressure points	Climate change Freshwater acidification Marine eutrophication Marine acidification Freshwater eutrophication Terrestrial acidification Water availability Freshwater ecotoxicity Land transformation Land occupation	Climate change Land/see use change Direct exploitation Pollution Invasive alien species	Lists correspond to the original versions of the footprinting models but implementations may include more or less pressure points from one vendor to another.

Source: J.P. Morgan Asset Management, Global Biodiversity Model for Policy Support (GLOBIO).[44]

[43] Teillard, F.; Anton, A.; Dumont, B.; Finn, J.A.; Henry, B.; Souza, D.M.; Manzano P.; Milà i Canals, L.; Phelps, C.; Said, M.; Vijn, S.; White, S; "A Review of Indicators and Methods to Assess Biodiversity – Application to Livestock Production at Global Scale". Livestock Environmental Assessment and Performance (LEAP) Partnership. Food and Agriculture Organization of the United Nations, Rome, Italy (2016). https://www.fao.org/3/av151e/av151e.pdf

[44] Schipper, AM; Hilbers, JP; Meijer, JR et al. "Projecting Terrestrial Biodiversity Intactness with GLOBIO 4, Global Change Biology Volume 26 p.760-771 (2020). https://www.globio.info/projecting-terrestrial-biodiversity-intactness-with-globio-4

2. The tools: The biodiversity investing data landscape continued

Note on units: MSA and PDF calculations are typically delivered on a "surface.time" basis (such as "km^2.year" for instance).[45] Take the example of a company that has an estimated impact of 10 PDF.km^2.year. The interpretation can be that, because of the company's activities, all species have disappeared within a year over 10 km^2, or 10% of species are disappearing every year for 10 years over a 10 km^2 area, or 10% of species have disappeared within a year over a 100 km^2 area.

While we want to see footprinting solutions thrive, as of today, we find them overly reliant on revenue segmentation data, which leads to limited differentiation among companies operating in the same segments. Vendors are already integrating corporate-level data to increase differentiation but as of the time of the assessment we thought that most solutions were not mature enough to fully inform investment decisions. However, footprinting solutions can help map sectors and areas of the portfolio that are the most at risk, and could be sufficient for portfolio-level reporting purposes. Improvements in company disclosures should also help solution providers deliver better products.

2.1.4. Remote sensing-based and alternative solutions

Remote sensing-based solutions are characterised by measurements of the attributes of an area or object collected from a distance, usually collected via satellite imagery. Satellite-based solutions typically aim to service corporate clients rather than asset managers and investors. Common use cases may include monitoring deforestation prior to selecting a supplier, mapping of biodiversity habitats, or demonstrating results of a commitment to sustainable practices.

Biodiversity tracking via satellite imagery is an expanding field of research.[46] As of today, we do not find the satellite-based solutions compelling for measuring and comparing the biodiversity impact of multiple companies. Current participants in this space focus on designing bespoke solutions for corporate clients with a specific area to assess, which is a different expertise than the scoring capability that asset managers would require. However, when we spoke to one of these satellite imagery specialists, we found that they were already collaborating with one of the main sustainability data vendors, in order to combine their expertise (new variables from satellite imagery, more complete supply-chain cartography from corporate data specialists) and build a solution that would better support the biodiversity investor.

Looking back at footprinting solutions, it becomes obvious that making the models rely less on estimates and more on hard data would benefit the whole biodiversity data landscape. Satellite imagery, because of its scalable nature, is – in our view – an ideal candidate for filling this gap. For these efforts to be fruitful, we think that solutions providers should build datasets that combine impacts (PDF, MSA, or competing metrics), localisation (satellite imagery would obviously be instrumental), ownership of assets and activities, and business relationships (value chain).

Other remote sensing-based solutions that we have encountered take advantage of advances in the fields of environmental DNA analysis[47] and ecoacoustics.[48] However, these approaches seem to be even less scalable than satellite-based solutions, which limits their usage for systematic biodiversity loss-related risk management in public markets.

[45] See presentation for "Webinar 2: Case Studies on Product Level Biodiversity for Business and Finance", EU B@B Platform – Webinar Series 'Measuring Biodiversity for Business and Finance', European Commission Business @ Biodiversity (1 October 2020).
[46] Priority list of biodiversity metrics to observe from space: https://www.nature.com/articles/s41559-021-01451-x
[47] Environmental DNA is DNA that is collected from environmental samples (soil, seawater, snow, air). The samples are analysed to identify the variety of taxa in the sample (also called metabarcoding). This technique can help assess population sizes and dynamics.
[48] Ecoacoustics, also called acoustic ecology, is the field of study that studies the relationship between human activity and the environment through sound.

2. The tools: The biodiversity investing data landscape continued

2.2. Interactions among data categories

To better understand how each solution can provide value to users, we deemed it relevant to decompose them in building blocks. We also believe that this approach makes the overlaps among different solutions more obvious.

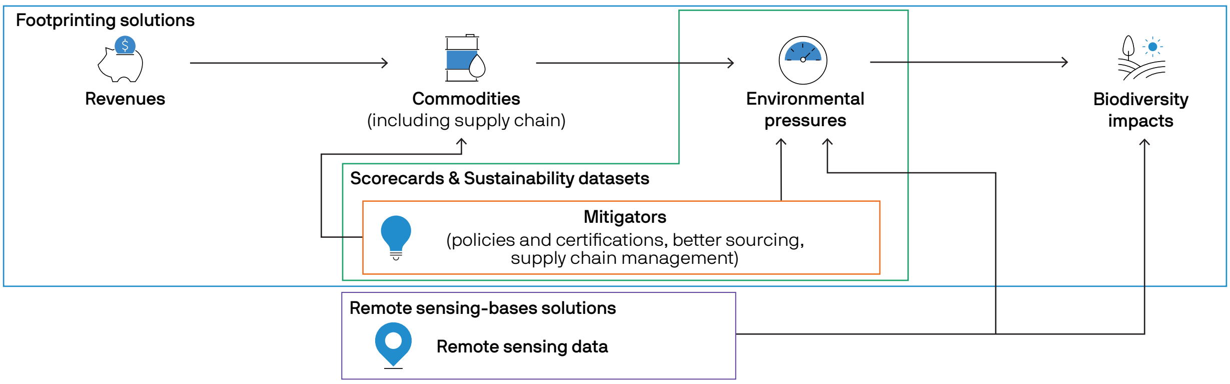
Footprinting solutions could simply refer to models that convert environmental pressures (climate change, land transformation, water acidification) into biodiversity impact metrics. However, in practice they are commonly also relying on models, or tables of inputs-outputs, that help map the supply chain. Environmental pressures are more the focus of natural capital approaches, which are linked, although not linearly, to biodiversity impacts. Natural capital is a slightly more measurable and mature field.

Mitigators are elements that help a company lessen its impact on biodiversity, compared to its peers. These can be related to sourcing strategies, energy management, offsetting efforts, etc. At a more abstract level, mitigators are the discrete decisions that make human activities less impactful on biodiversity. Scorecards typically focus on mitigators but some footprinting implementations also take them into account.

Geospatial data is being used to monitor environmental pressures but could also be used to better track supply chains. Although monitoring biodiversity from space is still a growing field of research, we think that in order to increase further the use of this type of data in biodiversity investing, improving the accuracy of footprinting models rather than working as standalone solutions is critical.

Given the advantages provided by footprinting solutions (comparability across sectors and biodiversity impacts, and large coverage), we believe that this category of solutions, if improved, is well positioned to become a critical tool in biodiversity investing. We hope to see more footprinting solution providers integrate other types of data, such as remote sensing data and information that can be found in biodiversity scorecards to increase differentiation among assessed companies.

Exhibit 8: Interactions among biodiversity data categories and solutions



Footprinting solution vendors add value by:
- Deploying quality-controlled public models to generate outputs;
- Injecting collected data (commodities, environmental pressures and mitigators).

Given that public models are mostly driven by estimates, there is a case for building a mitigator-focused scorecard. However, the absence of comparable metrics forces a sector-neutral if not a sector-specific approach.

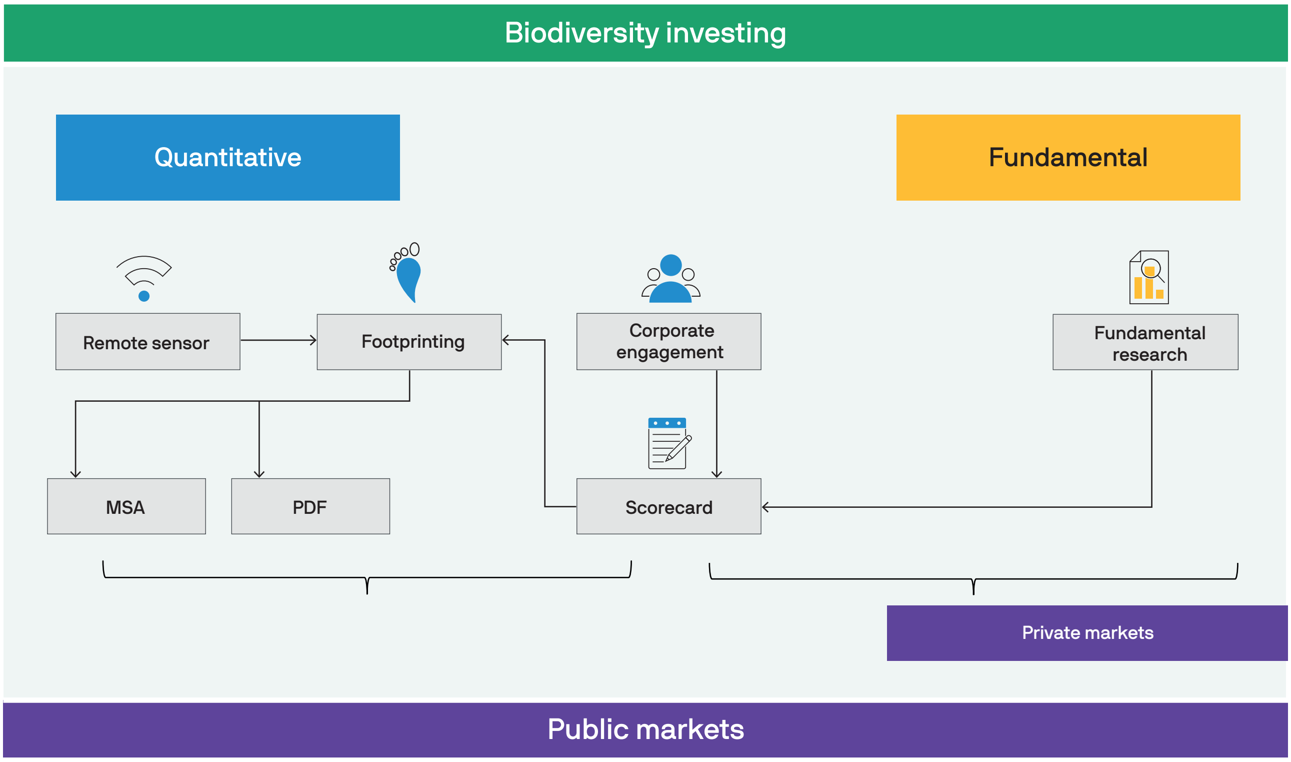
Source: J.P. Morgan Asset Management.

3. The biodiversity investing flowchart

Now that we have categorised, described and assessed the various types of data solutions for biodiversity investing we can suggest some practical applications. While the reader might be tempted to ask, “what is the best data solution?”, we think that there is no best solution. We believe that there is only a best solution for a given investor, depending on their history, capabilities, and preferences, rather than a universal answer.

It is common to categorise investor capabilities in terms of fundamental and quantitative. Both approaches are not exclusive and many large asset managers present both features. As a rough guide to biodiversity investing, we suggest the simplifying biodiversity investing tool flowchart below.

Exhibit 9: The biodiversity investing flowchart



Source: J.P. Morgan Asset Management.

3.1. Fundamental approach

3.1.1. Fundamental research

The fundamental approach to asset management is heavily characterised by its fundamental research. This responsibility is commonly given to research analysts. They are experts in collecting and processing data in both structured (financial reports, economic forecasts, etc.) and unstructured forms (conversations with corporate managers and industry experts, media contents, etc.).

While biodiversity is a different field from financial analysis, investment teams are starting to build expertise in sustainability-related topics. As previously noted, increasing focus and attention paid in various government, industry and supernational forums, emerging environmental regulations and voluntary reporting standards make these questions increasingly relevant as biodiversity may have a financially-material impact for investee companies.

3. The biodiversity investing flowchart continued

Given the importance of fundamental research for ESG integration in investment decision-making, we believe that research analysts can be a critical building block in the biodiversity investing landscape – particularly their ability to analyse unstructured data, which should help compensate for what is lacking in terms of data solutions. Research analysts also tend to focus on specific industries or regions, which limits the framing of biodiversity questions and allows them to focus on highly comparable biodiversity loss risks.

Finally, research analysts might be better positioned to look for companies making a positive impact on biodiversity (see part of section 1.2 about double materiality), as research in this area may be an element of certain sustainable investment strategies. Opportunities in biodiversity are bound to look more unstructured than risks. Biodiversity solutions come in different shapes and forms, and keeping a human element in the research process should make identifying opportunities easier compared to purely quantitative approaches.

3.1.2. Corporate engagement

According to the UK Stewardship Code, corporate engagement is the responsible allocation, management, and oversight of capital to create long-term value for clients and beneficiaries, leading to sustainable benefits for the economy, the environment and society.[49]

Corporate engagement has traditionally focused on corporate governance, but key issues such as biodiversity, as well as other emerging issues that investors believe may materially affect the financial performance and risks of investments, have become more common. Corporate engagement can be the vector for asset managers and asset owners to encourage companies to adopt stronger management and reporting practices, and to better understand the opportunities investees are aiming to seize.

Example: Engagement aims related to natural capital and biodiversity

- Assessment and disclosure of material nature-related risks.
- Establish a governance framework to mitigate financially material nature-related risks.
- Assess and disclose dependencies, impacts and risks related to natural capital.
- Analyse impacts due to changes in the pricing, demand, and supply of critical natural resources.
- Risk mitigation and business opportunities.
- Identify value-accretive strategies and set targets.

3.1.3. Scorecards

Scorecards can be an important building block of a biodiversity analysis for portfolio management. Sector researchers are used to sector-specific datasets, reports, and scorecards. We think for instance of the work at the Edison Electric Institute that provides frameworks for the sustainability reporting of energy companies, and which are leveraged by many analysts. In that sense, biodiversity scorecards can become an additional element in the research process.

[49] "The UK Stewardship Code 2020", Financial Reporting Council: https://www.frc.org.uk/getattachment/5aae591d-d9d3-4cf4-814a-d14e156a1d87/Stewardship-Code_Dec-19-Final-Corrected.pdf

3. The biodiversity investing flowchart continued

The main limitation of scorecards is their coverage. They usually focus on a sub-themes and cover only the most exposed actors. However, this weakness is less critical as most research analysts already focus on narrow universes to leverage their domain expertise. The real downside is that for less critical industries, there might be no relevant scorecard at all.

3.2. Quantitative approach

3.2.1. Footprinting solutions

Footprinting solutions are a natural fit for quantitative investing. They allow all corporate issuers to be classified based on a thorough methodology, and permit comparison across sectors and across different types of biodiversity impacts. These advantages make footprinting outputs, such as PDF and MSA measures, convenient inputs for optimised or tilted strategies similar to many ESG products or decarbonised strategies. Many solutions exist for creating portfolios with low tracking error vs. the benchmark, and enhanced characteristics and footprinting allows quantitative investors to work with familiar portfolio management capabilities.

However, we discussed in Section 2.1.3 how footprinting solutions are close to becoming the CO_2e of biodiversity investing, mostly on a theoretical level. As of today, it is our view not to use footprinting solutions alone for biodiversity investing. We think that, with this approach, currently three shortcomings can be identified:

The footprinting frameworks are still evolving and competing. We do not have a definitive answer as to whether a quantitative investor should use PDF, MSA or another metric. There are actually more alternatives, as the implementations vary from one vendor to another with changes at the model-level. Also, footprinting solutions are incomplete. For instance, almost all solutions did not integrate the impact of biodiversity on the oceans, and this field is bound to evolve greatly in the short to medium term. In short, there is no strong consensus around metrics, especially when compared to climate investing's CO_2e. One counter-argument is that ESG scores exist in different shapes and forms, and there is no real consensus on them either. However, ESG is a much more mature field, with methodologies driving composite ESG scores being more accepted, and we believe that most sustainable investors understand the strengths and weaknesses of their ESG solutions. Properly reviewing a footprinting solution requires capabilities that most asset managers are likely to lack as of today.

- Footprinting solutions rely too much on extrapolations from revenue segmentation data. We understand that disclosures and alternative sources of information are limited, and that this kind of approach can be useful for gap-filling, but we are wary of solutions for which this approach is the default. In its current state, footprinting data would overexpose/underexpose companies based on their revenue segmentation rather than mitigators put in place. We think footprinting solutions might be mature enough for reporting and identifying sectors or regions where further analysis and engagement would be appropriate, but not enough for quantitative investing.
- Because of the revenue segmentation dependency, there are currently limited measurable pathways for corporates to improve their score (inputs-outputs model constraints).

In theory, footprinting solutions would make for a formidable tool for quantitative investors, but their current implementations are not mature enough. We will be monitoring progress in this area and hope to leverage this family of products in the medium term.

3. The biodiversity investing flowchart continued

3.2.2. Scorecards

We discussed scorecards for fundamental research. Coverage was already an issue, but the problem is framed slightly differently in the case of quantitative investing. There is a strong rationale for using biodiversity scorecards in quantitative investing even if full universes are not covered. Data completeness (or rather incompleteness) is a common issue in quantitative investing, but we also know that some industries are more at risk than others so we believe that applying biodiversity criteria solely for a subset of the portfolio can be defended. Implicitly, sustainable investors who have been relying solely on ESG scores have already been implementing biodiversity criteria inconsistently as, by design, ESG materiality maps assign different weights and metrics to themes depending on industries. Scorecards also tend to focus on only one theme, thus creating a need for combining them, and to heavily rely on corporate policies as opposed to tangible resource consumption or impact data.

However, we think that quantitative investors interested in biodiversity risk should not shy away from exploring biodiversity scorecards even if they only provide coverage for a few hundred corporate issuers. Implementation will likely lack the elegance of the integration of complete datasets, such as the inability to provide portfolio level summary statistics, but we believe there could be merit in such additional tools for portfolio management.

3.2.3. Remote sensing-based solutions

Sensor-based solutions may naturally appeal to quantitative investors with their large datasets. There is also a precedent for using satellite imagery in investing, including for supply chain tracking. However, we saw in section 2.1.4 that as of today, these solutions are mostly tailored around individual corporate projects. We think that sensor-based data will make its way towards biodiversity investing through three venues:

- Supporting corporate biodiversity reporting;
- Augmenting footprinting solutions with more measurable inputs; and
- Creating its own biodiversity framework with efforts such as the Essential Biodiversity Variables (EBV), as some biodiversity patterns can be observed from space (see footnote in Section 2.1.3).

We think that in the context of biodiversity investing, satellite imagery will augment other solutions rather than form its own category. This could be an area of interest for all biodiversity investors, but implementation will likely go through an intermediary that can combine this type of data with other biodiversity frameworks rather than be handled directly by investors. We have also observed the development of asset location-based solutions, which can help identify exposure to biodiversity loss risk. However, these solutions do not measure impacts nor, as of today, seem to integrate qualitative elements (mitigators and actual resource consumptions or environmental pressures).

4. Practical applications: Selecting a footprinting solution

In this section, we consider more practical considerations. We believe that we have mapped out most of the data landscape for biodiversity investing, broken down the interactions between the multiple solutions, and suggested an approach based on one's capabilities.

The following is an illustrative example of selecting a footprinting solution.

Let's assume that a reader is now fully committed to taking their first steps in biodiversity investing and has even narrowed down a preferred approach to a footprinting solution. The reader will find at least half a dozen providers, with most of them offering similar outputs (a Scope 3 MSA or PDF figure for instance). The challenge is to know what makes one third-party footprinting solution preferable to another. We have created a five-point checklist that sets out our view to how this selection process could be approached.

1. **PDF vs. MSA**: Should the investor focus on the number of disappeared species (PDF) or the average abundance of all species (MSA)? Choosing between PDF and MSA can be interpreted as a trade-off between the precautionary principle (once a species is estimated to have disappeared, it is difficult to counterbalance the disappearance and to increase the PDF over a given period) and manageability (MSA is theoretically more reactive to efforts put in place to protect ecosystems).
2. **Coverage**: Despite the level of automation and the dependency on revenue segmentation, we observed that coverage could vary significantly from one vendor to another.
3. **Integration of sub-themes of interest**: While there is a large overlap among biodiversity sub-themes being integrated in footprinting solutions (climate change, land transformation), other sub-themes might not be integrated at all or differently (for example, the impact on oceans, invasive alien species). It is also worth noting that in some cases, the absence of some sub-themes might be due to added complexity of the modelling or lack of consensus on the measures used. It is therefore always worthwhile discussing product development plans with the relevant solution provider.
4. **Data injection**: Footprinting solutions need to move away from revenue segmentation for generating outputs. Revenue data should be used as an additional layer for gap filling when no other data points are available but relying too much on revenue data makes the final output impractical for quantitative approaches to investing. Investors may want to rank companies based on the mitigation strategies they put in place and real impacts, not classification of their activities.
5. **Future product developments**: Most footprinting solutions are new and come from actors already active in the sustainability or climate investing field. COP15 has accelerated the release of solutions, and these are bound to evolve. Most vendors openly discuss their development plans, but a review of what will be implemented and the credibility of the plans is a necessity. For instance, satellite imagery is a common item on vendors' "to-do" lists but requires specific knowledge, so it is important to inquire about their partners, or at which stage of the process they are at. There is still a lot of uncertainty about the standards for reporting and measuring biodiversity loss risk, and flexibility is also an important feature of better solution providers.

5. Conclusions

5.1 Our findings as investors

Throughout this research we have established that the biodiversity data solutions landscape is, in some ways, still lacking maturity, but is also evolving fast. With increased awareness of the risks linked to biodiversity loss, we think that the market for solutions will continue to improve rapidly.

While we hope for the emergence of a gold standard solution, we do not think there is one out there yet. Varying implementations of PDF and MSA are probably the closest to a gold standard today, but we think that the shortcomings in both approaches are too important to be able to use the solutions on their own. We invite potential and current biodiversity investors to monitor the data landscape more closely as tomorrow's solutions are being discussed today.

As pointed out, we also see merit in exploring the use of scorecards, whether already available or built in-house, as some biodiversity risks are industry specific. Some questions require a level of depth that can currently only be obtained via these methods, and there is also merit in focusing on industries that are more at risk than others.

We believe that corporate engagement can help to drive greater disclosure and improve best practices with underlying investee companies. In a field such as biodiversity investing, where data continues to be limited, dialogue with investee companies may complement data from solution providers.

5.2 Our message to solution providers

We are grateful to the solution providers and NGOs that are working to provide more transparency to the biodiversity loss problem. We believe that they have an important role to play to develop biodiversity investing further, in order to more effectively support the evaluation of investee companies' impact on natural capital and ecosystems.

Asset managers on their journey as biodiversity investors hope for the continued support of data partners. For footprinting metrics, we look forward to data solutions that:

- Better integrate value chain assessments (Scope 3): Asset managers require clear location, ownership, and relationship information to invest and engage corporates more efficiently.
- Emphasise on company-level data (and reduce reliance on industry inferences and estimates): Some industries are more responsible than others and understanding which actors are better at mitigating their impacts is critical to investors.
- Leverage multiple capabilities: Measuring biodiversity risk requires a diverse skillset, and the most robust solutions we have considered come from solution providers that use relevant partners and leverage domain expertise.

Note: For more information contact your J.P. Morgan Asset Management representative.

To contact AP4, please email: info@ap4.se

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