

Biodiversity measurement approaches

A practitioner's guide for financial institutions

4th
edition



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1. Financial institutions measuring biodiversity impacts and dependencies

Financial institutions (FIs) are looking for ways to assess their impacts on biodiversity and dependencies on ecosystem services via their finance and investment activities. The aim of this guide on biodiversity measurement approaches is to inform FIs and assist them in understanding the methodologies and tools currently in use and under development.

EU Business and Biodiversity work

Banks, investors, insurers and impact funds defined the need and format for this guide, as part of the 'sharing practices' activities of the [Finance & Biodiversity Community](#) (F&B Community) under the [EU Business & Biodiversity \(EU B&B\) Platform](#). By involving the [Workstream Methods](#), also part of the EU B&B Platform, this guide aligns with and builds on its report series [Assessment of biodiversity measurement approaches](#) (EU B&B). This report series gathers and assesses the input delivered by tool developers and leading practitioners. The series provides more in-depth information on the specific characteristics of the methodological approaches and provides detailed guidance on how to select suitable measurement approaches and metrics for both companies and FIs.

Finance for Biodiversity Pledge

The need for a biodiversity measurement overview was also expressed by signatories to the [Finance for Biodiversity \(FfB\) Pledge](#) to support the implementation of their commitment '3. Assessing impact'. This guide is a revised edition of the [2024 \(February\) Guide on measurement approaches](#) and serves as an annex to the 'Assessing impact' section of the FfB Pledge's more generic [Guidance to the Pledge](#) document.

Reading guide

This guide begins with a set of practical recommendations for FIs. This is followed by the twelve measurement approaches included in this guide and a description of the criteria used to assess them (Chapter 3). The criteria are aligned with those from the report series [Assessment of biodiversity measurement approaches](#). Chapter 4 maps the measurement approaches against these criteria. This is followed by Chapter 5, which provides a description of each measurement approach. Case studies demonstrating how FIs have used these measurement approaches are included in Chapter 6. Chapter 7 outlines the types of data sources and models available to support biodiversity measurement approaches, as well as data innovations and emerging data initiatives. Chapter 8 is dedicated to measuring marine biodiversity, as most of the measurement approaches described in this guide do not yet cover the marine realm extensively. Finally, Chapter 9 describes the next steps.

This is the fourth edition of the guide, published in October 2024.

2. Practical recommendations for financial institutions

This guide offers a straightforward presentation of methodologies and tools for FIs to measure impacts and dependencies, which are essential to address nature-related risks and opportunities. This guide is designed to align with key frameworks, standards and initiatives in the field of biodiversity impact and dependency assessment.

Before exploring the methodologies and tools included in this guide (Chapter 3), this chapter provides an overview of the categories commonly used to classify biodiversity assessment approaches. The following information offers clarity on this matter and outlines the steps FIs can follow to assess impacts and dependencies, thereby understanding the nature-related risks and opportunities they face.

2.1 Sector screening and prioritisation

FIs can begin by assessing their exposure to sectors with significant nature-related impacts. It is important to conduct this screening across all portfolios, ensuring that sectors with limited financial exposure are included as well. Nonetheless, starting with sectors that have significant financial exposure and high nature-related impacts is a pragmatic first step. Additionally, adopting a country-level approach can help identify priority sectors based on the financial exposure to critical countries or regions. Relevant metrics that can be used to measure the exposure to sectors include the outstanding amount or percentage of invested or owned assets (for asset owners and managers), and the lending volume (for banks), among others. By mapping the financial exposure to those sectors that are most exposed to nature-related risks, FIs can better prioritize which sectors require immediate attention.

2.2 Company-level assessments for priority sectors

The next step involves conducting company-level impact assessments, including the value chains of companies. In this context, various approaches exist, such as biodiversity footprinting. This method offers a practical estimate of portfolio companies' impacts using readily available data, enabling large portfolio assessments with minimal information, such as life cycle assessments and revenue figures. The [Partnership for Biodiversity Accounting Financials \(PBAF\) Standards](#) and the [TNFD's Discussion paper on biodiversity footprinting approaches for FIs](#) offer valuable insights, tools, and resources for understanding and conducting biodiversity footprinting assessments. Additionally, the FfB Foundation performed a footprinting assessment of over 2,300 globally listed companies using a collaborative footprinting approach ([access the FfB Multi-tool study here](#)).

In addition to assessing impacts, FIs can enhance their understanding of nature-related risks and opportunities by evaluating their dependencies on ecosystem services at the company level. All companies and sectors depend on ecosystem services to some degree, yet not all dependencies create business and financial risk. Examples of scenarios where dependencies can translate to financial risk include situations where the demand for an ecosystem service exceeds its supply or when there are potential negative impacts on production processes or on stakeholders dependent on those ecosystem services. While dependency assessment approaches are less mature than impact assessments, several tools are now available that enable the quantification of companies' reliance on ecosystem services.

2.3 Location-specific assessments and exposure to sensitive locations

FIs are encouraged to assess their exposure to companies with assets and/or activities in sensitive locations for biodiversity. Sensitive locations include areas important for biodiversity, areas of high ecosystem integrity, areas of rapid decline in ecosystem integrity, areas of high physical water risks and/or areas of importance for ecosystem service provision including benefits to indigenous peoples and local communities (IP&LCs). Examples of metrics that FIs can use to measure their exposure to sensitive locations are the amount or percentage of invested or owned assets (for asset owners and managers) and lending volume (for banks) in sensitive locations, among others. Further guidance on the tools and data to identify and assess sensitive locations is provided in the TNFD's [LEAP approach \(component L4\)](#) and [Additional guidance](#) for financial institutions.

Due to gaps in biodiversity data, FIs may face limitations in accessing spatially explicit data and in identifying the geographic locations of portfolio companies and financial activities, including their direct operations and value chains. Nevertheless, given that nature-related risks and opportunities can be spatially explicit, FIs are encouraged to explore existing metrics that address biodiversity impacts from a spatial perspective. Additionally, those FIs with access to nature-related data relevant to their portfolio companies and financial activities can take a more advanced approach by conducting assessments with state-of-nature metrics and data (see the [Biodiversity Finance Metrics for Impact Reporting](#) from the International Finance Corporation, and the [State of Nature Metrics](#) being developed by the Nature Positive Initiative). This allows for the assessment of changes in those biodiversity components and ecosystem services that are most material to the FI, as well as the direct and indirect impacts of portfolio companies and financial activities on these.

2.4 Assessment of nature-related risks

FIs that follow the previous steps will have adequate information to identify the nature-related risks associated with their portfolios and investments. Nature-related risks refer to potential threats posed to an organisation that arise from its and wider society's dependencies and impacts on nature. According to the TNFD, nature-related risks are categorised into physical, transition, and systemic risks. Physical risks arise due to changes in the biotic (living) and abiotic (non-living) conditions of ecosystems. Examples of physical risks include assets exposed to water price action due to resource depletion and the exposure of assets to increased operational disruptions caused by extreme weather events. FIs face transition risks when economic actors fail to align their actions with efforts to protect, restore and/or mitigate negative impacts. Examples of transition risks for FIs are the increased costs and penalties from stricter environmental regulations, affecting non-compliant portfolio companies, and the reputational damage from financing companies involved in environmentally harmful practices. Lastly, systemic risks arise from the breakdown of the entire system, such as increased inflation due to droughts.

Although there are currently only a limited number of tools available for directly quantifying nature-related risks¹, the development of such tools is advancing rapidly and will continue to do so over the coming years. Furthermore, there are indicators and metrics that can be populated with data to determine the value or extent of assets, liabilities, and revenue exposed to these nature-related risks and opportunities (see the [Recommendations of the TNFD](#) for additional information).

¹ Nature-related opportunities, not covered in this report, refer to the activities that create positive outcomes for organisations and nature by creating positive impacts on nature or mitigating negative impacts on nature (see the Recommendations of the TNFD for more information).

3. Measurement approaches selected and assessment criteria

3.1 Selected approaches

Based on considerations within the F&B Community, this guide includes only biodiversity measurement approaches that:

- 1 Are relevant to, and are currently explored or used by, the financial sector;
- 2 Include the direct main drivers of biodiversity loss identified by [IPBES \(2019\)](#) or provide insight into potential nature-related risks;
- 3 Are considered to be scientifically robust.

The following list includes the twelve tools assessed in this guide. The majority of these tools have multiple applications and can be used for different purposes, including supporting investor engagement programs, portfolio management strategies, and other investor decision-making processes. Please note that the information presented in sections 4, 5 and 6 has been provided directly by the tool developers².

- **ENCORE** (2024 version) – Exploring Natural Capital Opportunities, Risks and Exposure (Global Canopy, UNEP-FI and UNEP-WCMC)
- **IBAT** – Integrated Biodiversity Assessment Tool (BirdLife International, Conservation International, IUCN, UNEP-WCMC)
- **BRF** – Biodiversity Risk Filter (WWF)
- **BIA-GBS** – Biodiversity Impact Analytics – Global Biodiversity Score (CDC Biodiversité and Carbon4 Finance)
- **GBS-FI** – Global Biodiversity Score for Financial Institutions (CDC Biodiversité)
- **CBF** – Corporate Biodiversity Footprint (Iceberg Data Lab)
- **BFFI** – Biodiversity Footprint for Financial Institutions (CREM and PRé Sustainability, together with ASN Bank)
- **GID** – Global Impact Database (Impact Institute)
- **MBFM** – Biodiversity Footprint Metrics (MSCI)
- **BIAT** – Biodiversity Impact Assessment Tool (ISS ESG)
- **NRP** – Nature Risk Profile (UNEP-WCMC and S&P Global S1)
- **GIST NBS** – BIGER Footprint, SLAM, DIRO 360 (GIST Impact)

3.2 Criteria for comparing and selecting

This chapter presents the criteria selected for assessing each methodology and tool in a uniform way. The criteria are outlined in the table below and align with those in the report series [Assessment of biodiversity measurement approaches](#) (EU B&B Platform – Workstream Methods). The F&B Community and the FfB Foundation, in collaboration with the tool developers, selected and further refined the criteria for the finance sector. On the next pages, we include links to the sections in Update reports 2 (2019), 3 (2021), 4 (2022), and 5 (2024) of the Assessment of biodiversity measurement approaches in which a more detailed discussion of the criteria can be found.

² All information in this report is accurate to the best of the authors' knowledge at the time of writing and/or was provided by the tool developers. Any inaccuracies may be reported for correction; all feedback is appreciated. Measurement approaches undergo continuous development, and this report reflects a snapshot at a specific point in time.

Criteria for selecting measurement approaches for financial institutions

Organisational focus area (OFA)

For FIs this is the scope or part of their investment and finance activities they are looking into for measuring the biodiversity impact of that specific part.

Source: [Assessment of biodiversity measurement approaches - Update Report 5, Box 3 and F&B Community](#)

Balance-sheet	All the assets, liabilities and shareholders' equity of a FI at a specific point in time.	Corporate	A commercial or industrial enterprise.
Portfolio	A collection of finance activities or investments.	Project and site	The funding of a long-term infrastructure, industrial project or public services.
Sector	A section of the economy made up of firms or institutions that share the same or a related product or service.	Product or service	This covers the whole value chain as biodiversity measurement tools for products are LCA (Life Cycle Analysis) based.
Index	A method to track or evaluate the price performance of a group of assets in a standardised way, usually stocks, often to use as benchmark.	Supply chain	The upstream part of the value chain.

Business/finance Application (BA)

The type of application the measurement approach will be used for. The described BAs are based on the overview of BAs performed by the [Workstream Methods](#) and adapted for finance. Source: [Assessment of biodiversity measurement approaches - Update Report 5, Box 2](#)

BA 1 Assessment of current biodiversity performance - Material risk assessment; for example, exposure to and management of biodiversity loss at balance sheet, portfolio, sector and/or asset/company level. Due diligence assessment and identifying 'hotspots'.

BA 2 Assessment of future biodiversity performance - Scenario-analysis of the biodiversity development of certain portfolios, sector or asset categories, for example as a result of reducing pressures and restorative actions at asset or portfolio level. This may include scenarios on changing policies.

BA 3 Tracking progress to targets - Depends on the type of targets set by FIs, companies and governments. For example, 'Net positive impact by 2030'; targets on underlying drivers of biodiversity loss, 'No deforestation and water neutral by 2030'; 'Reverse nature loss in this decade'; keeping within a 'Safe operating space'.

BA 4 Comparing options / benchmarking - Comparing the impact of different investment options on biodiversity, such as different forms of benchmarking. For example, 'Best practice average of companies in a region/sector'; 'Best bio-value for money of conservation investment'; 'Commodity/sector risks & opportunities'; 'Best-in-class companies'; 'High opportunity asset categories'.

BA 5 Assessment / rating of biodiversity performance by third parties, using external data - Third party assessment by rating agency or data provider based on biodiversity criteria and populated with external data (in the absence of company data). For example, for comparing (listed) company biodiversity performance across a sector.

BA 6 Certification by third parties - Third party certification based on auditing of a clearly established methodological approach.

BA 7 Screening and assessment of biodiversity risks and opportunities - Identifying biodiversity risks and opportunities for investing in restoration, conservation or other actions from the Mitigation and Conservation Hierarchies.

Asset category

Category of assets owned or managed by FIs. Source: *F&B Community*

Corporate loans	Debt-based funding arrangement between a FI such as a bank and a company.	Mortgages and real estate	Debt-based instrument, secured by the collateral of specified real estate property, that the borrower is obliged to pay back with a predetermined set of payments.
Sustainability linked loans	Corporate loans of where the interest margin is linked to the improvement of the borrower's ESG score or to the improvement on tailored sustainability KPIs.	Impact funds	Fund with a goal to implement investments that generate a measurable, beneficial environmental (and/or social) impact, in addition to a financial return.
Listed equity shares	Company shares listed on a stock exchange.	Green bonds	Debt-based security to fund projects that aim to have a positive impact on climate and/or the environment.
Private equity	"Alternative investment" funds in which private companies are bought and managed before being sold for profit.	Project finance	Debt-based funding arrangement of long-term infrastructure, industrial projects, and public services using a non-recourse or limited recourse financial structure.
Corporate bonds	Debt-based securities issued by publicly held corporations to raise money for expansion or other business needs.	Commodity trade	Trade or purchase of primary goods, such as raw or partly refined materials from the agriculture, energy or metals sector.
Sovereign bonds	Debt-based securities issued by a government of a specific country.		

Maturity level

The maturity level of a measurement approach is based on the number of FIs it has been applied to (Source: [Assessment of biodiversity measurement approaches - Update Report 4](#), p. 26). Like the third edition, the definitions of the maturity levels in this fourth edition of the guide are slightly more stringent than in earlier versions.

Mature	The approach has been applied to the specific OFA, BA or asset class by at least 5 distinct FIs.
Emerging	The approach has been applied to the specific OFA, BA or asset class by 1 to 4 distinct FIs.
Potential	The tool has not been applied yet to the specific OFA, BA or asset category, but tool developers claim that the tool can be applied.

Pressure

Direct human influence on the environment (i.e., direct drivers, also referred to as impact drivers) that impacts biodiversity, including both ecosystems and species, frequently involves overlaps with other direct drivers. These drivers also feed back into indirect drivers (i.e., socio-economic and demographic trends, technological development, culture and government). Source: [IPBES](#).

Land use change	Human influence on terrestrial habitats, including the conversion of land cover (deforestation or mining), the changes in (agro-) ecosystem management (intensification or forest harvesting) or the changes in the spatial configuration of the landscape (fragmentation of habitats).	Sea use change	Human occupation and alteration of marine habitats, e.g., through wind farms, aquaculture, and shipping routes.
		Climate change	Changes in climate and weather patterns impacting in-situ ecosystem functioning and causing the migration of species and entire ecosystems. This may threaten as many as one in six species at the global level, and will have impacts on all biomes.

Pollution Deposition of substances into the environment (air, water, soil) is a driver of ecosystem change throughout all biomes, with particularly devastating direct effects on freshwater and marine habitats. This includes eutrophication, acidification, ecotoxicity, and ozone formation, but also the effects of noise, light and disturbance.

Direct exploitation Anthropogenic exploitation of wildlife, leading to biodiversity loss and extinctions. This includes overfishing, harvesting of species for medicinal use and pet trade, as well as water usage.

Invasive species Exotic or 'alien' species in terrestrial and aquatic ecosystems, disrupting the ecological functioning of natural systems by out-competing local and indigenous species for natural resources, with negative implications for biodiversity at local and regional scales and causing significant economic damage.

Other pressures Various additional pressures, such as fauna collisions and electrocutions, droughts, hunting, erosion, and pesticide use, among others.

Coverage

Biodiversity measurement tools can either focus on negative impacts on biodiversity or on the associated societal dependencies (i.e., the services provided by ecosystems and species). Source: [Assessment of biodiversity measurement approaches - Update Report 5, under section 3.3.4.3.](#)

Negative impacts (on species and ecosystems) Direct negative impact from human activities on species and habitats through the pressures described above. A measurement approach that focuses on negative impacts translates the environmental pressures associated with an activity (e.g., GHG emissions, pollution, etc.) into the effects that these pressures have on species and ecosystems.

Positive impacts (on species and ecosystems) Direct positive impact from human activities on species and ecosystems. This could be achieved through management actions (e.g., restoration, enhancement) that improve the state of biodiversity, or through actions that reduce or avoid negative impacts on biodiversity (e.g., improvement of protection status, pressure reduction).

Dependencies (ecosystem services) Services provided by ecosystems and species that society benefits from and depends upon, like clean air, water, climate adaptation and pollination. A measurement tool that takes into account dependencies is able to translate the interactions with biodiversity into consequences for FIs, businesses and the society overall. Thus, FIs that are highly dependent on ecosystem services should prioritise nurturing these interactions.

Scope

The boundaries of what is included when measuring impacts and dependencies. Source: [Assessment of biodiversity measurement approaches - Update Report 5, under section 3.3.4.2.](#)

Scope 1 Impacts generated in the area controlled by the entity and other impacts directly caused by the entity during the assessed period.

Scope 2 Impacts resulting from non-fuel energy (electricity, steam, heat and cold) generation for site-level use, including impacts resulting from land use changes, fragmentation, etc.

Scope 3 upstream Impacts which are a consequence of the activities of the company but occur from sources not owned or controlled by the company, upstream (supply chain) of its activities.

Scope 3 downstream Impacts which are a consequence of the activities of the company but occur from sources not owned or controlled by the company, downstream (consumption and waste) of its activities.

Metric

Biodiversity is the biological diversity of life on Earth: diversity of ecosystems, diversity of species and genetic diversity. Biodiversity metrics measure different elements (like species, ecosystem intactness, ecosystem benefits) and can be used to answer different questions. Source: [Assessment of biodiversity measurement approaches - Update Report 4](#), pp. 46-52.

MSA (Mean Species Abundance)	Measures 'intactness'. MSA compares the actual abundance of native species in a given ecosystem to their (estimated) abundance if the ecosystem were in an undisturbed state. All species are valued equally, threatened or not. An MSA value of 100% indicates that the biodiversity of this ecosystem is the same as at its original state and has not been affected by human activities.	STAR (Species Threat Abatement and Restoration)	Measures risk of extinction of species. STAR is the sum of the risks of extinction of species weighted by their threat status. Presence of threatened species is an indication that the ecosystem is under pressure. This can be useful to identify the conservation actions with the highest potential to prevent species extinction.
PDF (Potentially Disappeared Fraction)	Measures 'intactness'. PDF shows the percentage of species lost in a specific area due to environmental pressures in 1 m ² (land) or in 1 m ³ (water) over a period of one year. It does not measure decline in individual species' populations. All species are weighted equally; based on regressions between the intensity of each pressure and their impacts on species persistence.	Aggregate index	A composite index based on several parameters.
		Monetary value	Sum of the economic value of ecosystem services (such as timber production, fresh drinking water, carbon uptake, recreation, etc.). It helps focusing on the social benefits that people may gain from nature.

Type of data

The type of data that is commonly used as input data for the tool.

Source: [Assessment of biodiversity measurement approaches - Update Report 5](#), under section 3.3.6.

Biodiversity state data	State of biodiversity based on real life ecological survey data (count of populations or number of species) linked to the underlying assets assessed. Biodiversity state data modelled with pressure-impact relationships (or equivalent) are to be seen as 'pressure' data.	All these types of data can be:	
Pressures, resources and emissions data	Data related to emissions and extraction of resources such as raw materials, water, land use and land conversion.	U - User-derived data	U - Inputs based directly on measurements conducted by the assessed company. These measurements can relate to biodiversity state but also to pressures or inventory data. User-collected data on inventories can thus be associated with modelling of biodiversity state.
Economic quantification of activities data	The amount of material the organisation assessed extracts, produces, purchases or finances, e.g., the amount of cotton used for producing a T-shirt, or the amount a FI invests in a company.	E - Externally collected data	E - Data derived from external (sometimes global) datasets and not from direct measurements by the assessed company (e.g., sector averages). Externally collected data can nonetheless include biodiversity state data, e.g., based on species distribution maps from the IUCN (or IBAT).
		M - Modelled data	M - Estimated or interpreted and usually aggregated data, e.g., data related to potential economic growth. This can be both user-derived (e.g., own modelling of m ³ of water consumed) or externally collected (e.g., use of the average MSA of a given cell on GLOBIO's grid).

Effort

Required level of expertise, costs, and time investment needed for applying each approach. Source: *Assessment of biodiversity measurement approaches - Update Report 5, under section 3.3.7.*

Accessibility	Accessibility relates to 'open source' or 'commercial' tools. Note: Although a tool and all its technical information is made publicly available, external support from the tool developer could be required. This is made clear in 'required expertise'.	Cost for hiring	Costs for hiring external expertise, for the first measurement. H (high, i.e., exceeding 20 working days), M (moderate, i.e., between 5 and 20 working days) or L (low, i.e., less than 5 working days).
Required expertise	Required expertise refers to the type of technical and knowledge skills that are needed to apply the measurement approach – this is either available within the institution (INT), or needs to be hired (EXT). Some tool developers offer training allowing the company to apply the tool themselves in future iterations (indicated with EXT – T).	Other costs	Other costs, including necessary investments in license fees, necessary training and the purchasing of data from data providers. This excludes time investment by the FI itself. H (high, i.e., more than 10k), M (moderate, i.e., between 4 and 10k) or L (low, i.e., less than 4k).
		Efforts	Time investment by the FI itself, for the first measurement (effort for follow-up monitoring can be lower). H (high, i.e., more than 30 working days), M (moderate, i.e., between 10 and 30 working days) and L (low, i.e., less than 10 working days).

4. Overview of measurement approaches

Table 1: Maturity levels of approaches per organisational focus area, business application and asset category

	ENCORE	IBAT	BRF	BIA-GBS	GBS-FI	CBF	BFFI	GID	MBFM	BIAT	NRP	GIST NBS
Organisational focus area												
Balance sheet			●	●	●	●	●	●			●	●
Portfolio	●	●	●	●	●	●	●	●	●	●	●	●
Sector	●	●	1	●	●	●	●	●	●	●	●	●
Index			●	●	●	●	●	●	●	●	●	●
Corporate	●	●	●	●	●	●	●	●	●	●	●	●
Project or site		●	●	●	●	●	●	●	●	●	●	●
Product or service		●	●	●	●	●	●	●	●	●	●	●
Supply chain	●	●	2	●	●	●	●	●	●	●	●	●
Business/finance application												
BA 1: Assessment of current biodiversity performance	●	●	●	●	●	●	●	●	●	●	●	●
BA 2: Assessment of future biodiversity performance		●	●	●	●	●	●	●	●	●	●	●
BA 3: Tracking progress to targets		●	●	●	●	●	●	●	●	●	●	●
BA 4: Comparing options / benchmarking		●	●	●	●	●	●	●	●	●	●	●
BA 5: Assessment / rating of biodiversity performance by third parties		●	●	●	●	●	●	●	●	●	●	●
BA 6: Certification by third parties		●	●	●	●	●	●	●	●	●	●	●
BA 7: Screening and assessment of biodiversity risks and opportunities	●	●	●	●	●	●	●	●	●	●	●	●
Asset category												
Corporate loans	●	●	3	●	●	●	●	●	●	●	●	●
Sustainability linked loans	●	●	3	●	●	●	●	●	●	●	●	●
Listed equity shares	●	●	3	●	●	●	●	●	●	●	●	●
Private equity	●	●	3	●	●	●	●	●	●	●	●	●
Corporate bonds	●	●	3	●	●	●	●	●	●	●	●	●
Sovereign bonds	●	●	3	●	●	●	●	●	●	●	●	●
Mortgages and real estate	●	●	3	●	●	●	●	●	●	●	●	●
Impact funds	●	●	3	●	●	●	●	●	●	●	●	●
Green bonds	●	●	3	●	●	●	●	●	●	●	●	●
Project finance	●	●	3	●	●	●	●	●	●	●	●	●
Commodity trade	●	●	3	●	●	●	●	●	●	●	●	●

Legend Maturity levels
 ● Potential: 0 times applied
 ● Emerging: 1-4 times applied
 ● Mature: 5-more times applied

¹ Sector level focus
² As long as location and sector information is provided
³ Mature: if site location is known

Table 2: Pressures, coverage, scope, metric, data type and effort needed per approach

	ENCORE	IBAT	BRF	BIA-GBS	GBS-FI	CBF	BFFI	GID	MBFM	BIAT	NRP	GIST NBS
Pressure												
Land use change	●	●	●	●	●	●	●	●	●	●	●	●
Sea use change	●			●					●	●		
Direct exploitation	●			●	●	●			●	●	●	●
Climate change	●	●		●	●	●	●	●	●		●	●
Pollution	●			●	●	●				●	●	●
Invasive species	●	●	●			●			●	●	●	●
Coverage												
Negative impacts	●	●	●	●	●	●	●	●	●	●	●	●
Positive impacts		●	1		●	●	●					●
Dependencies	●	●	●	●	●	●	●	●		●	●	●
Scope												
Scope 1	●			●	●	●	●	●	●	●	●	●
Scope 2	●			●	●	●	●	●		●	●	●
Scope 3 upstream	●			●	●	●	●	●		●	●	●
Scope 3 downstream	●			2	●	3		●		●		●
Metric												
MSA	●			●	●	●		●	●	●		●
PDF							●	●	●	●		●
STAR	●	●										●
Aggregate index	●			●	●	●		●				●
Monetary value							Possible	●				(Ecosystem services)
Data type												
Biodiversity state data	M	E	E		U	M		U / M	E		E	E / M
Pressures, resources and emissions data	E			E	E / M	U / E / M	U / E / M	U / E / M	E / M	U / E / M	U / E	U / E / M
Economic quantification of activities data	M			U	U / E / M	U / E / M	U / E / M	U / E / M	E / M	U / E / M	U / E / M	U / E / M
Effort												
Accessibility	OS with support	Commercial	OS with support	Commercial	Commercial	Commercial	OS with support	Commercial	Commercial	Commercial	Commercial	Commercial
Required expertise	EXT-T	INT / EXT-T	INT / EXT-T	EXT-T	EXT-T	EXT-T	EXT-T	EXT-T	EXT-T	EXT-T	INT / EXT-T	INT / EXT-T
Costs for hiring	L	M	L - M	L	L	L	M - H	L - M		L		L
Other costs	L	L	L	H	H	H	L	M - H		H		L - H
Efforts	L	L	L - M - H	L	L	L	M - H	L - M - H		L	L - M - H	L - M

Legend Data types

U: User-derived
 E: Externally collected
 M: Modelled

Legend Efforts

EXT: External expertise required
 T: Training offered
 L: Low ; M: Moderate ; H: High

¹ Covered by upcoming modules - ACT

² Downstream impacts computed for climate change only in BIA-GBS

³ Mainly use-phasing and processing

Table 3: Aspects covered per pressure per approach

	ENCORE	IBAT	BRF	BIA-GBS	GBS-FI	CBF	BFFI	GID	MBFM	BIAT	NRP	GIST NBS
Land / sea use change												
Land use change / land transformation								In progress				
Land occupation												
Land use change in river and wetland catchments				1								
Encroachment												
Fragmentation												
Wetland conversion												
Sea use change												
Direct exploitation												
Water use												
Other resource use (e.g. fish, wild caught animals/plants)					2	2						In progress
Climate change												
Effects of climate change on freshwater ecosystems												
Effects of climate change on terrestrial ecosystems												
Effects of climate change on marine ecosystems												
Hydrological disturbance due to climate change												
Pollution												
Terrestrial acidification												
Terrestrial eutrophication					3	3						
Freshwater eutrophication												
Marine eutrophication												
Terrestrial ecotoxicity												
Freshwater ecotoxicity				4								
Marine ecotoxicity				5								Plastic pollution in progress
Photochemical ozone formation												
Non-GHG air pollution												
Solid waste				5								
Noise, light and disturbance					6	6						
Atmospheric nitrogen deposition												
Nutrient emissions to water					7	7						
Invasive species												
Alien invasive species							8					
Other pressures												
Various												
Fauna collisions and electrocutions												
Droughts												
Hunting/fishing												
Erosion												
Pesticide use					9	9						(partially covered through ecotoxicity pressure)

Legend Realms

- Freshwater
- Terrestrial
- Marine

- 1 Only river
- 2 Overfishing
- 3 Atmospheric nitrogen deposition
- 4 Upcoming
- 5 Plastic pollution - upcoming
- 6 Terrestrial (covered through encroachment pressure)
- 7 Freshwater eutrophication
- 8 Transport sector
- 9 Partly covered through ecotoxicity pressure

5. Information per measurement approach

5.1 ENCORE - Exploring Natural Capital Opportunities, Risks and Exposure

Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) is a free, online tool that helps organisations explore their exposure to nature-related risk and take the first steps to understand their dependencies and impacts on nature. This is presented in the ENCORE Natural Capital Module. ENCORE also contains a Biodiversity Module, which allows users to explore potential alignment of agriculture and mining activities with a nature-positive future.

ENCORE sets out how the economy – sectors, subsectors and activities – depends and impacts on nature. Financial institutions can use data from ENCORE to identify nature-related risks they are exposed to through their lending, underwriting and investment in high-risk industries and sub-industries.

As a sub-section of the tool, the ENCORE Biodiversity Module has been developed to help financial institutions explore how to align their investments in the agriculture and mining sectors with important global goals for nature.

With a vision to establish a *global financial system that works for nature and people*, ENCORE is designed to be a useful entry point to nature-related assessment initiatives – such as the risk management and disclosure framework developed by the Taskforce on Nature-related Financial Disclosures (TNFD) – guiding organisations through the early stages of their nature-positive journey, whatever their understanding or prior experience of managing nature-related risks.

Organisations and reviewers

The ENCORE tool is developed by Global Canopy, UNEP FI and UNEP-WCMC, who together form the ENCORE Partnership, previously known as The Natural Capital Finance Alliance (NCFA).

Global Canopy targets the market forces destroying nature by improving transparency and accountability. They provide innovative open-access data, clear metrics, and actionable insights to leading companies, financial institutions, governments and campaigning organisations worldwide to help them make better decisions about nature, forests and people.

The UN Environment Programme Finance Initiative (UNEP FI) brings together a large network of banks, insurers and investors that collectively catalyse action across the financial system to deliver more sustainable and inclusive global economies.

The UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) is a global Centre of excellence on biodiversity and nature's contribution to society and the economy. The Centre operates as a collaboration between the UN Environment Programme and the UK-registered charity WCMC.

Current stage of development

ENCORE is a tool that has been developed since 2018. It is maintained and continuously improved by the ENCORE partners. A major set of updates have been released in 2024. These have been delivered through the Sustainability Tools for Assessing and Understanding Natural Capital Impacts and Dependencies (SUSTAIN) project, which aims to improve, update and validate ENCORE's natural capital knowledge base. This focuses on incorporating the latest scientific and empirical research to build ENCORE's knowledge base, and on making improvements to its structure to enhance its usability. The improved knowledge base was released in Q2 2024.

Transparency of method

The different sections of the methodology can be accessed through the Data & Methodology tab on the ENCORE [website](#). Registered users can also access and download the knowledge base that underpins the tool.

What is the main purpose of this tool?

1. Risk management:

- Identify potentially material ecosystem services, natural capital assets, and impact drivers for different sectors.
- Identify important drivers of environmental change potentially affecting the portfolio.
- Assess the potential risk of disruption to specific natural capital considerations in specific locations. Sectoral exposure in specific areas can also be investigated.

2. Communication and stakeholder engagement:

- ENCORE provides the material needed to effectively communicate the implication of natural capital risks to the portfolio of FIs. This material can inform the next steps FIs wish to take to address these risks.
- By clarifying the links between economic activities and natural capital (be it through dependencies or impacts), ENCORE also helps integrate natural capital into existing risk management frameworks to institutionalise management of natural capital risks.
- ENCORE's biodiversity module can help users identify topics to assess with companies in their agriculture and mining portfolios during engagement discussions.

3. Biodiversity target setting and portfolio alignment

- The ENCORE biodiversity module helps FIs understand how their agriculture and mining portfolios could align with the vision of a nature-positive future, how this might evolve in the future (for mining), the associated biodiversity risks/opportunities, and what actions FIs can take to drive greatest alignment with global biodiversity goals.

What does it measure?

ENCORE provides information to users on the most pressing potential dependencies and pressures for each economic activity covered by the tool. The current version of ENCORE defines ecosystem services using CICES v4.3. In the upcoming updates to ENCORE, the improved knowledge base will include ecosystem services defined by System of Environmental-Economic Accounting - Experimental Ecosystem Accounting (SEEA-SEA), which are:

- Other provisioning services - Animal-based energy
- Biomass provisioning
- Solid waste remediation
- Soil and sediment retention
- Water purification
- Soil quality regulation
- Other regulating and maintenance service - Dilution by atmosphere and ecosystems
- Biological control
- Air Filtration
- Flood control
- Genetic material
- Global climate regulation
- Water supply
- Nursery population and habitat maintenance
- Noise attenuation
- Other regulating and maintenance service - Mediation of sensory impacts (other than noise)
- Local (micro and meso) climate regulation
- Pollination
- Storm mitigation
- Water flow regulation
- Rainfall pattern regulation
- Recreation related services
- Visual amenity services
- Education, scientific and research services
- Spiritual, artistic and symbolic services

The improved ENCORE knowledge base renames "Impact drivers" to "Pressures" for clarity and to be in line with the [Driver-Pressure-State-Impact-Response](#) framework.

The knowledge base assesses the following pressures:

- Disturbances (e.g., noise, light)
- Area of freshwater use
- Emissions of GHG
- Area of seabed use
- Emissions of non-GHG air pollutants
- Other biotic resource extraction (e.g. fish, timber)
- Other abiotic resource extraction
- Emissions of toxic soil and water pollutants
- Emissions of nutrient soil and water pollutants
- Generation and release of solid waste
- Area of land use
- Volume of water use
- Introduction of invasive species

What input data are needed?

The Natural Capital Module requires users who would like to explore their potential direct dependencies and impacts to select production processes and sub-industries of the economy. In the new version, users will need to select the economic activities they would like to explore.

The Biodiversity Module requires users to either upload a portfolio in CSV format, or – in the case of the agriculture sector – input the country location and cropland/pasture land area of their portfolios. Alternatively, details of turnover can be added instead of hectares of land. For the mining sector, the Biodiversity Module asks users to either upload a portfolio in CSV format, or select company(ies) and country(ies) of interest.

What other tools are most complementary to this tool?

ENCORE is a first step to understanding and assessing dependencies and impacts. Users are encouraged to delve deeper into their specific contexts, by assessing location-specific data, and other relevant datasets. A complementary tool is the Integrated Biodiversity Assessment Tool (IBAT), which provides geographically explicit information about biodiversity.

How can the tool be used for TNFD reporting?

ENCORE supports users in the scoping and prioritisation phases. As such, it is one of the most relevant tools for the Locate and Evaluate steps of the Locate-Evaluate-Assess-Prepare (LEAP) approach, specially L2 and E1-E4. You can find more information on the links between TNFD and ENCORE in a blog post published alongside the TNFD – see [here](#).

Main strengths and limitations

Strengths:

- Widely recognised and used tool.
- Recommended by leading corporate frameworks and standards (such as the TNFD, SBTN, and GRI).
- It has been used for macroeconomic analysis and studies worldwide (e.g., the Dutch Central Bank, the French Central Bank, European Central Bank, etc.).
- The knowledge base is backed by scientific literature and reviewed by experts.
- Allows users to identify priorities for further analysis.

Limitations:

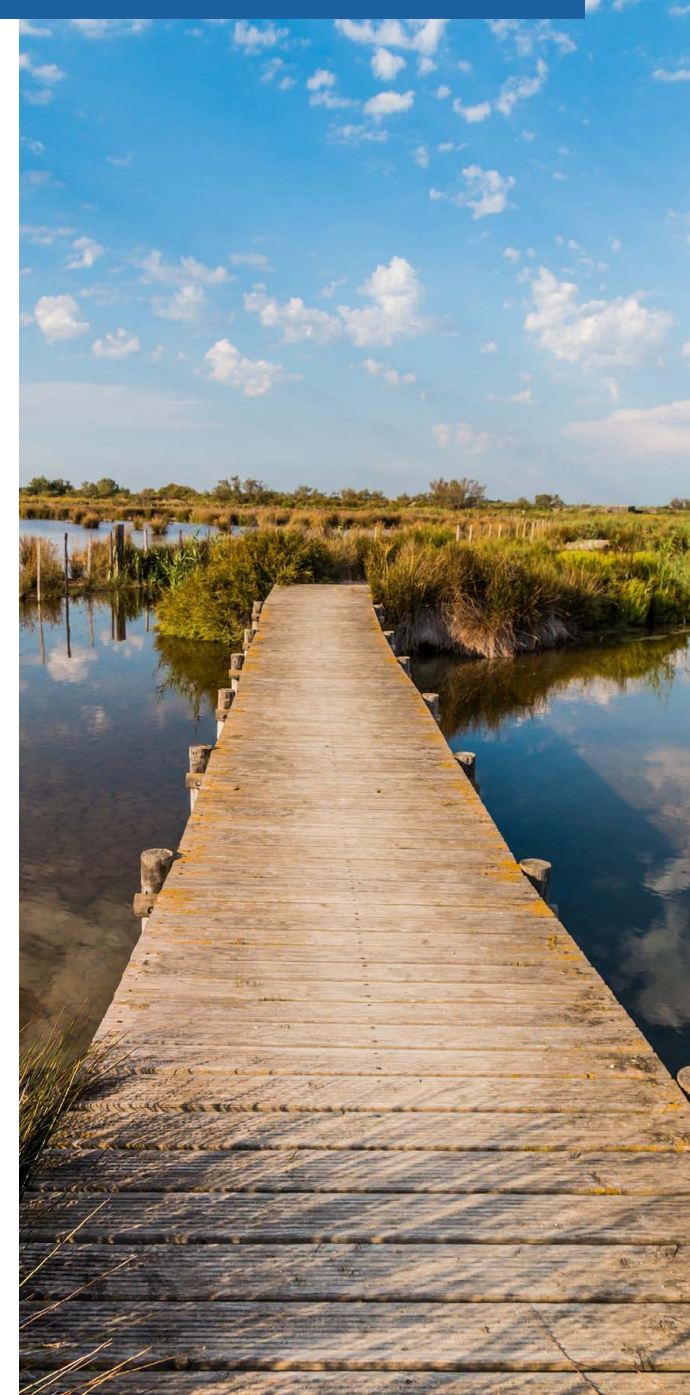
- It does not provide location or company-specific information.
- Further limitations are listed on the ENCORE website's [Limitations](#) page.

What are the costs?

ENCORE is a free tool, users only need to register to have access to all the functionalities and data.

ENCORE is made available under the Creative Commons Attribution-ShareAlike 4.0 International licence (CC BY-SA 4.0). This requires outputs that use ENCORE to be made available under the same licence. It also requires users to ensure that the following citation is always clearly reproduced in any publication or analysis involving the ENCORE materials in any derived form or format:

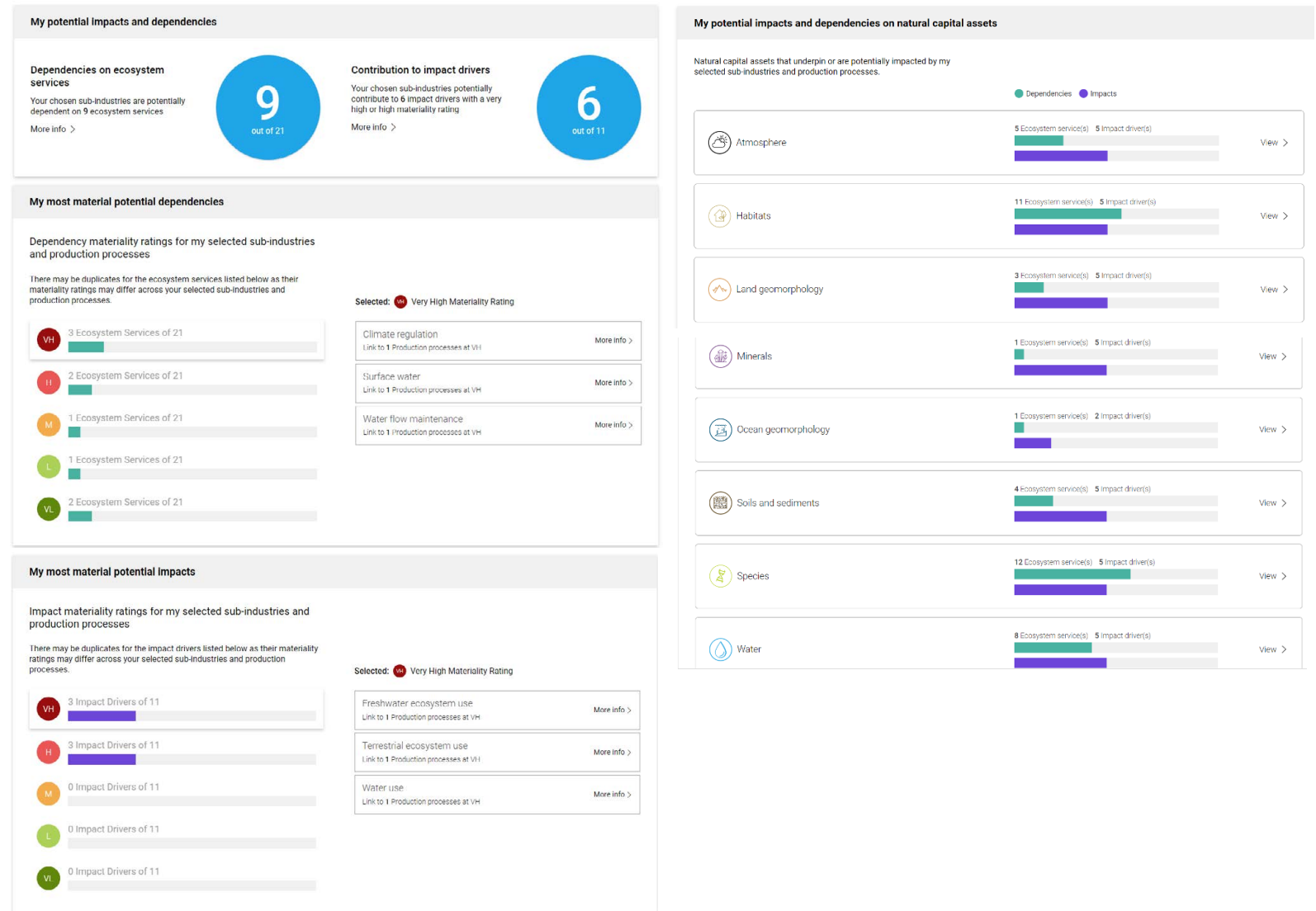
ENCORE Partners (Global Canopy, UNEP FI, and UNEP-WCMC) (year). ENCORE: Exploring Natural Capital Opportunities, Risks and Exposure. [On-line], [insert month/year of the version downloaded], Cambridge, UK: the ENCORE Partners. Available at: <https://encorenature.org>. DOI: <https://doi.org/10.34892/dz3x-y059>.

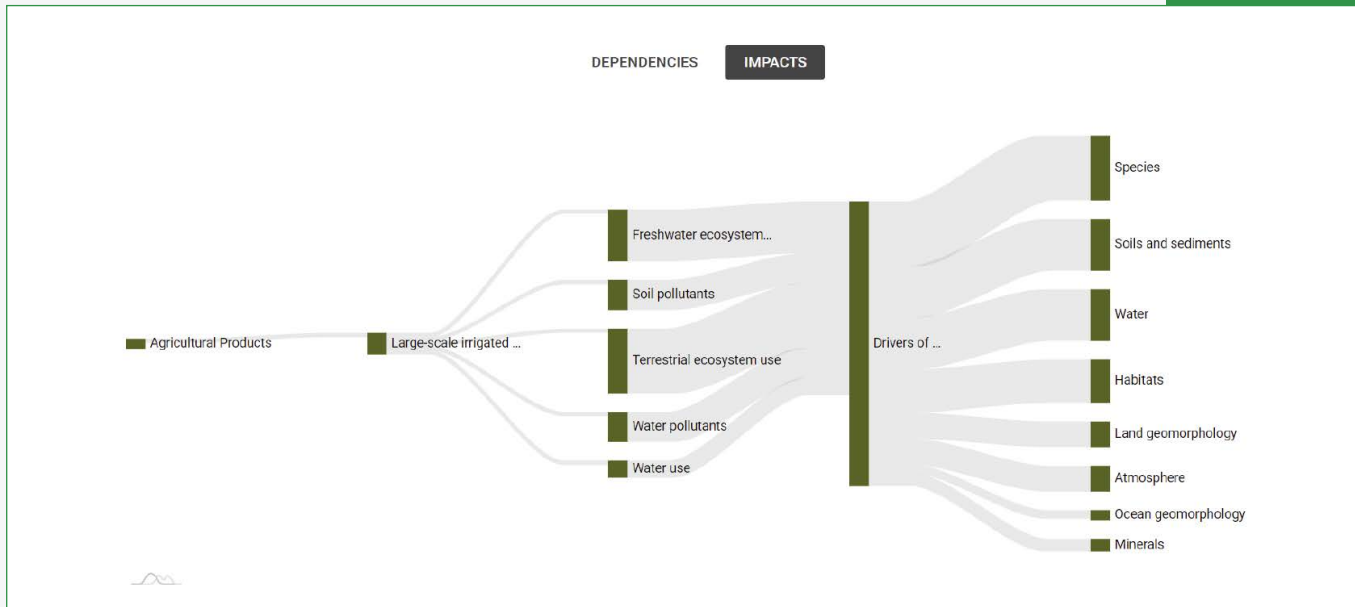
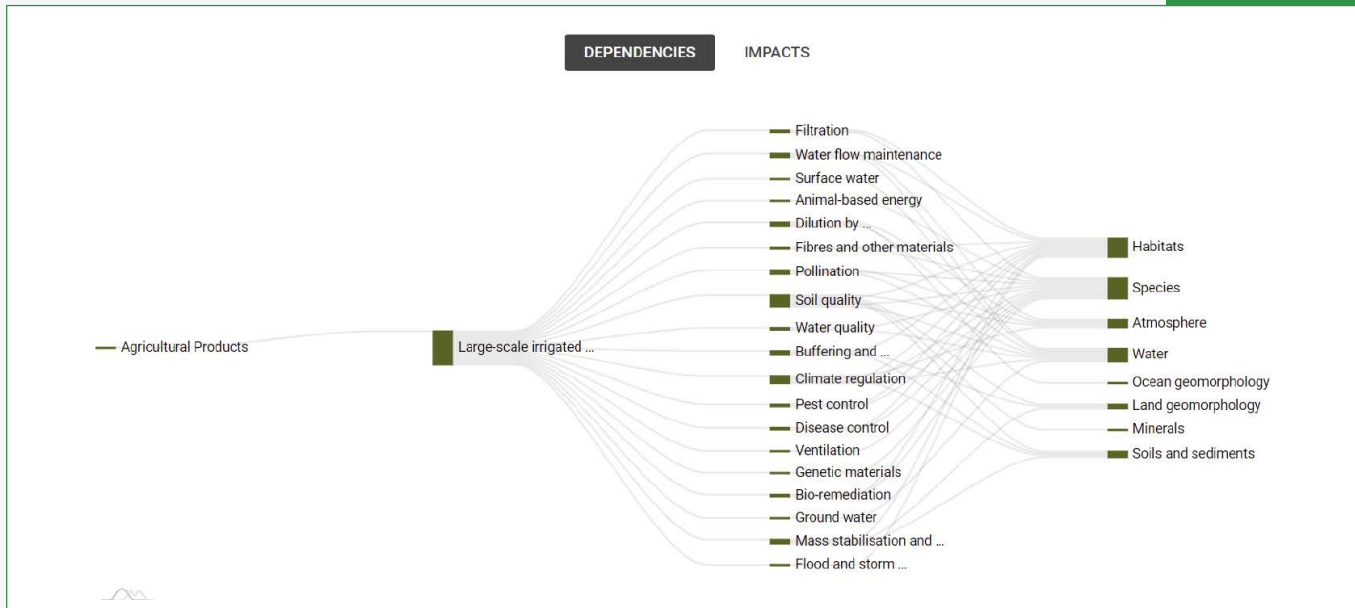


Output visuals ENCORE

Example of the current Natural Capital module outputs. These are the potential direct dependencies and impacts of the 'Large-scale irrigated arable crops' production process. This will change in the second half of the year to reflect the changes to the ENCORE knowledge base:

Overview of Data tab for the ENCORE natural capital module





5.2 IBAT - Integrated Biodiversity Assessment Tool

Integrated Biodiversity Assessment Tool (IBAT) is an Alliance between BirdLife International, United Nations Environment Programme – World Conservation Monitoring Centre, The IUCN and Conservation International. IBAT is a biodiversity data provider licencing commercial access to global biodiversity datasets and derived data layers including the IUCN Red List of Threatened Species™, the World Database on Protected Areas (WDPA) and the World Database of Key Biodiversity Areas (WDKBA).

Users can access IBAT either through the web-based interface or through an API. The following steps may be followed:

- 1 Create login credentials and log in to the IBAT website.
- 2 Upload one or more projects (locations) either through the 'projects' tab or 'Data map' tab (IBAT accepts csv, shapefiles, KML and KMZ). Alternatively, a user can upload a project by drawing a point, polygon, or line feature on the data map.
- 3 All the uploaded projects can be viewed under the projects tab. The projects page provides an overview of the overlap of each site with sensitive biodiversity areas and species within a 50km buffer.
- 4 For a more granular and detailed information, a user needs to select a specific project or create a portfolio of projects to generate different types of reports or GIS downloads.
- 5 After the reports/GIS are generated, a user can access them either via Pay As You Go model or through an annual subscription.
- 6 IBAT produces outputs in the form of GIS downloads and reports which can be used for multiple purposes including reporting requirements like TNFD, GRI and CSR.
- 7 In case of API, an API link will allow the user to query data straight into their internal tool/platform.

Organisations and reviewers

UNEP-WCMC, IUCN, BirdLife International and Conservation International.

Reviewers: The Biodiversity Consultancy (TBC), World Bank, IFC, TNFD, Newcastle University.

Current stage of development

The tool is developed and fully functioning. However, regular updates to the datasets and features are added periodically.

Transparency of method

The IBAT is based on three of the most globally authoritative datasets, the WDPA, WDKBA and the IUCN Red List of Threatened Species. These are based on scientifically robust and widely accepted global standards and methodologies which have open public access. For example, the methodologies and processes underpinning species assessments under the IUCN Red list are publicly available and have been developed by a range of taxonomic experts, researchers, academics, and experts globally. The identification of KBAs is based on the global standards developed by the IUCN, BirdLife International and other partner organisations which have open access on the IUCN and BirdLife International website.

In addition to these three core datasets, IBAT has two derived datasets: STAR and RWR. The methodologies for the derived datasets have open public access on the IUCN website and scientific journals.

What is the main purpose of this tool?

The main purpose of the tool can vary depending on the nature of organisations.

Private sector use: The main purpose of the tool is to allow organisations to identify and assess locations which are near sensitive biodiversity areas and species. This information can be used in various ways including prioritisation of prospective sites, making investment decisions, formulating nature/climate/biodiversity strategy, taking actions to reduce impact at existing sites and reporting against regulations, standards, and frameworks.

Government use: Governments can use the IBAT data to track and report progress against global and national goals and targets. With the use of IBAT, governments can formulate National Biodiversity Strategies and Action Plans (NBSAPs) in line with the KM-GBF, to assist with national biodiversity-inclusive spatial planning.

NGOs/Conservation sector: The main purpose IBAT here is to assist with conservation planning and action plans. The

data can be useful to prioritise areas where conservation actions are most likely to have positive outcome and areas where conservation actions are needed the most.

What does it measure?

The IBAT houses five different types of datasets, all measuring biodiversity through slightly different metrics and criteria.

The WDPA and WDKBA provides understanding of important areas for species, habitats and conservation, the IUCN Red list of Threatened Species gives the measure of the risk of extinction of species and areas where they are likely to be found. The Rarity-Weighted Richness (RWR) measures the relative importance of an area with respect to the global range of species.

The STAR (Species Threat Abatement and Restoration) metric measures the importance and impact of threat abatement and restoration activities at a particular location on global extinction risk of species.

What input data are needed?

The data input can be a point feature, line feature or a polygon which can either be uploaded through a shapefile, CSV, KML and KMZ or can be drawn on the data map.

What other tools are most complementary to this tool?

Other complimentary tools that can be used along with IBAT include ENCORE, global forest watch, RepRisk.

How can the tool be used for TNFD reporting?

IBAT recently launched a new report in IBAT called the Disclosure Preparation Report (DPR). The DPR identifies and prioritises sensitive sites in terms of their importance for biodiversity. The report is particularly relevant for the Taskforce on Nature-related Financial Disclosures (TNFD) recommend-

ed disclosure Strategy D and the Locate phase of the TNFD LEAP approach as well as the Global Reporting Initiative (GRI) Disclosure 101-4 'Identification of biodiversity impacts' and Disclosure 101-5 'Locations with biodiversity impacts' within GRI 101: Biodiversity 2024. Sensitive sites are defined as sites where: The area of influence (site + buffer) overlaps with a protected area or Key Biodiversity Area (KBA) and the area of influence (site + buffer) has STAR Threat Abatement and/or STAR Restoration scores exceeding the global median values of 0.01 and 0.003 respectively. Sensitive sites are then given a significance score to aid the prioritisation of sites. Significance scores of high, medium, and low are assigned based on the proximity of the site to a KBA or protected area relative to the appropriate buffer size based on the type of operation and the maximum STAR Threat Abatement and STAR Restoration scores found within the area of influence.

Main strengths and limitations

Strengths:

- Provides access to some of the most globally authoritative and widely used biodiversity datasets (WDPA, WDKBA, IUCN Red List of Threatened Species).
- USP: Only platform that provides commercial access for the use of these three datasets and access to STAR at 5km resolution.
- Provides outputs in the form of reports and GIS downloads which can be used for reporting against TNFD, GRI, CSRD, etc.
- Allows users to scan thousands of locations within a span of a few minutes.
- Training and support at no additional cost.
- Serves as a very crucial cost recovery mechanism for the conservation sector as the funds received are donated back to the partner organisations.
- The datasets are updated frequently with the frequency ranging from monthly update to bi-annually.

- Allows users to determine the distance of their location/site to the nearest area of biodiversity importance.
- Allows users to download GIS data which can be uploaded and analysed externally.
- Provides 6 different types of reports specific to different requirements like IFC PS6, TNFD, GRI and CSRD.
- The API functionality in IBAT allows users to directly extract data from IBAT into their internal tool.
- The tool is a unique alliance of four of the biggest global conservation charities which provides expertise ranging from research, policy, advocacy, and economics.

Limitations:

- Does not provide dynamic monitoring of the state of biodiversity.
- Difficult to obtain granular information if the user does not have information on location.
- Currently, does not provide a lot of detailed recommendations on actions to be taken specific to the nature of operations on the site.
- Currently, users are unable to track changes in trends in biodiversity historically.
- Currently, does not comprehensively cover the other two components of biodiversity: Ecosystem and genetic diversity.
- The annual subscription cost might restrict the tool to be useful for SMEs.

What are the costs?

The IBAT provides access through annual subscriptions and PAYG (Pay As You Go). The annual subscription ranges from \$5000 to \$35000. PAYG is structured around the number of downloads and the size of the area scanned.

The annual cost of maintaining the underlying datasets in IBAT ranges from \$6.5 to \$7 million dollars.

Output visuals IBAT

Multi-site Report

Overlap with protected areas and Key Biodiversity Areas (KBAs)

The following table shows the number of protected areas and KBAs overlapped by a 10.0 km buffer for each operational site where an overlap occurs.

Site	Area (km ²)	Protected Areas	KBAs
Bab-El Mandeb	7619	2	6
Bale Mountains	10311	8	5
Gaborone	54	0	1
Guéckédou	11831	9	4
Magaliesburg	421	7	1
Mampikony	731	2	2

Proximity Report

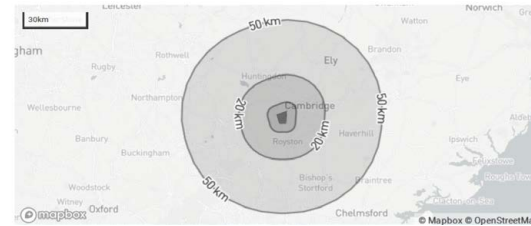
Buffers applied: 5.0 km | 20.0 km | 50.0 km

Generated by: Lewis Youl

Company/Subscriber: IBAT

Overlaps with:

Protected Areas	382
Key Biodiversity Areas	5
IUCN Red List	56



IUCN Red List of Threatened Species

The following threatened species are potentially found within 50km of the area of interest.

For the full IUCN Red List please refer to the associated csv in the report folder.

Species name	Common name	IUCN Category	Taxonomic Class
Acipenser sturio	Atlantic sturgeon	CR	Actinopterygii
Aesculus hippocastanum	Horse chestnut	VU	Magnoliopsida
Andreaea frigida	Icy rock-moss	VU	Andreaeopsida
Anguilla anguilla	European eel	CR	Actinopterygii
Anser erythropus	Lesser white-fronted goose	VU	Aves
Astacus astacus	Noble crayfish	VU	Malacostraca
Austropotamobius pallipes	White-clawed crayfish	EN	Malacostraca
Aythya ferina	Common pochard	VU	Aves
Balistes capricus	Gray triggerfish	VU	Actinopterygii
Bovista paludosa	Fen puffball	VU	Agaricomycetes

PS6 & ESS6 Report

World Bank Group Biodiversity Risk Screen FREETOWN

- Country: Sierra Leone
- Location: [8.3, -13.2]
- Created by: Ben Jobson

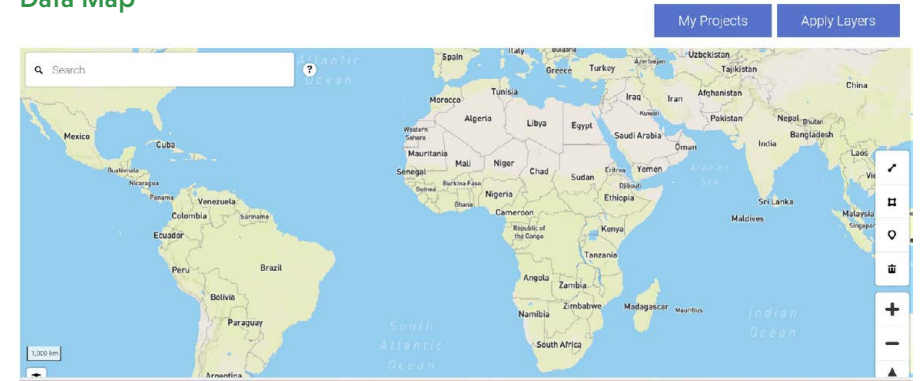
Overlaps with:

Protected Areas	50 km: 3	10 km: 1	1 km: 5	9
World Heritage (WH)	50 km: 0	10 km: 0	1 km: 0	0
Key Biodiversity Areas	50 km: 0	10 km: 0	1 km: 3	3
Alliance for Zero Extinction (AZE)	50 km: 0	10 km: 0	1 km: 0	0
IUCN Red List				58
Critical Habitat				Likely

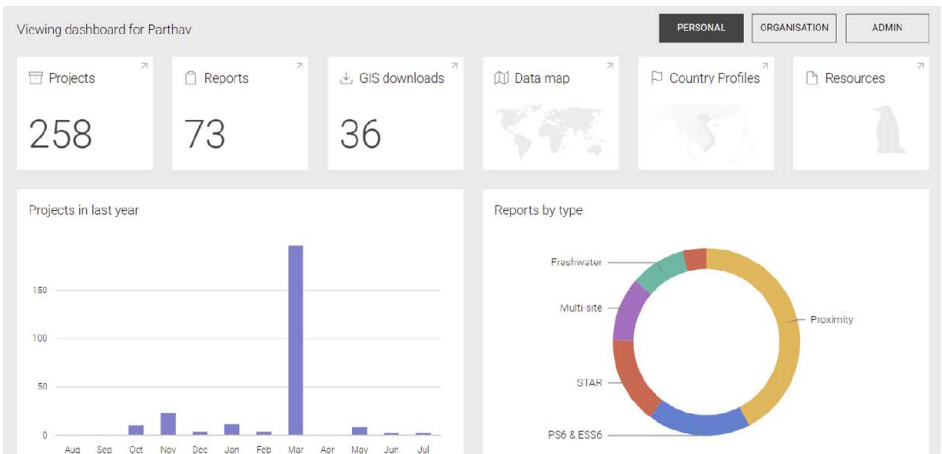
Excel Report

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O									
taxonId	kingdom	phylum	Na	class	Name	order	Nam	family	Nam	genus	Nam	scientific	common	N	redList	Cat	population	publicatio	assessment	criteria	marine	Sys	
5660	ANIMALIA	CHORDAT	REPTILIA	CROCODY	CROCODY	Mecistops	Mecistops	Slender	sr	CR	decreasing	2014	#####	A2acd+3i	FALSE								
8005	ANIMALIA	CHORDAT	REPTILIA	TESTUDIN	CHELONII	Eretmochi	Eretmochi	Hawksbill		CR	decreasing	2008	#####	A2bd	TRUE								
18175	ANIMALIA	CHORDAT	CHONDRII	RHINOPRI	PRISTIDAE	Pristis	Pristis	pec	Smalltooth	CR	decreasing	2013	#####	A2cd	TRUE								
20425	ANIMALIA	CHORDAT	MAMMAL	CETARTIO	DELPHINI	Sousa	Sousa	teu	Atlantic	H	CR	decreasing	2017	#####	A3cd+4cd	TRUE							
39374	ANIMALIA	CHORDAT	CHONDRII	CARCHARI	CARCHARI	Carcharhi	Carcharhi		Oceanic	W	CR	decreasing	2019	#####	A2bd	TRUE							
39385	ANIMALIA	CHORDAT	CHONDRII	CARCHARI	SPHYRNID	Sphyrna	Sphyrna	le	Scalloped	CR	decreasing	2019	#####	A2bd	TRUE								
39386	ANIMALIA	CHORDAT	CHONDRII	CARCHARI	SPHYRNID	Sphyrna	Sphyrna	n	Great	Han	CR	decreasing	2019	#####	A2bd	TRUE							
60180	ANIMALIA	CHORDAT	CHONDRII	RHINOPRI	RHINIDAE	Rhynchob	Rhynchob		African	W	CR	decreasing	2019	#####	A2d	TRUE							
61417	ANIMALIA	CHORDAT	CHONDRII	SQUATINI	SQUATINI	Squatina	Squatina	e	Sawback	F	CR	decreasing	2019	#####	A2bcd+3ci	TRUE							
61418	ANIMALIA	CHORDAT	CHONDRII	SQUATINI	SQUATINI	Squatina	Squatina	c	Smoothba	CR	decreasing	2019	#####	A2bcd+3ci	TRUE								
169211	ANIMALIA	ARTHROPI	INSECTA	ODONATA	COENAGR	Pseudagri	Pseudagri		mascag	CR	unknown	2010	#####	B1ab(ii,iii)	FALSE								
182821	ANIMALIA	CHORDAT	ACTINOPT	CYPRINOD	NOTHOBR	Scriptaph	Scriptaph		yse	mion	e	CR	unknown	2010	#####	B1ab(ii,iii)	FALSE						
18584848	ANIMALIA	CHORDAT	CHONDRII	RHINOPRI	PRISTIDAE	Pristis	Pristis	pris	Large	tooth	CR	decreasing	2013	#####	A2cd	TRUE							
22695185	ANIMALIA	CHORDAT	AVES	ACCIPITRI	ACCIPITRI	Necrosyr	Necrosyr		Hooded	V	CR	decreasing	2017	#####	A2acd+3ci	FALSE							
1.04E+08	ANIMALIA	CHORDAT	CHONDRII	RHINOPRI	GLAUCOSI	Glaucoste	Glaucoste		Black	chin	CR	decreasing	2019	#####	A2d	TRUE							
1.4E+08	PLANTAE	TRACHEOI	LILLOPSID	POALES	ERIOCAUL	Eriocaul	Eriocaul		adamesii	CR	decreasing	2020	#####	B2ab(iii)	FALSE								
1.48E+08	ANIMALIA	MOLLUSC	BIVALVIA	UNIONO	IRIDINIDA	Pleiodon	Pleiodon		ovatus	CR	decreasing	2020	#####	A2c	FALSE								
2475	ANIMALIA	CHORDAT	MAMMAL	CETARTIO	BALAENOI	Balaenopt	Balaenopt		Sei	Whale	EN	increasing	2018	#####	A1abd	TRUE							

Data Map



Dashboard



5.3 BRF – Biodiversity Risk Filter

The [WWF Biodiversity Risk Filter \(BRF\)](#) is a free-of-charge, web-based, spatially explicit corporate- and portfolio-level screening and prioritisation tool for biodiversity-related risks. It allows companies to understand and assess the biodiversity-related risks of their operational locations and their suppliers and to prepare an appropriate response plan. By the same logic, financial institutions can assess biodiversity-related risks for all companies in a given portfolio.

The current version of the WWF BRF tool consists of three key modules: the Inform Module, which provides an overview of the industry-specific dependencies on ecosystem services and impacts on biodiversity; the Explore Module, which is a collection of spatially explicit maps of the importance and local integrity of biodiversity; and the Assess Module, which contains a tailored physical and reputational risk assessment for which users need to input location-specific company and/or supply chain data. A fourth module, the Respond Module, is currently under development. This will support users in identifying suitable actions to respond to the identified risks.

Organisations and reviewers

Developed by the World Wide Fund for Nature (WWF), the Biodiversity Risk Filter is informed by an extensive range of global coverage scientific data that are peer reviewed and sourced from world leading and reputable institutions known for their expertise in environmental and climate science. [WWF BRF tool data source and methodology](#) are explicitly informed through our documentations that are publicly accessible.

These data also undergo regular updates and reviews to ensure its relevance and accuracy, and is typically under the update frequency of 2 years.

The Risk Filter team and the associated collaborators at WWF, which consists of experts in water and biodiversity risk assessments, continuously reviews and assesses the quality of the data used. This expert oversight helps to maintain high standards of data integrity and reliability. The team also engages with various stakeholders, including scientific communities, industry experts, and local organisations, to ensure the data reflects ground realities and is comprehensive in its coverage of biodiversity risks.

Current stage of development

The suite is fully operational and continuously updated. The additional accompanied Adaptation, Conservation, and Transformation (ACT) tool, specifically developed to address positive impact and opportunity in biodiversity, is currently under development and to be expected in 2025.

Transparency of method

The suite primarily uses publicly available and peer-reviewed data sources. Extensive documentations on data sources and methodologies are provided on the website and publicly accessible to maintain transparency. Further information on methodology, data and guidance can be found [here](#).

Main purpose of the tool

The WWF Biodiversity Risk Filter (BRF) is a corporate and portfolio-level risk screening and prioritisation tool to help identify risks and opportunities across company operations and value chains in various biodiversity key impacts and dependencies, supporting enhanced business resilience and sustainable practices.

It is however important to note that the tools are NOT meant as:

- Comprehensive modelling tools that captures nature in all facets at site level or that provides highly granular or near-real time information at local scale.
- Footprint assessment tools that provide biodiversity & water impact scores across corporate spheres of influence.

What does it measure?

The WWF BRF measures various physical and reputational risks with an extensive number of risk indicators and metrics. Under the physical risks, there are the risk category of Provisioning Services, Regulating & Supporting Services – Enabling, Regulating Services – Mitigating, Cultural Services, and Pressures on Biodiversity, while the Reputational risk includes the category of Environmental Factors, Socioeconomic Factors, and Additional Reputational Factors.

For more information on the WWF BRF – risk indicators and metrics, please see the [methodology document](#), specifically on appendix 0.3 and 0.4.

What input data are needed?

Required inputs include location (coordinates or address), industry classification of sites, and the business importance of sites.

What other tools are most complementary to this tool?

The Water Risk Filter (WRF) that is also under WWF Risk Filter Suite is best to complement the Biodiversity Risk Filter. The WWF Risk Filter Suite (including WRF and BRF) also aligns well with other tools like IBAT, ENCORE and REPRISK.

How can the tool be used for TNFD reporting?

With regards to how WWF Risk Filter Suite (incl. BRF) can support TNFD reporting, we have published the [Technical Guide: How the WWF Risk Filter Suite can support the Taskforce on Nature-related Financial Disclosures \(TNFD\)](#).

Main strengths and limitations

Strengths:

- The WWF BRF tool enables companies to systematically identify and prioritise biodiversity-related risks across their entire operations and value chains. This strategic approach helps in aligning biodiversity management with business goals.
- Guidance on Opportunities (upcoming in the accompanied ACT tool): beyond merely identifying risks, the BRF tool also highlights opportunities for companies to enhance their environmental stewardship.
- Support for Sustainable Practices: By providing insights into the dependencies and impacts on biodiversity, the

tool encourages companies to adopt more sustainable practices. This can lead to long-term benefits such as increased resilience and sustainability of business operations.

- Currently the tool support and is in the alignment of reporting standard and targets like SBTN, TNFD, and EU-ESRS.

Limitations:

- Like most risk assessment tools, it measures potential risk instead of actual risks.
- The tool provides a risk score rather than a monetary valuation of risks.
- Limited data for supply chain assessment.
- Other limitations inherent to WWF RFS modelling principles:
 - a. Applying this methodology at scale requires workarounds
 - b. Point-in-time assessment
 - c. Point location as site input (instead of polygons such as arable farming boundary or linear infrastructures such as railway lines)
 - d. Spatial granularity of assessment units differs, and aggregated/ standardised to HydroSHED Level 7.
 - e. Level of abstraction, all risk variables are translated into risk scores of 1 to 5.
 - f. Robustness of data: despite our best possible effort to select only the most up-to-date, reputable, global and mostly freely available data sets to assess each indicator, due to data availability of global data sets, some proxy data had to be included.
 - g. Error of omission: the current set of indicators have been carefully selected to try to achieve a balance between completeness, usefulness for the user and data availability. However, there are more aspects to

biodiversity risk that could be included in the tool. The explanations of the different indicators contain disclaimers if other data sets were considered but were not available or are planned to be included in future iterations of the tool. As new data becomes available and the inclusion of more data becomes necessary, indicators/data sets may be added or removed.

- h. Gap in trade-offs. Interrelations, trade-offs and feedback loops between different ecosystems and the services they provide are currently not considered.
- i. Industry materiality and the importance and integrity of biodiversity as key drivers of results. Results are sensitive to a) the industry materiality rating linked to companies' industry classification; and b) the thresholds of converging spatial biodiversity data into a score of 1 to 5.
- j. Natural resources are sourced from surrounding areas. For provisioning services, such as timber availability, it is assumed that natural resources are sourced directly from the surrounding area. This may or may not be the case.

What are the costs?

The WWF BRF tool is free to use and easily accessible online through the [WWF Risk Filter Suite platform](#).

For the access module where users can assess risks of their specific business site or portfolio location, a free login account/ registration is required.

For licensing please refer to our documentation of [Terms of Use](#).

Output visuals BRF

Figure 1. Map view of the risk assessment: where each circle represents the user business site locations with the corresponding risk level (colour). Users could switch to various different biodiversity risk aspects/ layers.



2023

WHICH BIODIVERSITY RISK ASPECT DO YOU WANT TO SEE?

Scope Physical Risk

Transparency of the risk layer

What additional information would you like to see?

Nothing selected

Which borders would you like to see?

Country Borders

Hide settings

WHAT AM I SEEING HERE?

Physical Risk

Physical Risk is driven by the ways in which a business depends on nature and can be affected by both natural and human-induced conditions of land- and seascapes. It comprises the risk categories: 1) Provisioning Services, 2) Regulating & Supporting Services - Enabling, 3) Regulating Services - Mitigating, 4) Cultural Services and 5) Pressures on Biodiversity. Therefore, physical risks account for the status of the ecosystem services that companies, or their suppliers, rely on. See the specific risk type layers for more details.

WWF Biodiversity Risk Filter (2023)

n/a Very low risk Very high risk

You are currently viewing risk layers for terrestrial areas only. To view also marine area risk layers, use the switch:

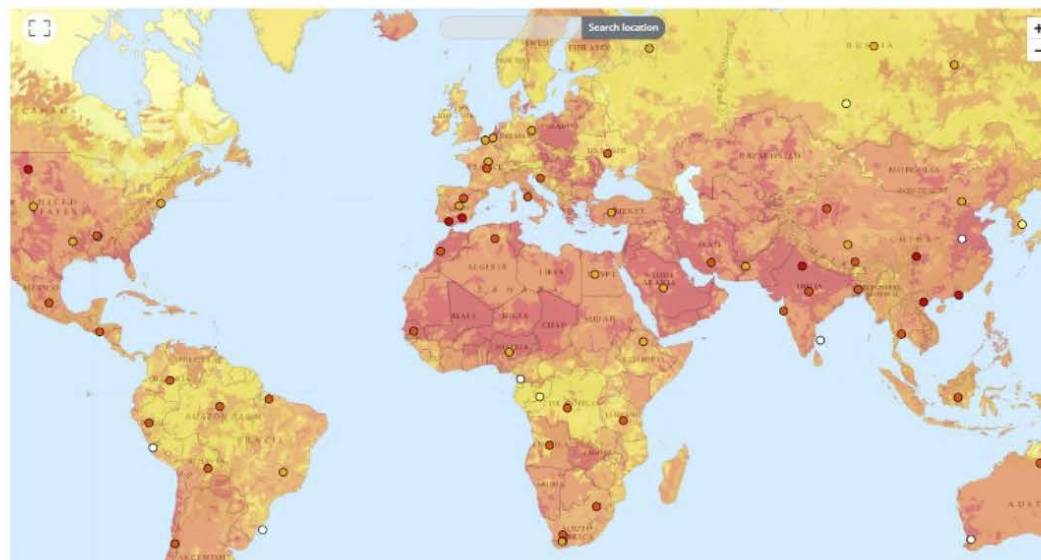
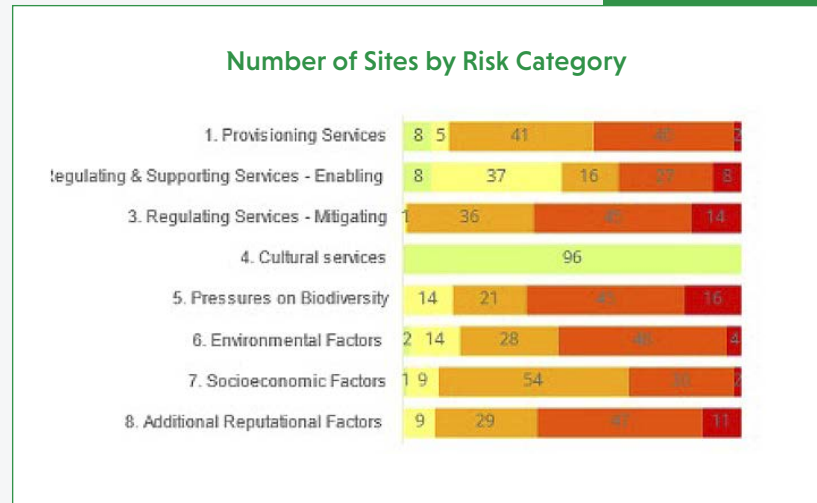
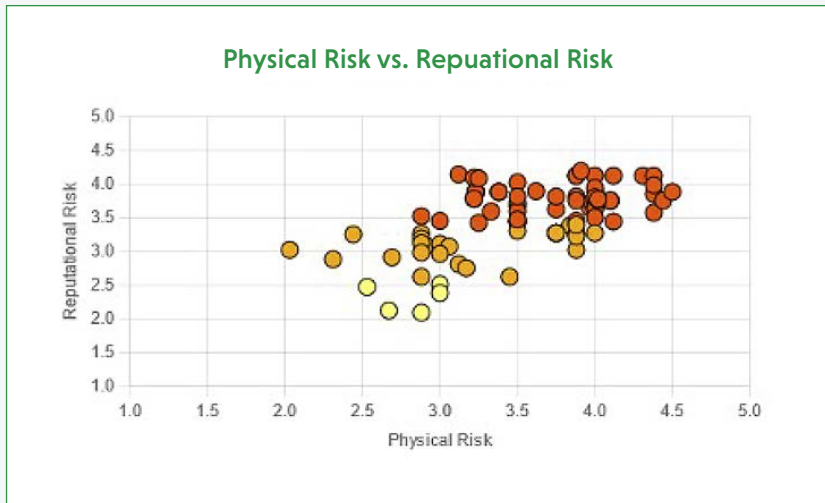
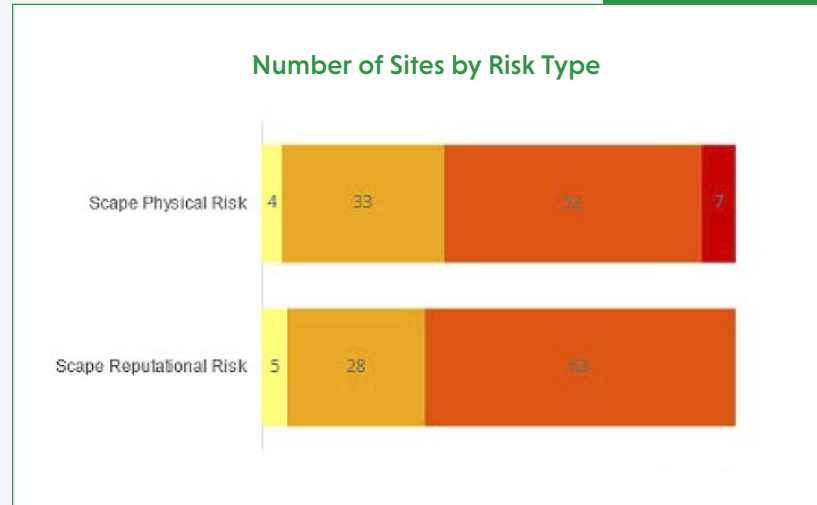


Figure 2. Detailed view of the risk assessment, this includes various output charts/ visual such as the visual for Number of sites by land- or seascape, Number of Sites by risk type, Physical risk vs. Reputational risk, and Number of sites by risk category.



5.4 BIA-GBS - Biodiversity Impact Analytics – Global Biodiversity Score

Biodiversity Impact Analytics – Global Biodiversity Score (BIA-GBS) measures the biodiversity impact of companies as well as their dependencies to ecosystemic services. Investors can identify areas of high biodiversity impacts and dependencies in their portfolios and use biodiversity impact data for decision-making and to engage with key stakeholders. By offering large-scale biodiversity data (7 200+ entities), BIA-GBS™ supports the transition of the financial sector to align with international targets and reduce the impact from multiple pressures on biodiversity.

Description and steps

BIA-GBS uses the Global Biodiversity Score, a corporate Biodiversity Footprint Assessment tool which links economic activity to pressures on biodiversity and translates these pressures into biodiversity impacts, using scientific knowledge. In BIA-GBS, the GBS is computed with two climate databases of Carbon4 Finance (C4F). First, Climate Risk Impact Screening (CRIS) assesses the exposure of listed assets to climate physical risk. It provides a breakdown of the issuers' economic activity by sector and country. Then, Carbon Impact Analytics (CIA) provides assessments of GHG emissions over the whole value chain. CIA uses bottom-up data collected by C4F's analysts. In BIA-GBS, CIA is used to refine results for climate change pressure.

Organisations and reviewers

BIA-GBS is co-owned by Carbon4 Finance and CDC Biodiversité. CDC Biodiversité is working with a scientific review committee with representatives of BRGM, UNEP WCMC, Universidad Iberoamericana, PBL, MNHN, Senckenberg, INRA, National University of Singapore and FAO.

Current stage of development

The database is currently running and used by FIs. Carbon4 Finance and CDC Biodiversité regularly update the database and methodology to fulfil the needs of the clients.

In terms of next developments, the database aims at further developing the following:

- Freshwater ecotoxicity - ecotoxic impacts in freshwater environments are currently covered by GBS. However, the uncertainties for this pressure are higher than for the rest of the impacts. They are therefore not currently included in the BIA-GBS database. Work is currently being finalised to improve the accuracy of these impacts, and thus potentially integrate them into BIA-GBS.
- Impacts on marine ecosystems - several integration options are currently being studied. In the GBS, an 'overfishing' module has been developed to measure the contribution of companies to the overexploitation of resources.
- Additional geolocalised land use data, based on satellite data from the European Space Agency, to improve the Land Use impact factors.

Finally, in the long term, continuous improvement of top-down methods and exploration of the development of bottom-up modules.

Transparency of method

The [BIA-GBS methodology documentation](#) is publicly available online. The [launch event](#) of the BIA-GBS explains further details of the methodology. Carbon4 Finance has a dedicated [webpage](#), and CDC Biodiversité provides all publications via this [weblink](#).

What is the main purpose of this tool?

BIA-GBS is suitable for calculating the footprint of a financial asset portfolio and indices composed of listed equity and/or corporate and sovereign bonds. BIA-GBS also measures the dependencies of companies and portfolios on ecosystem services. BIA-GBS can be used for risk management, regulatory reporting (e.g., related to Article 29 of French climate law), voluntary reporting, engagement with companies and exclusion policies at a sectoral level.

BIA-GBS is a biodiversity footprinting tool, providing a quantitative estimation of companies' impact and dependence on biodiversity. It uses financial data as well as physical flow data related to GHG provided by Carbon4 Finance's CIA database.

What does it measure?

BIA-GBS provides an estimate of the biodiversity footprint of portfolios or indices considering the full value chain of underlying companies. As BIA-GBS relies on the GBS methodology, it comes with the same concepts and limitations as GBS and GBS-FI. The impacts of pressures caused by specific economic activities on ecosystems are quantified using the GLOBIO model. BIA-GBS is not intended to replace local indicators which are best suited to local or on-site biodiversity assessments.

The impacts of pressures caused by specific economic activities on ecosystems are quantified, relying on the GLOBIO model which is based on pressure-impact relationships. BIA-GBS covers the following pressures on biodiversity:

- Land use
- Overexploitation of resources
- Climate change
- Pollution

The impacts related to these pressures can be broken down into sub-pressures and ecosystems (for terrestrial and aquatic ecosystems).

BIA-GBS also measures the dependencies of companies and portfolios on ecosystem services. The list of 21 ecosystem services in the ENCORE database is used. Two dependency scores are available in BIA-GBS: one average dependency score that measures the average dependency of a corporate or a portfolio on all ecosystem services; one critical dependency score that provides the share of a company or of a portfolio that is critically dependent, i.e., not substitutable, on at least one ecosystem service. BIA-GBS is not intended to replace local indicators which are best suited to local or on-site biodiversity assessments.

The granularity and accuracy of ESG data are pivotal elements in providing a robust understanding of an entity's or portfolio's biodiversity footprint. The BIA-GBS database offers a comprehensive and detailed dataset designed to assess biodiversity impacts and dependencies at multiple levels, below is the detail of the granularity and accuracy of the data provided through BIA-GBS:

- Concerning the dependency part of the methodology: 44 datapoints at entity level + 44 datapoints at instrument level + 44 datapoints at portfolio level = 132 datapoints provided in total
- Concerning the Impact part of the methodology: 57 datapoints at entity level + 36 datapoints at instrument level + 36 datapoints at portfolio level = 129 datapoints provided in total

The indicators available at entity and portfolio level are the following:

- Biodiversity Footprint in MSA.km2 (for the 4 terrestrial/aquatic/freshwater and dynamic/static combinations)
- Monetary intensity (by EVIC as well as turnover for corporate)
- Biodiversity by pressure (6 terrestrial pressures and 4 aquatic pressures)
- Biodiversity by scopes
- Portfolio performance against a benchmark
- Aggregate score (in MSApb*)
- Two dependency scores (critical and average) on 21 ecosystem services

What input data are needed?

BIA-GBS is an integrated solution meaning that data needed from FIs is minimal; they just need to characterise their portfolio or index with identification numbers for underlying companies (e.g., ISIN number) and financial exposure for each asset. For climate change, the GHG

emission data reported by the company and/or modelled by Carbon4 Finance are used (if available). The turnover is also directly reported by companies. Geographical or sectoral breakdown of turnover is assessed through other externally collected sources.

What other tools are most complementary to this tool?

For a more complete picture of corporates' impacts on biodiversity, BIA-GBS could be complemented with geolocated data on endangered species or habitats (e.g., using IUCN Red List of Threatened Species, Key Biodiversity Areas, Protected Areas, STAR) if asset locations are known. For enhanced precision on ecosystem services, the aggregated scores provided by BIA-GBS, based on qualitative evaluations could be complemented by quantitative metrics tailored to each ecosystem service.

How can the tool be used for TNFD reporting?

BIA-GBS is well-suited to align with the LEAP framework of the TNFD as it can be used for most phases of this framework.

BIA-GBS can be used for the "Locate" phase as a tool for screening sectoral impacts and dependencies across the entire value chain. It can inform the "Evaluate" phase as its output is a precise measurement of biodiversity impacts and dependencies of an asset or a portfolio. BIA-GBS can also inform the "Assess" phase by providing useful information on which the risk and opportunity analysis can be based. The results of all previous phases, obtained partially or entirely through BIA-GBS, can be the foundation of the answer to the "Prepare" phase.

BIA-GBS was used in a TNFD pilot, which assessed the tool's ability to respond according to the LEAP approach at company level and at portfolio level for the "Agriculture

and fisheries" sector. The pilot presentation webinar is available [here](#) and the detailed case study is available in this [publication](#). The conclusions expressed can be applied to the GBS-FI as well.

Main strengths and limitations

Strengths

- Good coverage on all the investment indices, assessment of sovereign bonds
- Covers all industry sectors and their potential impact on terrestrial and aquatic biodiversity
- Covers all countries. Biodiversity impacts are related to specific geographies (EXIOBASE divides the world into 49 regions for this).
- Company-specific data is collected for climate change pressures
- Integration of company-specific data for the other pressures under development, starting with the agri-food sector in 2022
- Differentiates static (e.g., land occupation) and dynamic (e.g., land conversion) impacts
- Easy to use
- Quantitative (and scientifically robust) link between pressures and impacts
- Scientifically well underpinned (best available knowledge and tools e.g., GLOBIO, EXIOBASE)
- Covers most drivers of biodiversity loss
- Compatible with international objectives: The MSA can be calculated on a global scale (e.g., the global level in 2010 was 68%). Therefore, it is possible to assess company trajectories and their compatibility with a level of remaining biodiversity. One could for instance assess the compatibility with the targets of the CBD (e.g., +5% biodiversity integrity in 2030).

- Biodiversity input data (MSA, pressure-impact relationships) based on extensive meta-analysis which allows for adding new studies continuously

Limitations

- Since the approach is partially based on sector averages and financial data, the impacts could be over/under-estimated at company level.
- Except for climate change-related pressures, impacts are based on sector averages, and thus not company-specific—although the sectoral x geographical split is company-specific. Considering the data used, the intra-sectoral comparisons have substantial limits.
- Pressure-impact relationships in the GLOBIO-model are biased towards the most studied species and ecosystems.
- Impacts on marine biodiversity are not covered.
- Invasive species and soil degradation are not factored in yet; overexploitation is factored in only partially.
- Shortcomings in linking pressures to economic activities.

What are the costs?

The time/effort required to calculate the impact is minimal, but the dataset is commercial. This means that FIs have to pay an annual fee to access it. The costs consist in the access to the database in the form of a subscription as well as the support from an analyst. The dataset is available directly, without the need for technical or knowledge skills. The time investment needed by the FI itself is low (less than ten days), as the outputs will be provided fully computed and usable. The fees include 2 hours of onboarding to better use the data and the support throughout the subscription by a dedicated analyst.



Summary of portfolio impact on biodiversity

Source: GBS 1.1, 02/22, Carbon4 Finance

Absolute impact
(MSAppb*)

77

Portfolio Covered Size
(Meuros)

983.71 M€

Portfolio Investment intensity
(Msappb* per b€ invested)

78

	Footprint MSAppb*		Footprint MSA.km ²		Surface Equivalents
	Dynamic	Static	Dynamic	Static	
Aquatic	7	17	0,1	9,5	 Terrestrial Dynamic impacts: x football fields 790
Terrestrial	33	19	4,2	125,7	

Terrestrial dynamic impacts are predominant

When considering the MSAkm2 static impacts are bigger because cumulated past impacts are by definition higher and terrestrial surfaces represent 92% of the total area considered. Once normalised in MSAppb*, we can see the predominance of terrestrial dynamic impacts.

All compartments are significant with a predominance of Terrestrial dynamic impact. The portfolio contributes to an annual loss of terrestrial biodiversity equivalent to the artificialization of 1230 soccer fields.

Portfolio Investment intensity in MSA_{m2}
(MSAm2 per k€ invested)

	Dynamic	Static
Aquatic	0,1	9,7
Terrestrial	4,3	127,8

Summary of portfolio impact on biodiversity and the most dominant pressures (drivers of biodiversity loss)

Source: GBS 1.1, 02/22, Carbon4 Finance

Land Use



Climate Change



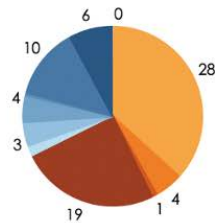
Wetland conversion



Land Use in catchment of wetlands



Impacts by pressure



pressure

- Atmospheric Nitrogen Deposition
- Climate change
- Encroachment
- Fragmentation
- Land use
- Freshwater eutrophication
- Hydrological disturbance due to climate change
- Hydrological disturbance due to direct water use
- Land use in catchment of rivers
- Land use in catchment of wetlands
- Wetland conversion

For all biodiversity type, land use and climate change are predominant.

Land use and climate change are the predominant pressures for terrestrial biodiversity. Wetlands conversion and land use in catchment of wetlands are predominant pressures for aquatic biodiversity

Scope 3 impacts (upstream) are largely predominant over Scope 1

Scope detail

- Scope 1 & 2
- Scope 3

Impacts by scope

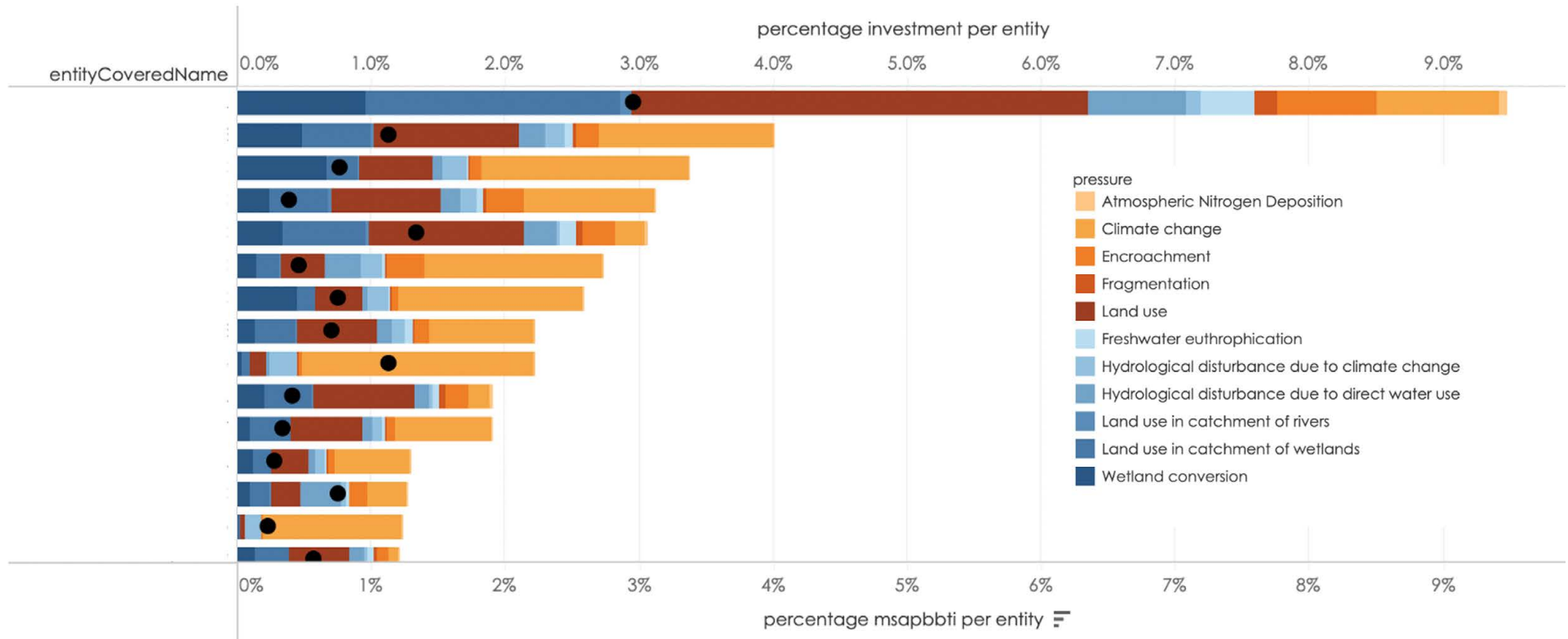


Distribution of impact and pressures (drivers of biodiversity loss) of entities (like companies) within a portfolio

Source: GBS 1.1, 02/22, Carbon4 Finance.

- The bar is the share of the score in MSAppb*
- The black dot is the share of the investment in %

Entity distribution - Impact vs Investment in percentage
(Footprint in MSAppb*- investments in M€)



5.5 GBS-FI - Global Biodiversity Score for Financial Institutions

The Global Biodiversity Score for Financial Institutions (GBS-FI) covers the uses of the GBS for tailor-made solutions for financial institutions, encompassing a wide range of non-listed asset classes. It is a tool based on the GBS, which provides an overall and synthetic vision of the biodiversity impacts and dependencies of economic activities.

GBS-FI solutions are applications of the GBS methodology to non-listed financial assets, based on data specifically collected for the assets assessed. They can cover a wide range of non-listed assets, through equity and debt: real estate (construction and exploitation of buildings), companies that are not listed on public stock exchanges or even infrastructures. The main difference with listed assets lies in access to the data used for assessing the biodiversity footprint. As public data is not available, data must be collected directly from the financial institution or from the investee. The assessment methods are thus tailored to each need to take into account the specific data availability and the specificity of the assets covered. This tailoring led to developing several approaches to use GBS-FI solutions on non-listed portfolios: Screening, Advanced Screening, and Simplified Biodiversity Footprint Assessment.

Organisations and reviewers

Just like the BIA-GBS tool, the GBS-FI methodology is developed by a dedicated team in CDC Biodiversité, a subsidiary of the Caisse des Dépôts Group, the French largest public FI. The methodology is periodically reviewed by a scientific committee to guarantee its robustness. The GBS has also developed a Club of Businesses for Positive Biodiversity (B4B+ Club) which acts as a platform for the GBS development (a group of 50+ businesses representing different sectors, including the finance sector).

Current stage of development

The first GBS-FI analysis were conducted in 2019 for asset managers. Since then, several assessments have been conducted on various asset classes: investments, corporate loans, private equity, real estate loans, etc.

What is the main purpose of this tool?

The GBS-FI is suitable for calculating the footprint of financial assets, from a single asset to a whole portfolio. Assessments have been conducted on assets ranging from a single investee company to portfolios comprised of hundreds of thousands of lines. These assessments can guide investment decisions and biodiversity roadmaps definition for FI, and also be the basis for engagement policies with investees.

The uses of the assessments are conditioned by the granularity of data used, which determines the precision of results. The GBS-FI can use a mix of data depending on its availability. The difference between BIA-GBS and GBS-FI lies in the type of asset evaluated (BIA-GBS measures only listed assets) and the data used. GBS-FI can assess assets with limited public data, such as companies in private equity or infrastructures.

What does it measure?

GBS-FI provides an overall and synthetic vision of the biodiversity footprint (measurement in MSA.km² of the changes occurring on ecosystem extent and condition) of financial assets (e.g., private equity, corporate loans) considering the

full value chain of underlying economic activities (associated companies businesses). GBS-FI also measures dependencies on biodiversity of the assets. As GBS-FI relies on the GBS methodology, it comes with the same concepts and limitations. It is not intended to replace local indicators which are best suited to local or on-site biodiversity assessments.

The impacts of pressures caused by specific economic activities on ecosystems are quantified, relying on the GLOBIO model which is based on pressure-impact relationships. The GBS-FI covers the following pressures on biodiversity:

- Land use
- Overexploitation of resources
- Climate change
- Pollution

The impacts related to these pressures can be broken down into sub-pressures and ecosystems (for terrestrial and aquatic ecosystems).

The methodology for measuring dependencies is based on the ENCORE methodology for ecosystem services. GBS-FI provides two types of dependency score for each asset:

- Average dependency score: the average of the dependency score of the asset to each of the 21 ecosystem services covered.
- Critical dependency score: the share of the asset's activity that is critically dependent, i.e., not substitutable, on at least one ecosystem service.

What input data are needed?

The GBS-FI can work with different datasets listed below, by increasing order of usefulness in terms of the precision that can be expected from the assessments:

- 1 Economic activity data: turnover and purchases by country and industry (of the asset)
- 2 Pressures, resources and emissions data:
 - Commodities, services or refined products extracted or consumed
 - Carbon emissions on scope 1, 2 and 3 (see definition in paragraph 2.2)
 - Land use changes (ideally using GLOBIO's 16 habitat types nomenclature including different use intensity for forests, grasslands, agriculture, etc.)
 - Water withdrawal and consumption by Scope
 - Nitrogen and phosphorous emissions by Scope
- 3 Comprehensive biodiversity direct data: when very detailed ecological monitoring data are available, the Mean Species Abundance can be directly calculated.

The minimal data that can be used by GBS-FI is the amount invested in an asset or an outstanding amount, broken down by sector of activity and country. In that case, the biodiversity footprint assessment is called a screening, as it relies on financial data only.

What other tools are most complementary to this tool?

For a more complete picture of corporates' impacts on biodiversity, GBS-FI could be complemented with geolocated data on endangered species or habitats (e.g., using the IUCN's STAR metric) if asset locations are known.

How can the tool be used for TNFD reporting?

The GBS-FI can be used for various needs of TNFD reporting. It is especially useful to answer to the LEAP framework of the TNFD, as it can be used for most phases of this framework.

The GBS-FI can be used to inform localised biodiversity stakes during the 'Locate' phase. It includes modules aimed at measuring the level of ecosystem integrity and its speed of depletion at specific locations, using satellite data. This information can be complemented by additional tools and qualitative analysis. The GBS-FI can entirely answer to the 'Evaluate' phase as its output is a precise measurement of biodiversity impacts and dependencies of an asset or a portfolio of assets. The GBS-FI can inform the 'Assess' phase by providing useful information on which the risk and opportunity analysis can be based. The results of all previous phases, obtained partially or entirely through the GBS-FI, can be the foundation of the answer to the 'Prepare' phase.

What other tools are most complementary to this tool?

For a more complete picture of corporates' impacts on biodiversity, GBS-FI could be complemented with geolocated data on endangered species or habitats (e.g., through IBAT) if asset locations are known.

Main strengths and limitations?

Strengths:

- Scientifically well underpinned (best available knowledge and tools e.g., GLOBIO, EXIOBASE)
- Quantitative (and scientifically robust) link between pressures and impacts
- Covers terrestrial and aquatic biodiversity

- Differentiates past and new impacts
- Can be spatially explicit
- Covers most drivers for biodiversity loss
- Covers all industry sectors and all countries
- Compatible with site-level data (micro) and international objectives (macro)
- Biodiversity input data (MSA, pressure – impact relationships) based on extensive meta-analysis which continuously allows for adding new studies
- Will allow for introducing weight factors differentiating ecosystem condition based on protection regime, protected species, etc.

Limitations:










- Pressure-impact relationships in the GLOBIO model are biased towards the most studied species and ecosystems.
- Marine biodiversity is not factored in.
- Invasive species and soil degradation are not factored in yet; overexploitation is factored in only partially.
- Remaining shortcomings in reallocation rules (i.e., linking pressures to economic activities)

What are the costs?

GBS-FI costs vary according to the approach chosen:

- Screening: €25-35000
- Advance screening: €35-45000
- Simplified Biodiversity Footprint Assessment: €15-30000 for companies, €15-40000 for infrastructures (on top of a cost to develop a sector-specific or infrastructure-specific methodology)

A detailed overview of the range of cost and business applications of each approach is provided below.

	BIA-GBS	GBS-FI – Loans and Equity		
	 			
TYPE OF ASSESSMENT	Screening		Advanced Screening	Simplified Biodiversity Footprint Assessment
 Asset class	Listed corporates (equities and bonds), sovereign bonds	All types of portfolios	Real estate, private companies, project finance	Infrastructure, private companies (Small to mid-caps)
 Data collected by the end-user	ISIN and invested amounts	Sector and country of the financing Outstanding or investment amount Turnover, EVIC	Screening data + Less than 20 portfolio-specific physical indicators ⁽¹⁾ (GHG, land occupation, raw materials...)	Screening data + Less than 100 refined physical indicators (GHG, land occupation, raw materials...)
 Cost of the assessment	Subscription with annual fee	~25-35k€	~35-45k€	~15-30k€ / company ~15-40k€ / infrastructure ⁽²⁾
 Time required to obtain impacts and dependencies	Immediate (access to a database)		3-5 months ⁽³⁾	
 Needs addressed	<ul style="list-style-type: none"> • Identification of hotspots of sectoral impacts and risks: key sectors and/or issuers for further analysis • Ground for engagement with corporates 		<ul style="list-style-type: none"> • Identification of best-in-class players • Monitoring of portfolios' biodiversity performance 	<ul style="list-style-type: none"> • Identification of hotspots of impacts • Definition of action plan for the issuer
 Business applications			<ul style="list-style-type: none"> Assessment of current biodiversity performance BA 1 Assessment of future biodiversity performance BA 2 <p>N.B. The Advanced Screening approach provides only a partial response to BAs 1 and 2, while the Simplified Biodiversity Footprint Assessment approach is more suited to addressing these BAs.</p> <ul style="list-style-type: none"> Tracking progress to targets BA 3 Comparing options BA 4 Assessment / rating of biodiversity performance by third parties, using external data BA 5 Screening and assessment of biodiversity risks and opportunities BA 7 	

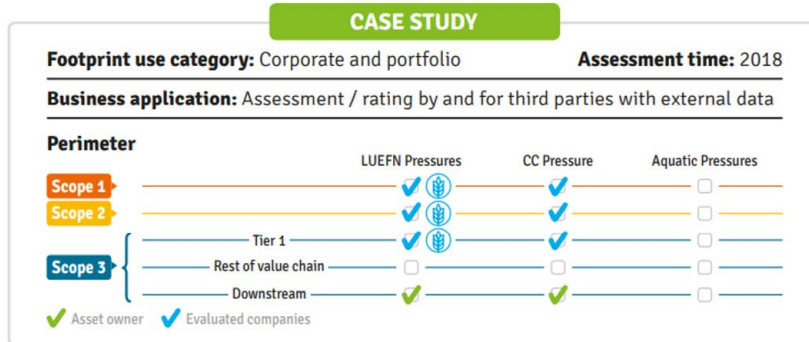
(1) Physical indicators, or input data indicators, are the different types of data to be collected. For example, if commodities quantities are collected, each commodity type is considered as a physical indicator. Core indicators number aim to stay below 100 but it may vary based on the use case: more than 3 000 products can be covered by the Global Biodiversity Score and this granularity can prove valuable for assessing some sector.

(2) on top of a cost to develop a sector-specific or infrastructure-specific methodology

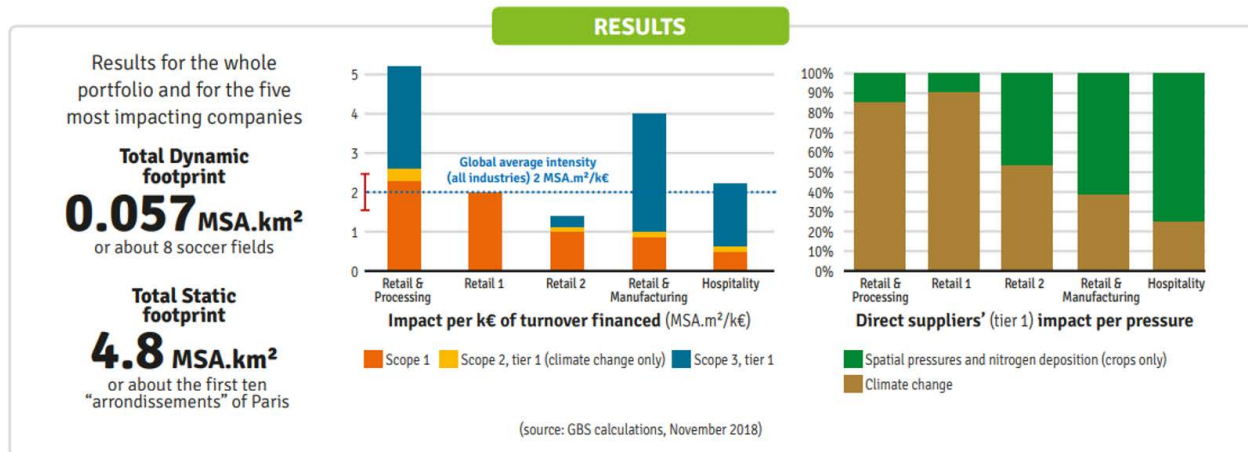
(3) depending on the sector, the amount of data on hand for the assessment and the availability for data collection

Figure 6: Multi-purpose biodiversity assessments provided by the GBS for the financial sector; from databases to tailor-made solutions for various asset classes, data granularities, and ranges of cost. Business applications from Lammerant (2022)

Overview of the coverage of the assessment



Overview of the results of the assessment, in absolute impact and in intensity of impact



5.6 CBF - Corporate Biodiversity Footprint

The Corporate Biodiversity Footprint (CBF) is designed to assess the annual impact of activities of corporates, FIs, real assets and sovereign entities on global and local biodiversity. This appraisal is based on the impact generated from the products purchased or sold by companies calculated throughout their value chain.

The CBF models the impact of corporates through four main environmental pressures on species and habitats. These pressures are calculated along the whole value chain of the entity or asset, appraising their processes, products, and supply chains. All pressures are aggregated into scope 1, 2 and 3 according to the definitions and boundaries set forth in the GHG Protocol.

Organisations and reviewers

The methodology and any new developments are supervised by a scientific committee to ensure the quality and the relevance of the CBF. The role of the scientific committee is to advise on the key scientific pillars of the methodology, the latest scientific developments and its alignment with best available resources and methodologies to account for biodiversity impacts.

Current stage of development

Since 2023, *Positive contributions* are available for corporates as *Reduced and Avoided impacts*, while data collection for *Positive impacts* through restoration projects is ongoing. The integration of impacts from water use and *invasive species* will be available in Q4 2024.

Transparency of method

The CBF [methodological guide](#) is available on IDL website as well as some sectoral slides. We also include training

session when users are onboarding and access to the ESG support team to answer questions.

What is the main purpose of this tool?

The purpose of the CBF is to assess the annual impact of a corporate/real asset/Sovereign's activities on global and local biodiversity throughout the value chain.

Also, as the CBF is provided under multiple KPIs (impacts per scope, per pressure, absolute and relative), the metric is an appropriate indicator to measure a company's biodiversity-related risks and to identify the source of risks.

Positive contributions of corporates are also available to follow corporates' performance overtime or against a sectoral benchmark.

What does it measure?

The CBF assesses the annual impact of a corporate/asset/sovereign's activity based on products and assesses their impact on biodiversity throughout the value chain. This annual impact also considers the persistence of pressures due to these annual activities across time (time integration). There are no technical limitations to using reported pressure data at company level, only data availability is at stake.

What input data are needed?

Depends on the data available to be used for the calculation:

- Environmental data reported by companies are considered best.
- If no environmental data are reported, consumption and production data are used to model environmental pressures.
- If only sales are reported, the volumes are modelled using our customised Input/Output.
- When no data is available, a biodiversity footprint is modelled from the sectoral average.

What other tools are most complementary to this tool?

Tools that gather actual site-specific biodiversity data—biodiversity state, endangered species and others—complement the CBF's datapoints which are based on potential biodiversity impacts modelled through pressure-impact relationships.

How can the tool be used for TNFD reporting?

The tool has been used in partnership with financial institutions and consultancies for several TNFD Pilots. A public report for one of the pilots is available [here](#).

Further developments and data audit on intermediate datapoints are being carried out to be able to provide TNFD metrics from the TNFD Recommendations by Q4 2024.

Main strengths and limitations

Strengths:

- Coverage: All sectors are covered, including listed and non-public entities. The full universe *IDL Global* encompasses +8000 issuers across all geographies.
- Comprehensiveness: The CBF performs an analysis based on products and assesses their impact throughout the value chain (all scopes) of a corporate, combining modelled and reported data (data collection from analysts) and other publicly available information
- Data granularity and quality: more than 2.000 commodities are used to map the activities of companies, and *Data Quality Levels* (DQL) are available for each datapoints to inform on the type of primary data used initially.
- Diversified applications: The tool is suitable for assessing performance at corporate level over multiple asset classes (equity, bonds, Sovereigns) and aggregated financial portfolios, comparing issuers within sectors and for comparing individual incremental impact. It can be used for index creation, portfolio footprint, exclusions, engagement, voluntary or regulatory reporting frameworks
- Transparent: the methodology and any new developments are supervised by a scientific committee to ensure the quality and the relevance of the CBF.
- Actionable and recognised: The CBF was developed by financial professionals to serve the needs of financial institutions with data solutions that are fit to their constraints (auditability, traceability, scalability).

Limitations:

- The CBF covers terrestrial biodiversity and freshwater biodiversity, but does not account for marine biodiversity yet.

What are the costs?

For data access, depending on the coverage required, prices typically range from €20000 to €60000. Access to the biodiversity footprint calculator for consultants comes at a price of €5000 per license.



Output visuals CBF

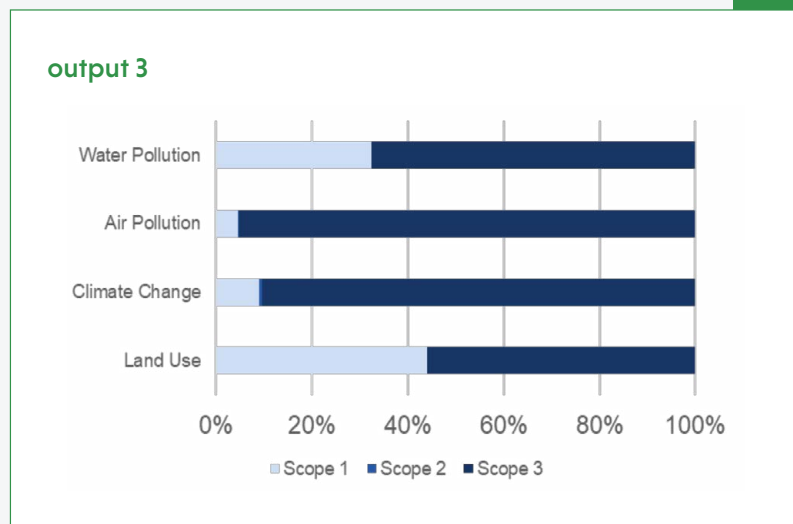
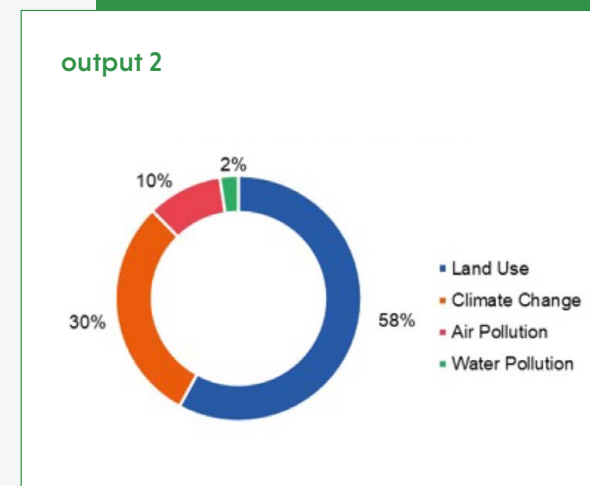
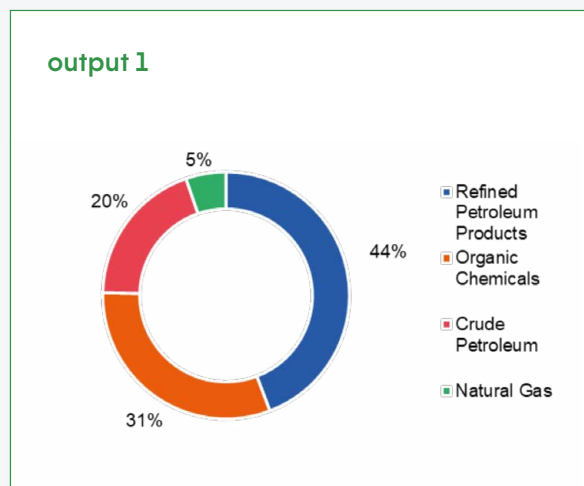
The Corporate Biodiversity Footprint (CBF) assessment systematically assesses the footprint of a corporate, a project or an infrastructure through different angles, so that the financial institution can have a direct outlook on the key contributors to the biodiversity footprint across products, pressures and scope.

The illustration below is based on the assessment of a listed oil & gas company.

The first output graphic shows the breakout of the footprint by main product or service of the company, enabling to understand the main products at risk for the biodiversity footprint, especially in comparison with the % of sales of each product.

The second output graphic shows the breakout of the footprint by main pressure. If the main pressure on biodiversity is globally the land use change pressure, that might not be the case for specific sectors or specific companies. In the case of an oil & gas company, the climate change pressure, related to the downstream impact of oil & gas combustion is logically very significant.

The third output graphic shows the breakout of the footprint by scope, revealing the relative weight of direct vs. indirect impact for each pressure, which is key to assess the materiality of the biodiversity risk across the value chain of the company.



5.7 BFFI - Biodiversity Footprint Financial Institutions

The Biodiversity Footprint Financial Institutions (BFFI) provides a biodiversity footprint of the economic activities in which a FI invests. The methodology allows calculation of the environmental pressures and the biodiversity impact of investments within an investment portfolio, at the level of a portfolio, an asset class, a company, or a project.

Description and steps

The BFFI consists of four steps:

The first step is creating an overview of the economic activities in which the FI invests. This step includes:

- A 'definition' of the activities of a company: what is the company producing? In what sectors is the company active? And where does production take place or is the turnover generated?
- A selection of the investments included in the assessment (all major investments). Recently this step was completely automated by linking data from a number of data providers with revenue data on listed companies to the BFFI software tool, which allows the assessment of large indices.

In the second step, the environmental impact of the economic activities of the company or projects in which a FI invests, is assessed. The environmental data in the EXIOBASE input/output-database is used to assess what land use, water use, emissions, etc. (pressures) are linked to the economic activities, unless more accurate data (like company data) is available. EXIOBASE takes into account worldwide trade flows between countries and between sectors. It is also possible to use other input data, such as other input/output-tables (e.g., EORA), LCA databases (e.g., Ecoinvent, World Food Database, Agrifootprint Database), or specific on-site data (currently done for assessing specific projects for impact investors).

In the third step, the ReCiPe model (see text box p. 55) is used to calculate the environmental pressures on a midpoint level (e.g., climate change resulting from CO₂ emissions) and to calculate the resulting impact on ecosystem quality or biodiversity (endpoint level). This latter step is based on science-based 'pressure-response' relations (e.g., the effect of a 1 degree temperature rise on biodiversity).

This results in an impact on terrestrial, freshwater and marine biodiversity. The unit used to express the impact on biodiversity is PDF.ha.yr, the Potentially Disappeared Fraction of species (see p. 8) multiplied with the area (in hectare for terrestrial, or cubic meter for aquatic biodiversity) and duration of the loss (in year). The result is then used to calculate the biodiversity footprint in m² per € invested (for each investment category) and the total footprint in m² for all investments.

In this process, ReCiPe covers the following stressors (sometimes referred to as midpoints):

- For terrestrial ecosystem quality: Climate change, Photochemical ozone formation, Acidification, Ecotoxicity, Water scarcity, Land use occupation, Land use change
- For freshwater ecosystem quality: Climate change, Eutrophication, Ecotoxicity, Water scarcity
- For marine ecosystem quality: Ecotoxicity, Eutrophication

In the fourth step, a qualitative analysis is used to guide the interpretation and the use of the footprint results, looking at (among others) the limitations of the data and the footprinting methodology and their potential influence on the footprint results. The combined quantitative and qualitative analyses are used to decide on follow-up actions, like zooming in on impact hotspots, engagement with companies, and/or establishing/changing investment criteria. Currently, a fixed list of qualitative issues is publicly available per equity category, and a general description of the procedure to assess which issues are not covered in the quantitative assessment is to be found in the 2016 assessment report by ASN Bank (currently not on their website). However, some additional considerations will need to be added for a more specific assessment.

Organisations and reviewers

The EXIOBASE database is compiled by NTNU, TNO, SERI, Universiteit Leiden, WU, and 2.-0 LCA Consultants.

ReCiPe was developed in 2008 by RIVM, CML, PRé Sustainability and the Radboud University Nijmegen on behalf of the Dutch Ministry of Infrastructure and the Environment. In 2016, the ReCiPe method was revised thoroughly. New versions of both the model and the background report were published, developed by RIVM and Radboud University Nijmegen. The release

of ReCiPe-2016 was published in scientific literature ([ReCiPe2016: a harmonized life cycle impact assessment method at midpoint and endpoint level](#)).

Current stage of development

The BFFI is ready to be used by companies and FIs that want to assess their impact on biodiversity.

The method is continuously being developed. The following updates are scheduled:

- Updating the EXIOBASE data with newer versions
- Updating the impact assessment method in accordance with the latest scientific development
- Improving the assessment of dependencies
- Adding more asset classes and specific project finance categories

Transparency of method

The method is fully transparent because the databases used (EXIOBASE and ReCiPe) are publicly available and the BFFI methodology is explained in their reports.

What is the main purpose of this tool?

The methodology is suitable for the following applications:

- Calculating the footprint of a financial asset portfolio, an asset class, a company or a project.
- Development of an engagement policy and investment criteria based on insights in the main drivers behind the impact.
- Use as a scoping step: to identify biodiversity impact hotspots on a portfolio level, enabling FIs to zoom in on a selection of loans and investments.
- Use the footprint to develop a “no net loss or net gain” policy and track progress.

The methodology has been used to assess projects developed by impact investors which require site-specific data. This has proven to work well, especially as there is a benefit in assessing the portfolio in the same way as a specific investment in an area.

The BFFI method is used for assessing the biodiversity footprint of organisations, and as such belongs to the suite of biodiversity footprinting tools. Although first developed for a financial institute, i.e., the ASN bank, the BFFI method can also be used for companies to determine their biodiversity footprint. By assessing the impact of a company's operations in specific sectors and geographies, the method gives insight into the biodiversity hotspots of their operations.

What does it measure?

The BFFI method measures potential biodiversity loss in PDF.ha.yr for scope 1 (impact of the company through direct operations), scope 2 (impact of the energy companies the company sources its energy from) and scope 3 (upstream, towards suppliers and sub-suppliers, and downstream, towards the use and end-of-life phase) pressures. A number of case studies have been accompanied with a dependencies study based on ENCORE. Although ENCORE is not part of BFFI, the tool could partially use some of the same data and principles.

All pressures that contribute to biodiversity loss can be reported individually. The pressures for which this is possible are:

- Freshwater ecotoxicity
- Freshwater eutrophication
- Global warming, Freshwater ecosystems

- Global warming, Terrestrial ecosystems
- Land use
- Marine ecotoxicity
- Marine eutrophication
- Ozone formation, Terrestrial ecosystems
- Terrestrial acidification
- Terrestrial ecotoxicity
- Water consumption, Aquatic ecosystems
- Water consumption, Terrestrial ecosystem

What input data are needed?

Revenue data when the analysis is done at portfolio level. The sectors and regions wherein the revenue is accrued is also needed.

Purchasing data when the analysis is conducted at company level. Detailed material and natural resource inputs and emissions if case-specific products or projects are analysed.

What other tools are most complementary to this tool?

For a more complete picture of corporates' impacts on biodiversity, BFFI could be complemented with geolocated data on endangered species or habitats (e.g., through IBAT) if asset locations are known.

How can the tool be used for TNFD reporting?

BFFI can be used for the Locate, Evaluate and Assess modules of the LEAP framework prescribed by the TNFD. The tool can help locate where in the world and value chain impacts and dependencies can take place, as well as evaluate them by quantification, which results in insights in the potential hotspots in a portfolio. These can form the basis for assessing the risks and opportunities. The outputs can be used to report in line with a selection of indicators prescribed by TNFD.

Main strengths and limitations

Strengths

- Scientifically well underpinned.
- Use of open-source database and methodologies (no black box calculations).
- The EXIOBASE input/output-model shows trade flows between countries and sectors and therefore allows for a geographical identification of impact hotspots on a country level.
- Location/region-specific data can be used when available.
- Covers most drivers for biodiversity loss, including pollution.
- Supported by a range of stakeholders (including government, knowledge institutes and NGOs) after stakeholder consultations.
- Scalable to be used by other banks.
- The complementary qualitative analysis guides correct interpretation and use.

Limitations

- Since the approach is based on sector averages, revenue and models, it currently represents potential rather than actual biodiversity footprint.
- EXIOBASE data is based on sector averages, and thus not company-specific. This weakness can be addressed by using other LCA databases or by collecting additional data.
- Land-use related impacts are biased to temperate regions which means that land-use related impacts will be less accurate for tropical regions.
- Inclusion of location-specific characteristics is limited, limiting the methodology's fitness for use on a project level. For projects, alternative approaches are being

included in the methodology. On a portfolio level, with the aim of identifying biodiversity impact hotspots, this limitation is acceptable.

- Not all drivers of biodiversity loss are covered by the ReCiPe methodology. For example, the introduction of invasive species is not yet covered, and overexploitation is not yet fully covered (overexploitation of fish species was integrated in 2020). This limitation is addressed by the complementary qualitative analysis, which elaborates on the significance of this limitation for the analysis and what it means for the interpretation of results.

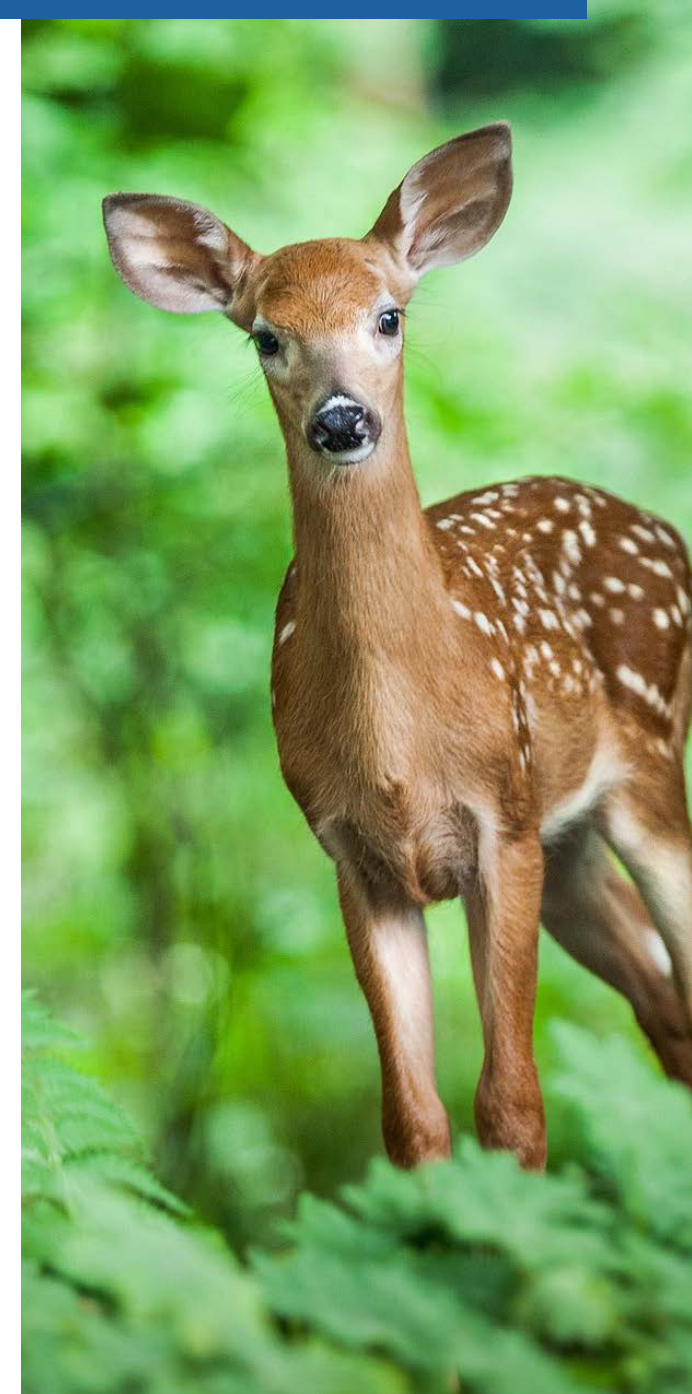
What are the costs?

Costs are dependent on the size of the project and the level of detail needed.

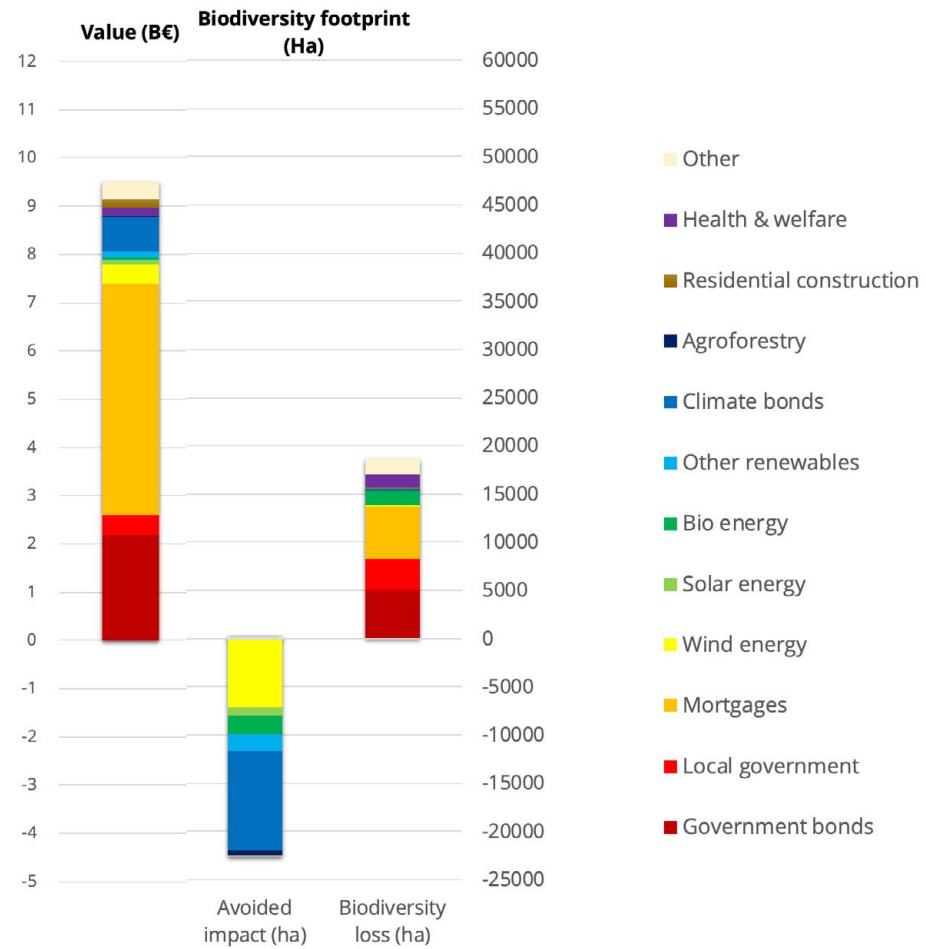
Costs for the tool are related to software, input data, and consultancy hours (when applicable).

- **Software:** LCA software, for example SimaPro, is needed to model the impacts. This type of software comes with [different license options](#), starting at €5900 for the annual subscription.
- **Input data:** Financial input data can be either already available at the FI or is commercially available via data providers. This comes with a license fee.

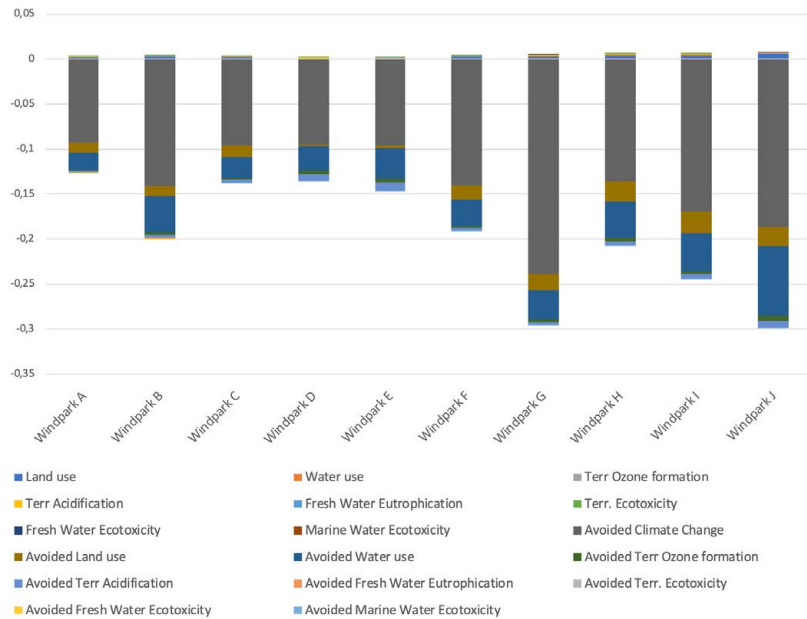
Expertise and knowledge: If the FI has the capacity and expertise to do the impact calculations themselves, EXIOBASE data is available for free, as well as the ReCiPe model. If capacity and expertise is not available internally, external consultants (PRé Sustainability or other consultants trained in BFFI) can be contracted. For this, costs are dependent on the consultancy firm, size and complexity of the project, and the level of detail needed for the results.



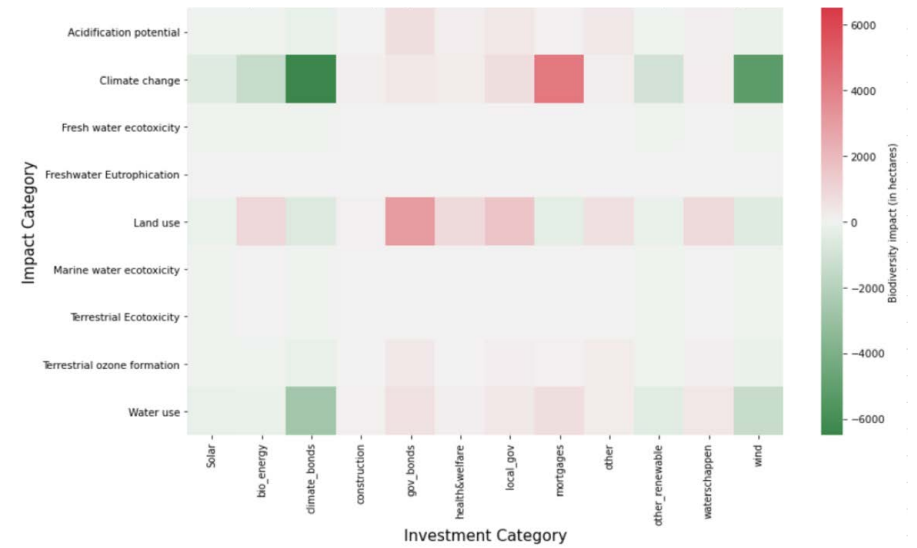
Total value and total biodiversity impacts at portfolio level



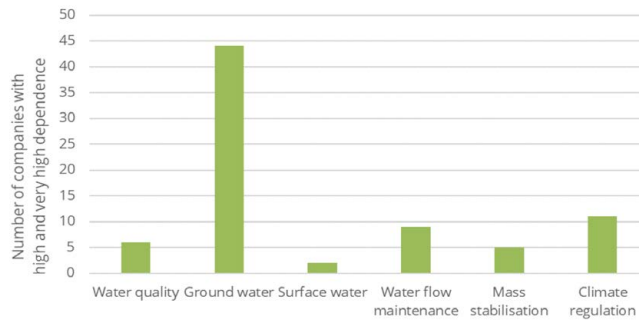
Biodiversity impact by drivers of loss, per project in m² per invested euro



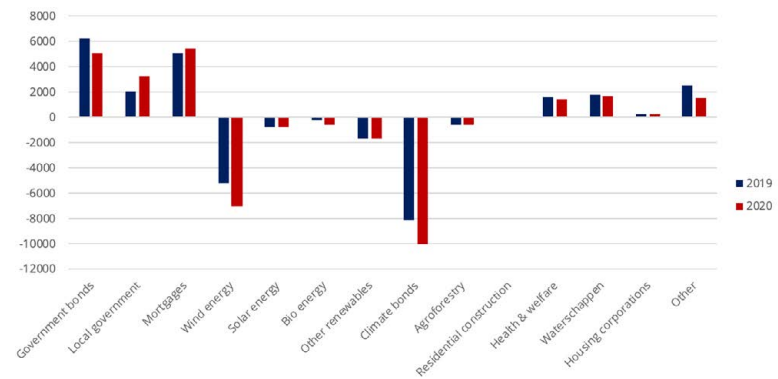
Heatmap for biodiversity impact at balance level, linking investment categories to impact categories (drivers of biodiversity loss)



Number of companies in a portfolio with high and very high dependencies on specific ecosystem services



Net biodiversity impacts in hectares per investment category per year for 2019 vs 2020



5.8 **GID – Global Impact Database**

The [Global Impact Database \(GID\) biodiversity model](#) is a quantitative biodiversity impact database, built on 10 years of experience in impact measurement. It is used by organisations to understand, report and act on the impact of their portfolios. It specialises in integrating insights from a variety of data sources, geographic and sector granularity, including emerging economies and the agricultural sector, and an innovative value chain representation.

Description and steps

The GID biodiversity model measures the biodiversity impact caused by five main pressures: contribution to climate change, air pollution, water pollution, water use and land occupation.

Emission pressures (contribution to climate change, air pollution and water pollution) and water use are calculated on company or country-sector level using company disclosures and several multi-regional input/output-databases combined. Land occupation is calculated on a country-sector level based on cross-referencing of Geographic Information System (GIS) datasets on biome cover, biodiversity state and crop productivity. GID relies on both ReCiPe and GLOBIO for pressure-impact modelling. Trade data from Global Trade Analysis Project [GTAP](#) is used to attribute biodiversity impact across economic activity in different sectors and countries. The GID method attributes impacts on biodiversity to companies based on their responsibility within the value chain. Companies with a higher added value are deemed to have a higher responsibility. In this way, both up- and downstream impacts are covered without double counting. This means that the impact arising from an investment in the electricity

sector will be included in the impact arising from an investment in the coal sector, since they share value chains, but the two can be aggregated without double counting.

Biodiversity loss is measured in hectares of pristine nature-equivalents. Monetized results representing the value of ecosystem services loss are also available, using [True Price monetization factors](#). This presents the value of nature lost in a way that is easy to understand and allows for comparison with financial metrics and other monetized impact metrics.

Organisations and reviewers

The Impact Institute has developed a standardised approach for organisations to quantify their impacts in a collaboration with Harvard Business School, Singapore University, and Erasmus University Rotterdam, called the [Impact Weighted Account Framework](#). They aim to create a common impact measurement and valuation approach tailored to banks by collaborating with ABN AMRO, Caixa bank, Danske Bank, DBS, UBS, and Harvard Business school in the [Banking for Impact](#) initiative. Impact Institute is a spin-off of [True Price](#), which is a global leader in the field of true cost accounting and true pricing.

GID is based on more than 10 years of experience in impact measurement and builds on True Price's [Natural Capital Methodologies](#), developed in collaboration with Wageningen Economic Research. The development process is subject to a strict internal validation process, assuring internal consistency as well as alignment with external methodologies.

Current stage of development

The GID Biodiversity model is available for use by FIs. Upcoming developments include:

- The addition of a tool to automate the combination with investment data
- Coverage of new biodiversity pressures (e.g., land use change)
- Extension of company-level data

Transparency of method

A description of the [GID methodology](#) is available online. [The True Price monetisation factors](#) and [Natural Capital methodologies](#) are also available online.

What is the main purpose of this tool?

GID Biodiversity is a data tool to help FIs quantify and understand the biodiversity impact of investments and portfolios based on exposure to companies, sectors and countries. It can be provided with advisory services and biodiversity training to build self-sufficient internal biodiversity capabilities. It allows users to identify biodiversity drivers at a high-level or to dive into specific portfolio constituents. The model covers a wide range of reporting and non-reporting companies and asset classes. The results are available in monetary units to allow comparison with financial metrics and other monetized impact metrics. The model covers the full value chain (scopes 1, 2 and 3). Results can be aggregated to provide a view on value chain biodiversity impact without overestimating it within portfolios (no double counting).

As a footprinting tool, GID Biodiversity is based on industry averages derived from global input-output (MRIO) databases for trade and value chain data and relies on biodiversity models such as ReCiPe and GLOBIO for emissions data and land occupation metrics. When company reported data and/or revenue data is available, the resulting estimates of potential impact are further refined. In fact, by integrating the country-sector level approach with more accurate data on pressures and companies' operations, impact results are more closely aligned with actual impacts.

What does it measure?

The tool measures the current and future yearly biodiversity impacts attributed to an investment, looking at direct, upstream and downstream impact. Results are expressed either in biodiversity-hectares (based on PDF.m² or MSA, ha), or in monetary value. The biodiversity impact of the global economy is attributed over value chains. This means that the responsibility of biodiversity loss is shared between

value chain participants, where companies and sectors with higher added value are attributed more responsibility. The methodology avoids double counting, meaning that the attributed impact of all companies sums up to the global biodiversity loss.

Individual biodiversity pressures are measured and can be reported separately, either at impact level (e.g., Air pollution) or at the level of the underlying indicators for each impact (e.g., NH₃, NMVOC, NO_x, SO₂, etc.). The output of each pressure can be presented either in monetised or non-monetised units.

The tool also integrates dependencies. The approach used to measure dependencies is based on the ENCORE database and methodology, and evaluates how economic sectors, subsectors, and production processes rely on ecosystem services.

What input data are needed?

GID Biodiversity impact estimates are mapped to portfolios to measure biodiversity impact. Data on portfolio companies, countries, and sectors are required to map to GID. GID can be combined with lending or investment data such as invested amount and clients' revenues to calculate portfolio impact.

If bottom-up data on investments and pressures are available, this can be used to refine estimates (e.g., exposure to specific regions, biomes, crops, sectors, emissions to air and water, water use data, land use data, MSA measurements).

GID can also be used for impact accounting at sector or country level without further data input.

What other tools are most complementary to this tool?

For a more complete picture of corporates' impacts on biodiversity, GID could be complemented with geolocated data on endangered species or habitats (e.g., through IBAT) if asset locations are known. Furthermore, GID could be complemented with more detailed company data on land use (e.g., for taking into account company specific good practices).

How can the tool be used for TNFD reporting?

GID Biodiversity allows to identify, quantify, and assess the most material nature-related issues across any investment portfolio, making it possible to apply the TNFD's LEAP (Locate-Evaluate-Assess-Prepare) approach.

Specifically, the tool can be used as a base for Locating and Evaluating key drivers of biodiversity loss across the asset side of any balance sheet provided by a FI. By being asset-agnostic and covering all countries and sectors globally, it allows for scalable analyses of asset portfolios of any kind. Impact Institute's in-house advisory team complements the GID-based analyses with a focus on dependency pathways, on assessing the most material biodiversity impacts that have been scoped, as well as on further deep dives into relevant sectors, regions, or biodiversity pressures.

Finally, Impact Institute provides a complementary suite of reporting and strategic advisory services that support the final steps of the LEAP methodology, focusing on risks and opportunities in connection with the FIs internal processes.

Following the latest publications of the TNFD Recommendations, Impact Institute published a TNFD Case Study detailing how GID can feed into the application of the LEAP methodology for FIs. More information can be requested through data@impactinstitute.com. Impact Institute is also a member of the TNFD Data Catalyst working group.

Main strengths and limitations

Strengths:

- Wide coverage of industry sectors and countries (including wide coverage of emerging markets)
- Crop-specific and spatially-explicit layers available
- Easy to measure the impact of a portfolio or the impact attributable to an investor or loan provider
- Can produce biodiversity estimates with limited or extended data input
- Includes scope 1, 2 & 3 (upstream and downstream) biodiversity impact
- Double counting is avoided when attributing over the value chain, allowing for aggregation of results
- Monetisation allows comparison of biodiversity impact with other impacts and financial metrics
- Combines multiple databases and state of the art models (such as ReCiPe or GLOBIO) to get the best estimates
- Part of a toolbox for broader impact reporting and impact-weighted accounts, beyond biodiversity impact analysis

Limitations:

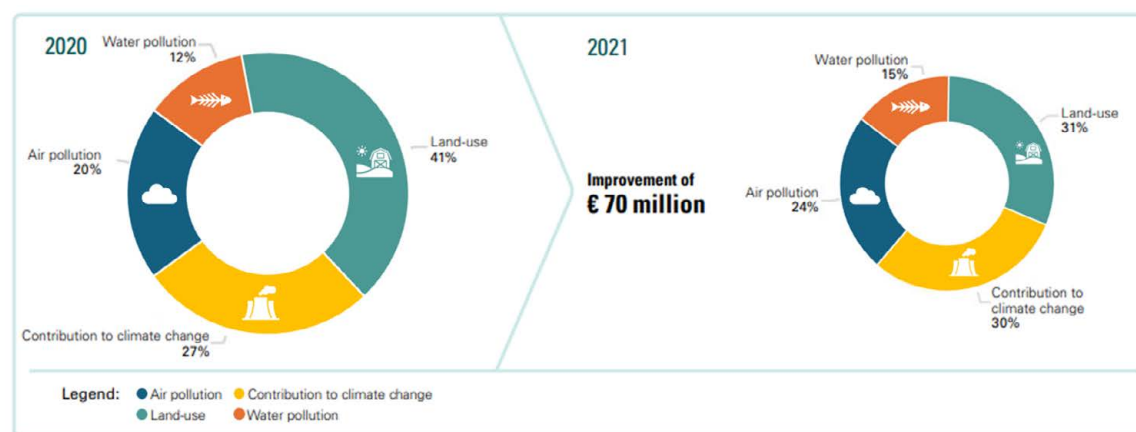
- Represents an estimate of impact rather than actual impact
- In the current version, pressures that are not considered due to data availability include impact of climate change on marine ecosystems, invasive species, chemicals and land use change (other than through land use)
- Some of the limitations of the data provided by third parties will remain in the final estimate
- Biodiversity loss in the same biome has equal weight, independently of whether species and habitats are more or less endangered and rare

What are the costs?

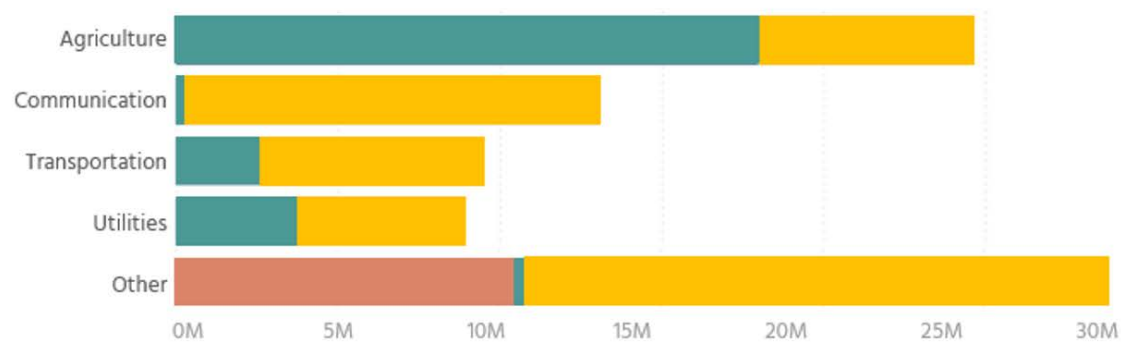
The GID data can be acquired directly or be purchased alongside Impact Institute advisory services. Fees depend on whether additional advisory or data is required (e.g., assistance in analysis and reporting), the amount of data (e.g., number of pressures requested), company size (e.g., AuM), and whether custom additions are required (e.g., enhanced granularity sectors made specifically for a portfolio).

Output visuals GID

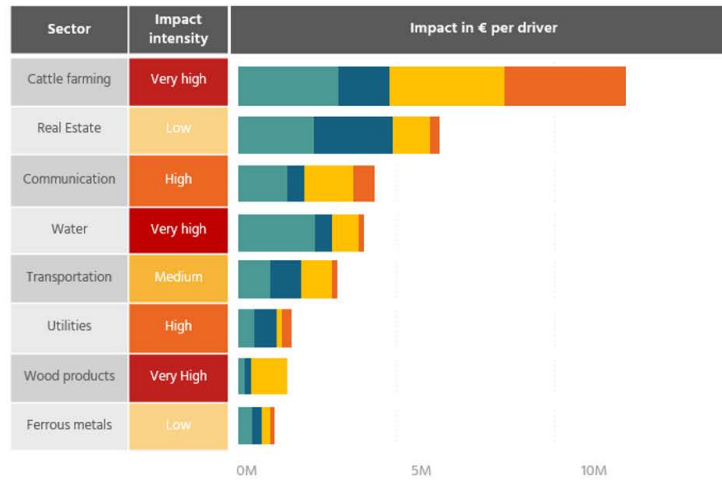
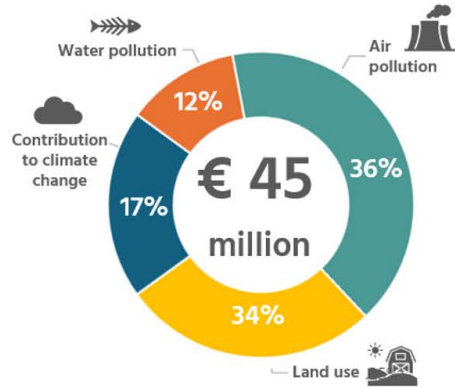
Biodiversity impact breakdown by pressure: year-to-year comparison



Impact on biodiversity loss per sector and value chain step

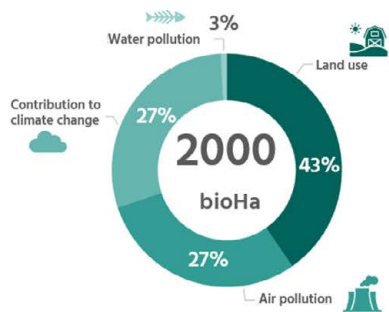


Biodiversity impact by investment sector and biodiversity pressure – Monetised

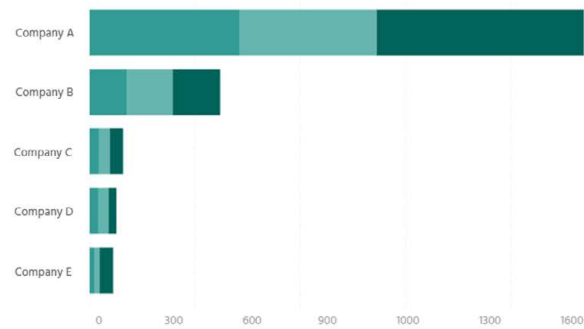


Biodiversity footprint by company and biodiversity pressure – Non-monetised (bio-hectares)

Attributed footprint (bioHa) impact – portfolio level



Attributed footprint (bioHa) impact per company



5.9 MBFM – Biodiversity Footprint Metrics (MSCI)

MSCI Biodiversity Footprint Metrics are designed to quantify the potential impact of a company's activities on biodiversity.

MSCI provides metrics based on Potentially Disappeared Fraction of Species (PDF) and Mean Species Abundance (MSA).

To allow a complementary view, MSCI provides data for both these metrics.

Description and steps

MSCI ESG Research offers data on two biodiversity footprint metrics to measure the level of biodiversity impact, one based on the Potentially Disappeared Fraction of Species (PDF) and the other based on the Mean Species Abundance (MSA).

The footprint assessment based on PDF takes global species diversity as a proxy for the state of biodiversity and indicates a company's potential contribution to global species extinction due to pressures, where the agent may be a company, activity or asset. MSCI ESG Research calculates the footprint metric based on PDF for direct operations of a company. The PDF metrics assess companies' potential annual biodiversity impacts if pressures persist over the next 100 years.

The footprint assessment based on the MSA takes local terrestrial biodiversity intactness as a proxy for the state of biodiversity. This intactness is decreased by pressures, such as land use for human activities. MSCI ESG Research calculates the footprint metric based on PDF for direct operations of a company. The metric considers the current impact of a company on local biodiversity intactness versus a background state without the company's presence.

The MSCI Biodiversity Footprint Metrics are based on a spatially explicit assessment. MSCI ESG Research quantifies impacts for pressures for known asset locations available in MSCI's GeoSpatial asset location data set. Location- or asset-level values are aggregated at the company level.

MSCI ESG Research also provides underlying data (input data for pressure categories). The MSCI Biodiversity Footprint Metrics can be aggregated to company-, portfolio- and fund-level metrics.

Organisations and reviewers

Data quality assurance processes and analytical quality controls are conducted on all data prior to publication. The quality assurance process for data used in the MSCI Biodiversity Footprint Metrics includes a combination of system and manual checks, such as system-driven validation rules, exception-based checks, and processes to identify outliers and outdated data.

Current stage of development

Available.

Transparency of method

MSCI ESG Research provides a detailed methodology document and underlying input data to its clients.

What is the main purpose of this tool?

MSCI Biodiversity Footprint Metrics may be used for different purposes.

- **Engagement:** Biodiversity footprint metrics may be used to engage with companies. The metrics could be considered a starting point to mitigate or manage related biodiversity risks. The metrics could be used in combination with a company's risk management practices to address biodiversity impacts.
- **Address regulatory/ reporting pressure:** The metrics may be used to identify companies that might face pressure from biodiversity-related regulations, including reporting requirements on biodiversity impacts. However, the metrics do not constitute any advice to their users about, for example, whether companies with a low or high biodiversity footprint comply with any regulations. The information is provided "as is" and does not constitute legal advice or any binding interpretation. Any approach to comply with regulatory or policy initiatives should be discussed with a user's own legal counsel and/or the relevant authority, as needed.
- **Alignment with (voluntary) reporting frameworks:** The metrics may be used to report against voluntary reporting frameworks such as the Task Force on Nature-related Financial Disclosures (TNFD) framework. While the TNFD does not define specific impact biodiversity metrics, the initiative does recognise the relevance of measuring the level of ecosystem condition and species extinction risk at the company level.

- **Risk management:** The metrics may be used for risk management.
- **Exclusion-based investing:** The metrics may be used for exclusion-based investments to build portfolios with potentially lower biodiversity impacts.

What does it measure?

The MSCI PDF based biodiversity footprint metric measures a company's potential contribution a global species extinction. The metric is a unitless fraction which indicates the potential disappearing fraction of species if a company's pressures are ongoing over the next 100 years. MSCI ESG Research also provides the PDF per pressure category and underlying data on pressures.

The MSCI MSA based biodiversity footprint indicates the spatial extent of a company's potential contribution to the degradation of local ecosystem/biodiversity intactness or in other terms: how could a company impact the location specific MSA by the way it uses land?

What input data are needed?

MSCI ESG Research uses data on different pressure categories (e.g. GHG emissions, water consumption) which rely on both company disclosures and estimation models. MSCI ESG Research has developed models to estimate company land use and water consumption (detailed below in Section 5), given a lack of detailed and consistent company reporting on land use and water consumption across sectors and regions. In addition, MSCI ESG Research uses data on physical assets from its MSCI GeoSpatial dataset. This dataset comprises externally sourced data (e.g., licensed databases, government sources and open sources) combined with manually collected data, both of which have undergone a quality verification process.

What other tools are most complementary to this tool?

The MSCI Biodiversity Footprint Metrics are complementary to other metrics part MSCI Nature & Biodiversity Solutions which include 160+ data points as of September 2024. These metrics are designed to help investors integrate biodiversity and nature considerations into investment decisions and to align with disclosure obligations from emerging regulations and voluntary reporting frameworks. E.g. clients may use the MSCI Biodiversity Footprint Metrics in combination with MSCI metrics that assess a company's biodiversity risk management practices or in combination with MSCI biodiversity-sensitive areas screening metrics to assess geographic exposure.

How can the tool be used for TNFD reporting?

The Biodiversity Footprint Metrics may be used to report against voluntary reporting frameworks such as the Task Force on Nature-related Financial Disclosures (TNFD) framework. While the TNFD does not define specific impact biodiversity metrics, the initiative does recognise the relevance of measuring the level of ecosystem condition and species extinction risk at the company level. For TNFD's Core Disclosure Metric C 5.0 - *Ecosystem condition*, the MSCI MSA based footprint metrics may be used while for C 5.0 - *Species extinction risk* the MSCI PDF based footprint metrics may be used.

Main strengths and limitations

Strengths:

- Spatially explicit (location specific impact of pressures considered).
- Based on academic sound methodologies: LC-Impact/ GLOBIO Model.
- Scope: MSCI Biodiversity Footprint Metrics are calculated

for all assessable constituents in the MSCI ACWI Investable Markets Index (IMI).

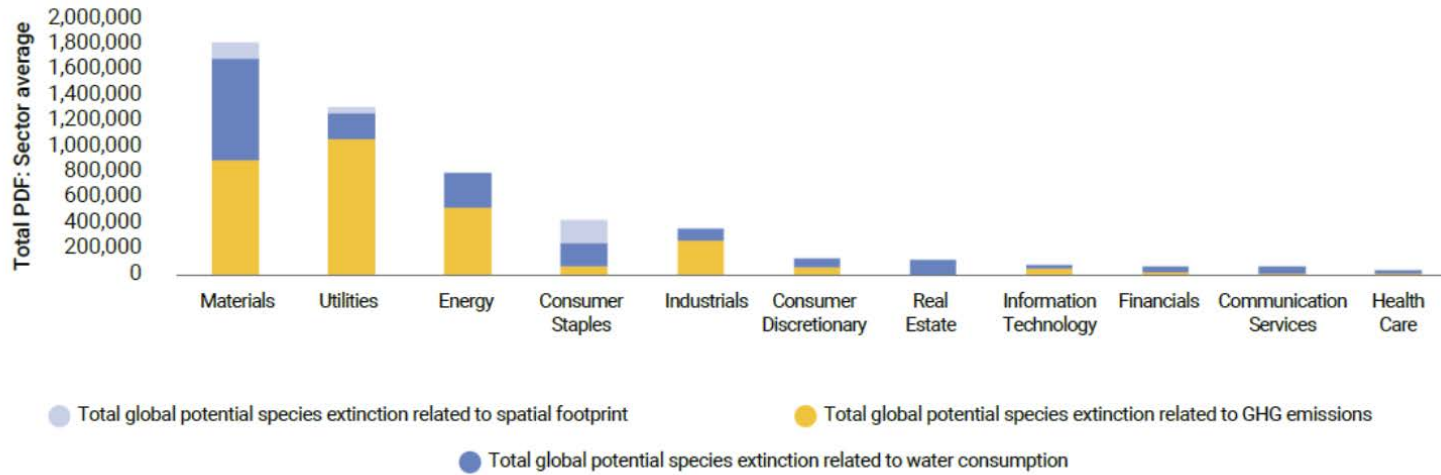
Limitations:

- Scope 3 or supply chain impacts currently not modelled.
- Not all potential pressure categories considered.

What are the costs?

Commercial licensing. Information not publicly available. Available on request.

Exhibit 10: PDF - Average by sector



Source: MSCI ESG Research, May 2024. We calculated the average PDF per sector. Sectors refer to GICS® sectors. GICS is the global industry classification standard jointly developed by MSCI and S&P Global Market Intelligence. Data refers to all constituents of the MSCI ACWI Investable Markets Index (IMI) as of May 23, 2024

5.10 BIAT – Biodiversity Impact Assessment Tool

ISS ESG' Biodiversity Impact Assessment Tool (BIAT) quantifies the potential impact of corporate activities on biodiversity based on life-cycle impact assessment methodology. Conveying biodiversity loss with both PDF and MSA, the BIAT is complemented by an ecosystem services dependency assessment which enables investors to understand the impact and dependency risk exposure of investments.

Description and steps

The BIAT aims to assess drivers of biodiversity loss and thus models the impact of corporate operations by considering a set of environmental pressures on species and habitats, taking into account inputs and outputs in the entire value chain. It leverages a bottom-up assessment of a company's business activities in different geographical locations, applies Life Cycle Impact Assessment (LCIA) methodology (IMPACT World+), and incorporates recognized databases such as EXIOBASE. In addition, biodiversity-relevant data sets and tools such as Science Based Target Network Materiality Tool, and ISS ESG's proprietary biodiversity performance data are used to refine the data on company and industry level.

The BIAT's output flows from a multiple-step process: 1) Economic Activity Identification & Supply Chain Modelling, 2) Upstream and Downstream Impact Assessment, 3) Species Richness Assessment, 4) Species Abundance Assessment, and 5) Refinement and Normalization. Outputs are described quantitatively with the biodiversity metrics Potentially Disappeared Fraction of species (PDF), and Mean Species Abundance (MSA).

Along with the biodiversity impact assessment, the solution comprises a separate dependency assessment which links businesses and their economic activities to 22 ecosystem

services within 3 overarching groups (provisioning, regulating & maintaining, and cultural). Ecosystem services and materiality grades are derived from ENCORE and CICES (Common International Classification of Ecosystem Services). Outputs also include a company's revenue exposure to specific ecosystem services and the level of intensity of each dependency.

Organisations and reviewers

The Biodiversity Impact Assessment Tool was developed in collaboration between ISS ESG and Quantis, a renowned environmental sustainability consultancy.

Current stage of development

The first version of the BIAT was launched in September 2022 and was extended by the dependencies assessment in September 2023. The dataset is available for +17,000 issuers (as of January 2024) and is accessible for use by FIs through ISS ESG's client platforms, including a comprehensive Portfolio Report.

Transparency of method

A short description of the methodology is publicly accessible on ISS ESG's [website](#). Clients have access to a comprehensive methodology document, additional relevant materials and onboarding training sessions.

What is the main purpose of this tool?

The BIAT quantifies the biodiversity impact of corporates and allows investors to calculate the biodiversity footprint of portfolios. The data set includes aggregated factors for PDF and MSA on a company basis which will help investors to disclose on and understand the biodiversity risks and impacts of their investment portfolios.

What does it measure?

To allow for granular analysis and a better understanding of the impact, the full solution includes more than +650 underlying factors (data on impacts per sector, region and environmental impact categories, ecosystem services). The final MSA and PDF indicators can be used to identify the industry leaders and laggards as related to biodiversity impact.

As part of the assessment, 10 environmental impact indicators from IMPACT World+ are considered: Climate Change, Marine Acidification, Fresh Water Acidification, Terrestrial Acidification, Freshwater Eutrophication, Marine Eutrophication, Freshwater Ecotoxicity, Water Availability, Land Transformation, and Land Occupation.

The dependency assessment allows users to assess risk exposure of companies by identifying revenue exposure to specific ecosystem services, and the level of intensity of that dependency.

Together, the biodiversity impact assessment, and the ecosystem services dependency assessment address the topic of double materiality, allowing users to assess both the impact and dependency related risk exposure of companies.

What input data are needed?

The model is built on financial data in companies' balance sheets, paired with geographical breakdown of revenues as well as EXIOBASE data on activities, and modelled with associated resources (inputs) and emissions (outputs). Internal and external data at the industry, country, and company level is used to refine the model.

How can the tool be used for TNFD reporting?

In addition to the assessment of impact (MSA and PDF metrics) and dependencies (Ecosystem Services dataset), the BIAT portfolio report provides a selection of Additional Disclosure Metrics for FIs.

Main strengths and limitations

Strengths:

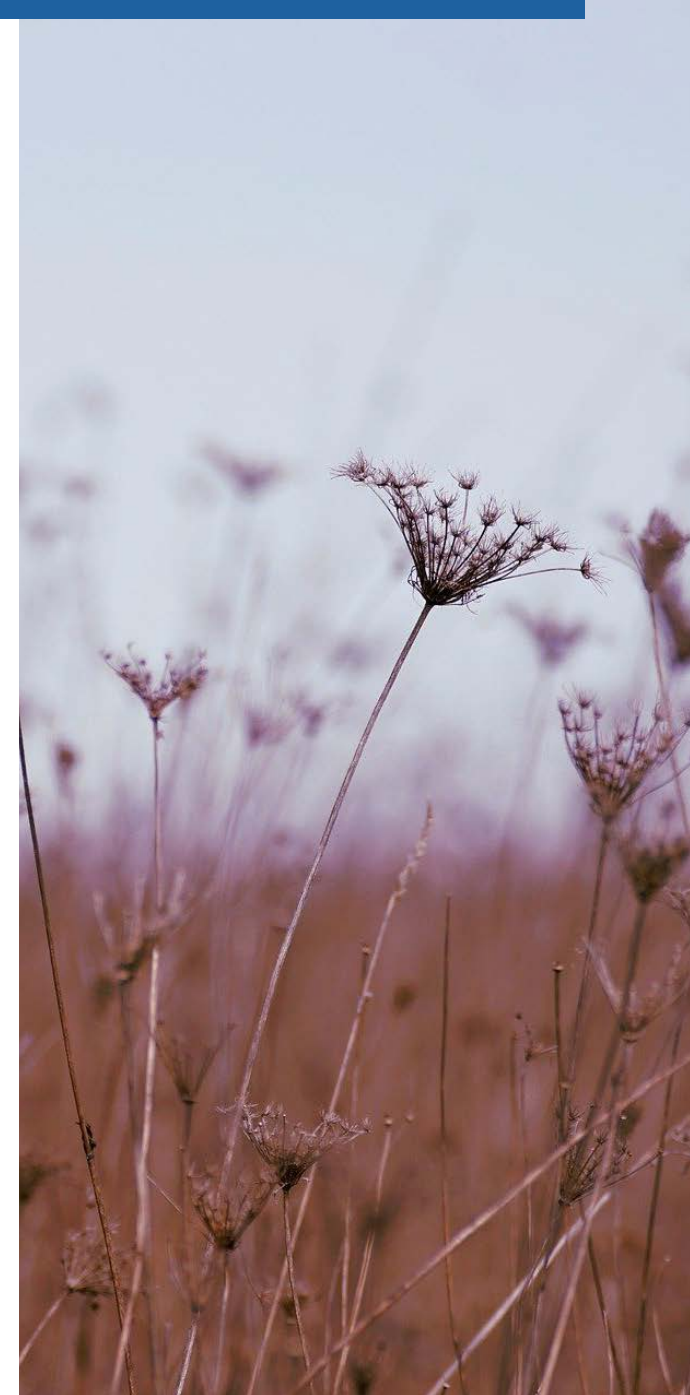
- Top level outputs (i.e., absolute and relative impacts, decile rank, biodiversity impact classification) as well as 650+ granular underlying factors (e.g., per impact indicator, activity, country) allow for multiple applications and detailed insights.
- The solution allows users to assess both impact and dependency risk exposure of companies, thus *addressing the topic of double materiality*.
- A Portfolio Report supports comprehensive understanding and analysis of the data.
- The methodology comprises a refinement step that allows addressing drivers of biodiversity loss which are not fully addressed by LCIA methodology and incorporates company performance.

Limitations:

- The tool is built on various proxies and assumptions based on sectoral impacts, thus providing a potential rather than actual biodiversity footprint.
- Some environmental pressures are partially covered due to lack of availability e.g., invasive species and water use.

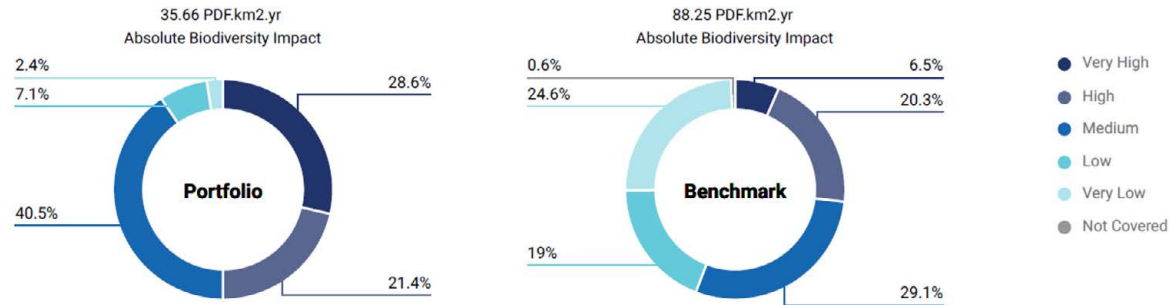
What are the costs?

The cost will depend on the use case. The subscription to the BIAT includes access to the database (via the DataDesk platform or feed) as well as the reporting functionality. As part of the onboarding process, methodological documentations and training sessions are provided.

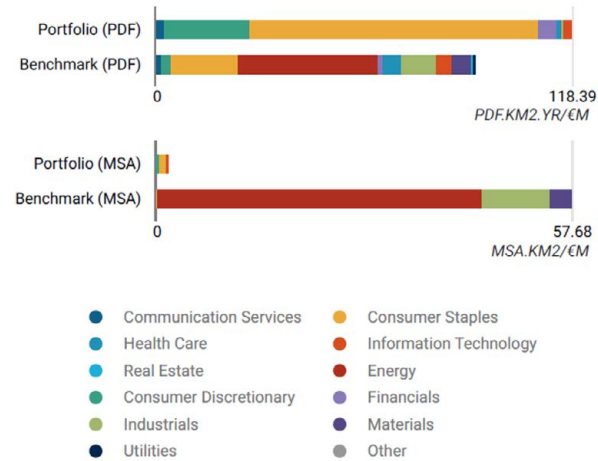


Impact classification BIAT

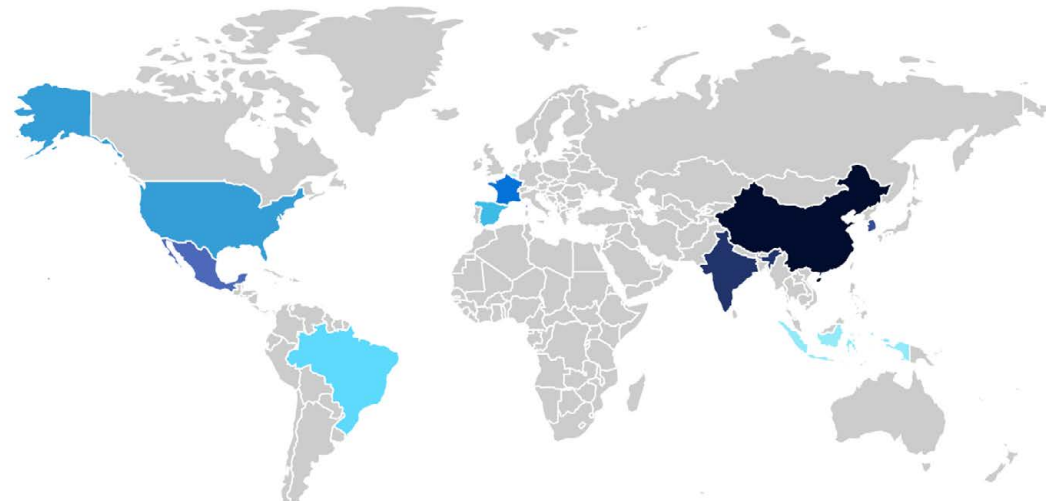
Impact Classification



Intensity Breakdown per GICS Sectors



Breakdown of Impact per Region (Top 10)



5.11 NRP - Nature Risk Profile

The Nature & Biodiversity Risk dataset assesses nature-related impacts and dependencies across a company's direct operations that can be applied at the asset, company, and portfolio level. The dataset applies the Nature Risk Profile, a new methodology for analysing companies' impacts and dependencies on nature, launched by S&P Global Sustainable1 and the UN Environment Programme (UNEP).

The Nature & Biodiversity Risk dataset supports companies, investors, and entities as they seek to understand, manage, and mitigate exposure of corporates and portfolios to nature-related risks and impacts. The dataset is in line with the Taskforce on Nature-related Financial Disclosures (TNFD) LEAP approach and can be leveraged by market participants for more transparent alignment with the TNFD recommendations.

This dataset includes:

- 130+ metrics to measure impacts and dependencies on nature & biodiversity
- Ecosystem Footprint metrics to measure impact, and Dependency Scores to measure dependencies across 21 Ecosystem Services
- Impact and dependency metrics for 20,000+ public and private companies
- Leverages database of over 1.6 million assets mapped to corporate owners, based on S&P Global and other third-party datasets
- Overlap with Key Biodiversity Areas (KBA) and Protected Areas (PA) screening metrics and visualisation
- Understand nature risk exposures using maps and results visualisations in desktop-enabled solution

Biodiversity Footprint looks at the direct impacts and dependencies a company has on nature:

- 1 Negative impact of a company on biodiversity
 - MSA (Mean species abundance) – %
 - Definition: Indicator of the level of biodiversity loss. Specifically measures the decline in density of native species. Local indicator.
 - Scope: Operations and supply chain
 - Calculation method: Uses company-specific data, but is primarily modelled based on industry and location
- 2 Business dependence on biodiversity/business risk
 - Ecosystem services via ENCORE
 - Definition: indication of the increased risk to the economy due to the decrease in ecosystem services due to different environmental pressures (pollution, waste, climate change, etc.)
 - Scope: Operations and supply chain
 - Calculation method: Modelled according to turnover, sector and location
- 3 Company mitigation/management activities with respect to biodiversity
 - ESG score (described above because already used) - metric 0-100
 - Definition: Indicator of the company's own management and priority of the impacts on biodiversity measured on their reporting capacity. Similar to ESG scores.
 - Scope: Operations only
 - Calculation method: at company level (not specific to a location).
- 4 Positive impact of the company on biodiversity (conservation, regeneration, reconstitution, synergistic growth)
 - Change in MSA (Mean species abundance) – %
 - Definition: Indicates whether negative impacts on biodiversity have increased or decreased. Will not be available until there is historical data on the impact, i.e. within year 2.
 - Scope: Operations and supply chain
 - Calculation method: Uses company-specific data, but is primarily modelled based on industry and location

- 5 The company's proximity to biodiversity hotspots
- Key biodiversity areas/protected areas – km, etc.
 - Definition: Indicates the proximity of areas classified as protected. Not directly related to the impact on biodiversity, however, the proximity of a place rich in biodiversity could increase the likelihood that there could be negative spillover effects in these areas, thus having an impact on biodiversity. Tends to be higher in areas with more advanced environmental regimes (developed countries) than in areas that actually have higher densities of biodiversity (tropics, etc.). Local indicator.
 - Scope: Operations. Could include supply chain if we link supply chains to businesses e.g., via Panjiva data.
 - Calculation method: based on business/asset location.

Coverage:

1.6+ million assets linked to corporate entities and ultimate parent entities. 20,000 companies representing over 98% of global market capitalisation

Partnership/ history:

Robust, science-based, and open-source nature risk assessment methodology, developed in partnership with UNEP-WCMC

Organisations and reviewers

Developed in partnership with UNEP-WCMC. See user example, CTBC [here](#).

Current stage of development

Completed, Asset Level, Company Level and Portfolio Level, Direct Operations, Terrestrial Biome. Supply chain, Country level and Marine ecosystem, Deforestation and Freshwater ecosystem and risk mitigation, integrated in version 2.0.

Transparency of method

- Co-developed the GLOBIO model in 2002 with UNEP GRID-Ardenal and PBL Netherlands Environmental Assessment Agency and introduced the concept of **Mean Species Abundance**
- Co-Developed the **ENCORE Tool** and framework in partnership with the Natural Capital Finance Alliance
- Trusted knowledge hub on nature and biodiversity, curating and contributing to leading datasets including **IBAT Alliance, Nature Map Initiative, UN Biodiversity Lab, among others.**

What is the main purpose of this tool?

S&P Global's Nature & Biodiversity Risk dataset applies the Nature Risk Profile methodology by combining essential sustainability intelligence on corporate entities and their assets with geospatial datasets on nature and biodiversity.

With the aim to learn from and guide clients towards a better understanding of nature-related risks and opportunities while test-driving the TNFD's Beta framework.

What does it measure?

Nature and Biodiversity risk data can help investors, Banks and other clients

- Understand your company's impact and dependencies on nature
- Prepare for disclosure mandated by regulation
- Measure portfolio performance against an index
- Manage risk and disclose nature-related performance based on recommendations by the TNFD Framework
- Understand the performance of peers and compare to a benchmark

What input data are needed?

Solution requires a company name, or index for analysis.

What other tools are most complementary to this tool?

ESG Score Raw data company commitments data, Climonomics Physical Risk tool, Commodity Insights Energy Transition Tracker, Mobility IHS emissions Data, Net Zero Commitment Tracker, and more.

How can the tool be used for TNFD reporting?

Follow TNFD Beta recommendation and bespoke solutions for [TNFD mapping](#).

Main strengths and limitations

Strengths:

- Company report: Companies can use this service to assess and report the nature-related risks of their operations.
- Portfolio assessment: Financial institutions can assess and report the nature-related impacts and dependencies of their portfolios through an end-to-end assessment.
- Dataset: Access curated & comprehensive Nature & Biodiversity Risk data intelligence and analytics services to efficiently assess company operations & investment portfolios.
- TNFD Aligned Metrics: Understand impacts and dependencies on nature in line with TNFD recommendations
- Broad Data Coverage: Impact and dependency metrics for >17,000 public and private companies.
- Extensive Asset Level Data: Over 1.6M assets mapped to corporate owners.
- Open-Source Methodology: Built on the Nature Risk Profile methodology, informed by a Knowledge Community of >200 market participants.
- Specialist Analyst Support: Experienced analyst program management and delivery.

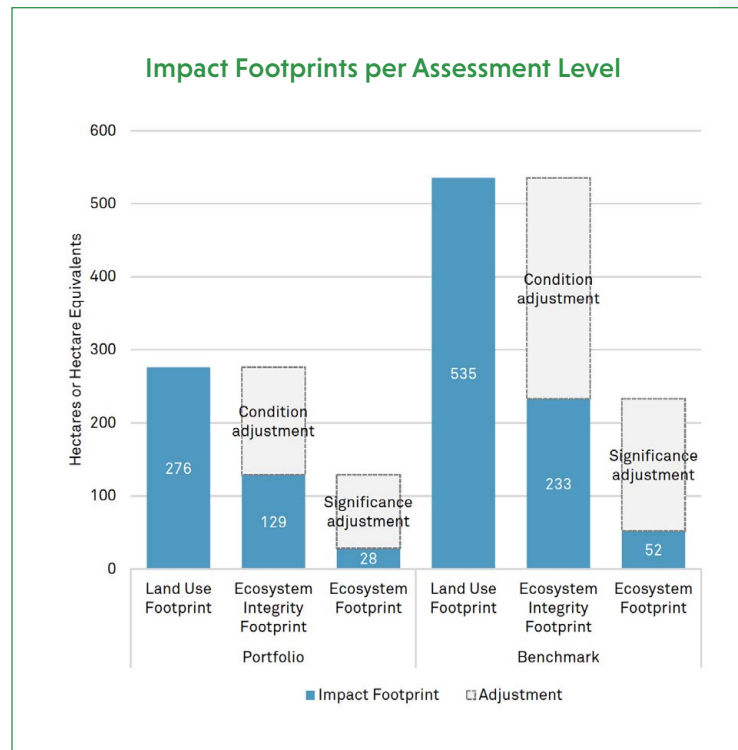
Output visuals NRP

Limitations:

- Supply Chain data yet to be integrated (2025 timeline)
- S1 TNFD Advisory services required in addition to solution

What are the costs?

Reach out to S1_ESGspecialists@spglobal.com for more details.



Ecosystem Integrity impact versus significance adjustment comparison

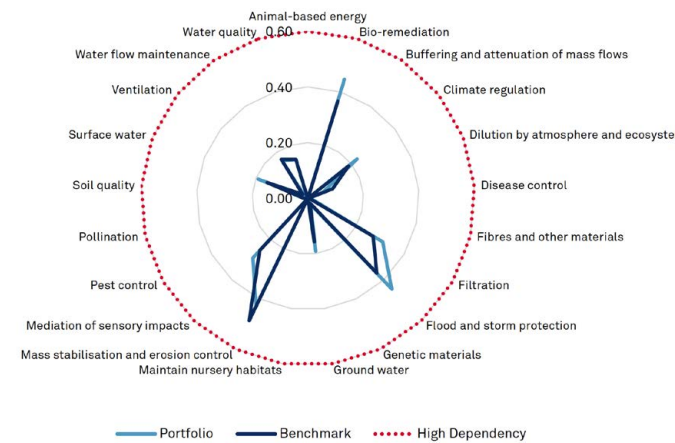
The grids below show the portfolio and benchmark land-use weighted exposure to different levels of Ecosystem Integrity Impact (EII) and Ecosystem Significance (ES) adjustments. The distribution of adjustments have been split into quintiles, based on the full Sustainable1 universe of 17,000+ companies. The lower left corner of each grid represents exposure to companies with both ES and EI adjustments at the company level among the lowest 20% of the universe, while the upper right corner represents highest 20%. For reference, the quintile cut-offs are shown in the right-hand table.

Ecosystem Integrity	Portfolio				
	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
5th Quintile	1.3%	0.0%	0.5%	0.1%	0.1%
4th Quintile	0.1%	0.3%	0.1%	0.4%	0.0%
3rd Quintile	0.0%	0.0%	0.0%	0.3%	0.0%
2nd Quintile	1.0%	0.0%	1.5%	0.6%	0.0%
1st Quintile	4.8%	1.3%	15.9%	22.7%	48.8%

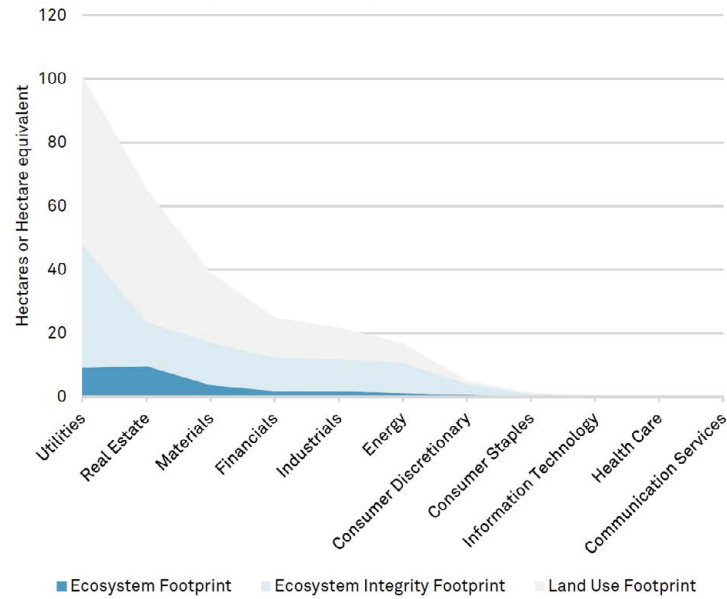
Quintile	Eco-Integrity Impact	Ecosystem Significance
1st	0 to 0.76	0 to 0.08
2nd	0.76 to 0.81	0.08 to 0.1
3rd	0.81 to 0.82	0.1 to 0.13
4th	0.82 to 0.86	0.13 to 0.19
5th	0.86 to 1	0.19 to 1

Ecosystem Integrity	Benchmark				
	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
5th Quintile	1.1%	0.0%	0.0%	0.3%	0.0%
4th Quintile	0.7%	0.1%	0.3%	0.2%	0.4%
3rd Quintile	0.1%	0.0%	0.0%	0.4%	0.8%
2nd Quintile	0.9%	0.5%	0.2%	0.3%	0.3%
1st Quintile	3.9%	0.5%	2.9%	18.0%	67.8%

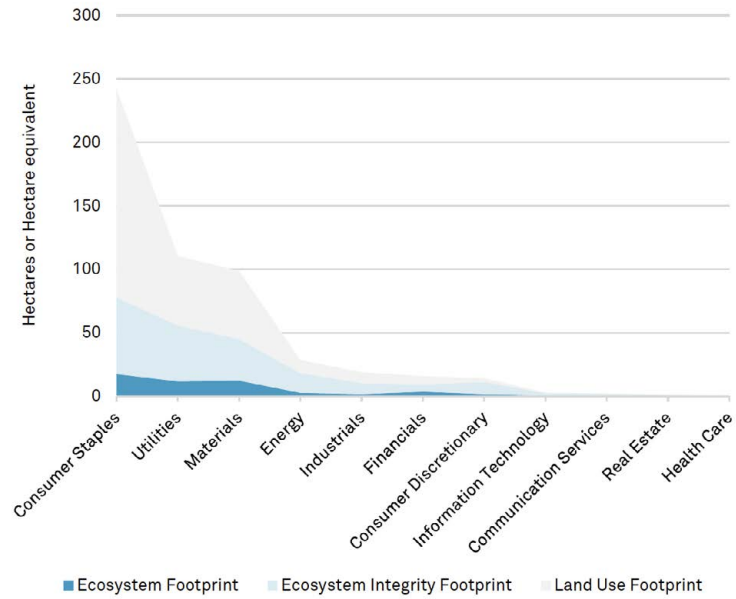
Ecosystem Service Dependency



Portfolio Ecosystem Footprint by Sector



Benchmark Ecosystem Footprint by Sector



5.12 GIST Nature & Biodiversity Suite (NBS)

GIST Nature & Biodiversity Suite (NBS) of tools –BIGER Footprint, SLAM, and DIRO 360– are designed to provide financial institutions with comprehensive, actionable intelligence for nature-positive strategies. TNFD-aligned impacts, dependencies, risks, and opportunities are quantified and contextualised from the level of individual assets up to global portfolios.

Biodiversity Impact and Global Extinction Risk Footprinting Tool (BIGER Footprint)

GIST Impact's [Biodiversity Impact and Global Extinction Risk Footprinting Tool \(BIGER Footprint\)](#) measures the operational and value chain biodiversity impacts of a company due to its emissions. The product uses peer-reviewed LC Impact as the methodology to calculate the impacts of GHG emissions, air pollution, water consumption, water and land pollution, waste generation, and land use on terrestrial, freshwater, and marine ecosystems. The outputs are expressed in Potentially Disappeared Fraction (PDF) of global Species, also known as Species Extinction Risk.

The Biodiversity Impact and Global Extinction Risk Footprinting Tool (BIGER Footprint) uses LCIA methodology to calculate the biodiversity impacts of a company's operations and value chain using a combination of direct and indirect drivers. The methodology is based on LC Impact and uses geographically specific Characterisation Factors to arrive at impacts on terrestrial, freshwater, and marine ecosystems. The input data for calculations include GHG emissions, air pollution, water consumption, water and land pollution, waste generation, and land use for a particular year, and the impacts are calculated for the respective year. The outputs are presented in terms of

global PDF or Land Conversion Equivalence (km²), i.e., the area of land transformation from natural to urban conditions that would cause a comparable impact on biodiversity.

Organisations and reviewers

The BIGER Footprinting tool is based on the publicly available and peer-reviewed LC-IMPACT methodology.

Current stage of development

The product is ready and is in active use by clients of GIST Impact. GIST Impact has a database of biodiversity impacts of 15,000 companies starting from 2016 to present year. GIST Impact also has a data portal that clients can use to access the data.

Transparency of method

The methodology is based on publicly available, peer-reviewed methodology and GIST Impact has a transparent method of calculating the impacts. Users have full end-to-end access to all physical values, geographic apportionment, and impact coefficients (a.k.a., characterisation factors) that are used to derive the PDF values.

What is the main purpose of this tool?

The main purpose is to calculate the scientifically robust biodiversity footprint of a business' operations and value chain that can be aggregated across a collection or portfolio of companies to determine relative or cumulative

biodiversity impacts. The tool also helps identify material drivers of biodiversity loss (aligning with IPBES drivers). In the case of portfolios, the tool can identify which companies, drivers, and geographies are contributing to overall impacts for the purpose of managing impacts and enabling disclosures.

What does it measure?

The tool measures the biodiversity footprint at a company level in the metric of Potentially Disappeared Fraction (PDF) of global Species, also known as Species Extinction Risk. The impacts of individual pressures are all provided (GHG emissions, air pollution, water consumption, water and land pollution, waste generation, and land use) as well as ecosystem-specific impacts.

What input data are needed?

Environmental emissions data (such as GHG emission, air pollution, water consumption, etc.). GIST Impact's database contains 15,000 publicly listed company's datapoints (which can be traced to company reports). In the absence of client-provided data, GIST Impact can also estimate these data points using its robust ML models.

What other tools are most complementary to this tool?

GIST Impact SLAM
GIST Impact DIRO 360

How can the tool be used for TNFD reporting?

GIST's implementation was given as an example in the TNFD [Discussion paper on Biodiversity footprinting approaches for financial institutions](#), December 2023, with example applications for two financial institutions.

Main strengths and limitations

Strengths:

- Based on widely accepted LC Impact methodology
- Estimates Global Extinction Risk (not just localised impacts) by accounting for geographic distribution of species and ecosystems
- Quantifies impacts on terrestrial, freshwater, and marine ecosystems
- Includes geographically apportioned impacts
- The output metric of PDF is broadly adopted for business applications
- Required input data is accessible from company disclosures
- GIST Impact's database of over 15,000 companies offers global market coverage

Limitations:

- The methodology does not include drivers of invasive species
- All calculations are dependent on data availability; Impacts for toxicity and land transformation (e.g., deforestation) can be calculated for corporate customers who provide the relevant inputs, but because this information is not generally publicly disclosed by companies these drivers are not included for portfolio analysis.

What are the costs?

Financial Institutions: Annual license includes underlying input data (environmental drivers, geographic apportioning, characterisation factors); cost varies by portfolio size and packaging with complementary offerings (SLAM, DIRO 360). Cost Level H (> €10000)

Corporates: Annual license, customer provides input data as available, GIST Impact models missing data; cost varies by extent of operations, number of use cases, and number of physical assets to be assessed, as well as by packaging with complementary offerings (SLAM, DIRO 360). Cost Level M (€4000 to €10000) to H (> €10000)

Output visuals BIGER Footprint

The GIST Impact Biodiversity Impact and Global Extinction Risk (BIGER) Footprint tool indicating Potentially Disappeared Fraction (PDF) for eight environmental drivers, calculated annually, with comparison to reference benchmarks for an example company from GIST's corporate database.



TOTAL IMPACTS IN PDF

4.81x10⁻⁴ PDF

WHAT IS PDF?

Potentially Disappeared Fraction or PDF indicates the fraction of global species that are put at risk of extinction due to the environmental pressures created by company operations, including local effects (e.g., land use) and global effects (e.g., emissions).

TOTAL IMPACTS IN LAND CONVERSION EQUIVALENCE

2810.71 km²

WHAT IS LAND CONVERSION EQUIVALENCE?

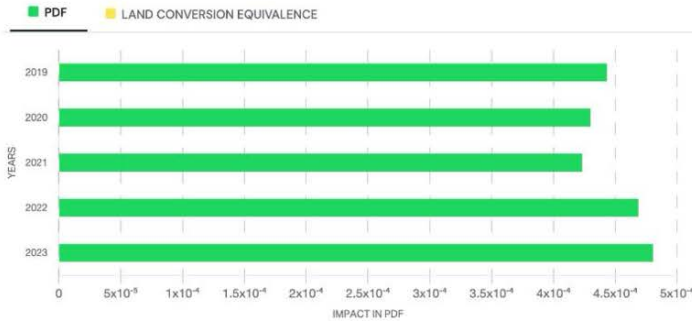
Land Conversion Equivalence [km²] translates PDF impacts into an equivalent area of land converted from a mostly-natural baseline to urban use, based on global averages. It does not indicate actual land use by the entity.

WHAT IS BIODIVERSITY FOOTPRINT?

Learn more

Biodiversity impacts are evaluated using the Potentially Disappeared Fraction of Species (PDF), a metric that quantifies the additional pressures exerted by business activities on the local or global environment, resulting in repercussions for species richness. This measurement assesses the increased risk of extinction for a portion of the total species count if the pressures from business activities persist. The PDF impacts stem from the extra pressure introduced annually by company operations. Each yearly value represents an elevated risk of extinction, both locally and globally, across short and long-time frames.

Impact Trends



Impact Composition

2023

TOTAL BIODIVERSITY IMPACT



SECTOR BENCHMARK COMPOSITION



- GHG Emissions Impact
- Sulphur Oxides Impact
- Nitrogen Pollutants Impact
- Land Use Change Impact
- Water Consumption Impact
- Nitrogen Oxides Impact
- Phosphorous Pollutants Impact
- Waste Generation Impact

Benchmark Deviation

PDF LCE

	UNIT	BENCHMARK	2021	2022	2023
TOTAL BIODIVERSITY IMPACTS	PDF per MIL USD Revenue	6.43x10 ⁹	7.44x10 ⁹ +16%	7.20x10 ⁹ +12%	8.93x10 ⁹ +39%
GHG Emissions	PDF per MIL USD Revenue	1.26x10 ⁹	6.73x10 ¹⁰ -47%	4.44x10 ¹⁰ -65%	4.28x10 ¹⁰ -66%
Water Consumption	PDF per MIL USD Revenue	3.30x10 ⁹	5.28x10 ⁹ +60%	5.57x10 ⁹ +69%	7.04x10 ⁹ +110%
Sulphur Oxides	PDF per MIL USD Revenue	1.85x10 ¹¹	1.07x10 ¹¹ -42%	7.70x10 ¹² -56%	5.61x10 ¹² -70%
Nitrogen Oxides	PDF per MIL USD Revenue	2.86x10 ¹¹	7.71x10 ¹¹ +170%	6.35x10 ¹¹ +120%	7.05x10 ¹¹ +150%
Nitrogen Pollutants	PDF per MIL USD Revenue	1.63x10 ¹²	4.82x10 ¹⁴ -97%	7.81x10 ¹⁴ -95%	3.50x10 ¹⁴ -98%
Phosphorous Pollutants	PDF per MIL USD Revenue	4.04x10 ¹³	1.09x10 ¹⁴ -97%	1.52x10 ¹⁴ -96%	1.44x10 ¹⁴ -96%
Land Use Change	PDF per MIL USD Revenue	8.86x10 ¹²	1.02x10 ¹¹ +16%	1.14x10 ¹¹ +26%	1.10x10 ¹¹ +24%
Waste Generation	PDF per MIL USD Revenue	7.69x10 ¹¹	1.38x10 ⁹ +1,700%	1.10x10 ⁹ +1,300%	1.38x10 ⁹ +1,700%

Sensitive Location Assessment and Mapping (SLAM)

GIST Impact's [Sensitive Location Assessment and Mapping \(SLAM\)](#) (powered by IBAT) evaluates where a company's operations occur in proximity to ecologically sensitive locations, as defined by TNFD. This includes areas that are important for biodiversity, have high or declining ecosystem integrity, are important for ecosystem service delivery, have high water physical risks, or are of importance to affected communities.

The Sensitive Location Assessment and Mapping (SLAM) uses GIST Impact's Asset Location Database, with 2.4 million assets associated with 6,500 companies, to identify where company operations are in proximity to ecologically sensitive areas. For each asset, a buffer zone is defined (with a radius that depends on the asset type and category of the sensitive area, following guidance from IBAT), and the degree of overlap between the asset and the sensitive locations is then scored from very low (no overlap) to very high to identify the company's overall exposure to sensitive locations. SLAM data can be aggregated at a portfolio level to help identify the overall risk of the portfolio resulting from the intersection with important ecologically sensitive areas.

Organisations and reviewers

GIST Impact has developed this product in partnership with the [Integrated Biodiversity Assessment Tool \(IBAT\) Alliance](#), which is the data provider for Key Biodiversity Areas, Protected Areas, IUCN Red List species, and Species Threat Abatement and Restoration (STAR) data.

SLAM Analysis for other data categories includes:

- [Water Risk Data from WRI Aqueduct](#)
- Mean Species Abundance data derived from the [GLOBIO 4 Model](#)

- Proximity to territories acknowledged as important to [Indigenous Peoples](#)

Current stage of development

The product is in active use by GIST Impact's Corporate and Financial Institution customers. Note that when asset locations are provided by individual companies for their own evaluations this information is never exposed to other users; only publicly available and third-party provided asset information is included in our company database.

What is the main purpose of this tool?

The SLAM tool helps companies identify where their operations are at risk of disturbing ecologically sensitive areas, and how to prioritise mitigation actions. For portfolio managers, SLAM provides overall and counterparty-level exposure to important or legally protected biodiversity areas. This tool also enables companies and financial institutions with disclosure requirements for CSRD and TNFD LEAP.

What does it measure?

The SLAM measures the exposure of company asset locations to ecologically sensitive areas, as defined by TNFD guidance, including Key Biodiversity Areas, areas in the World Database of Protected Areas, the habitat range of threatened species from IUCN Red List along with their conservation status, areas of high or declining ecosystem integrity, proximity to areas of importance to Indigenous Peoples, and proximity to areas of high water stress.

What input data are needed?

As GIST Impact maintains a robust asset location database, the following data points are marked optional for SLAM mapping:

- Company's asset locations (optional)
- Asset type classification (optional)

What other tools are most complementary to this tool?

GIST Impact BIGER Footprint Tool
GIST Impact DIRO 360 Tool
IBAT

How can the tool be used for TNFD reporting?

The SLAM tool satisfies TNFD LEAP Locate (L4) guidance to identify business activities that interface with ecologically sensitive locations, and the TNFD Recommendations for Financial Institutions core disclose metric F1.CO.1, financial exposure to companies with assets or activities in ecologically sensitive locations.

Main strengths and limitations

Strengths:

- Satisfies TNFD guidance for identifying business activity interfaces with ecologically sensitive locations, including core disclosure metric F1.CO.1
- Covers all categories of sensitive locations as defined by TNFD
- Includes TNFD-recommended data, including IBAT KBAs, WDPAs, and Red List Species areas
- Applies IBAT guidance for determining how different asset types interface with sensitive locations
- Available for 8,500+ global corporates as of Q4 2024; expanding to >12,000 corporates in 2025
- Asset- and company-level scores for level of exposure to sensitive locations
- Trusted and transparent data sources

Limitations:

- Limited by the accuracy and completeness of data about asset locations and types

What are the costs?

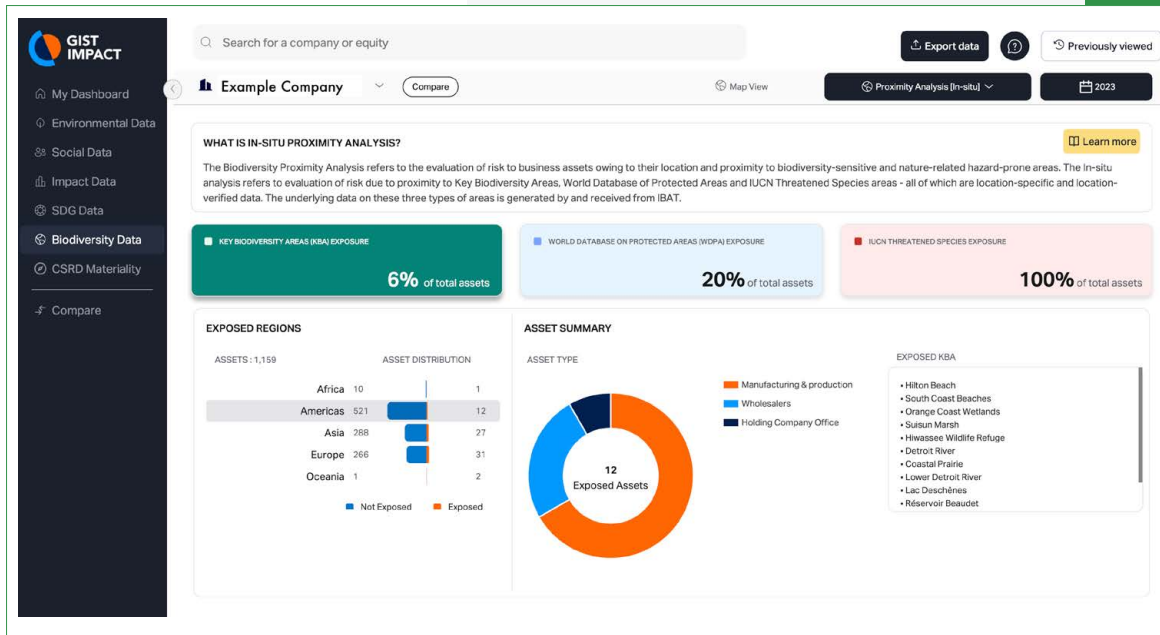
Financial Institutions: annual license, includes tabular summary data, geospatial data, and mapping visualisations; cost varies by portfolio size, number of use cases, and whether customer has an existing license for IBAT data. Cost Level M (€4000 to €10000) to H (> €10,000)

Corporates: annual license, includes tabular summary data, geospatial data, and mapping visualisations; requires license for IBAT data. Cost Level M (€4000 to €10000), exclusive of IBAT data license.

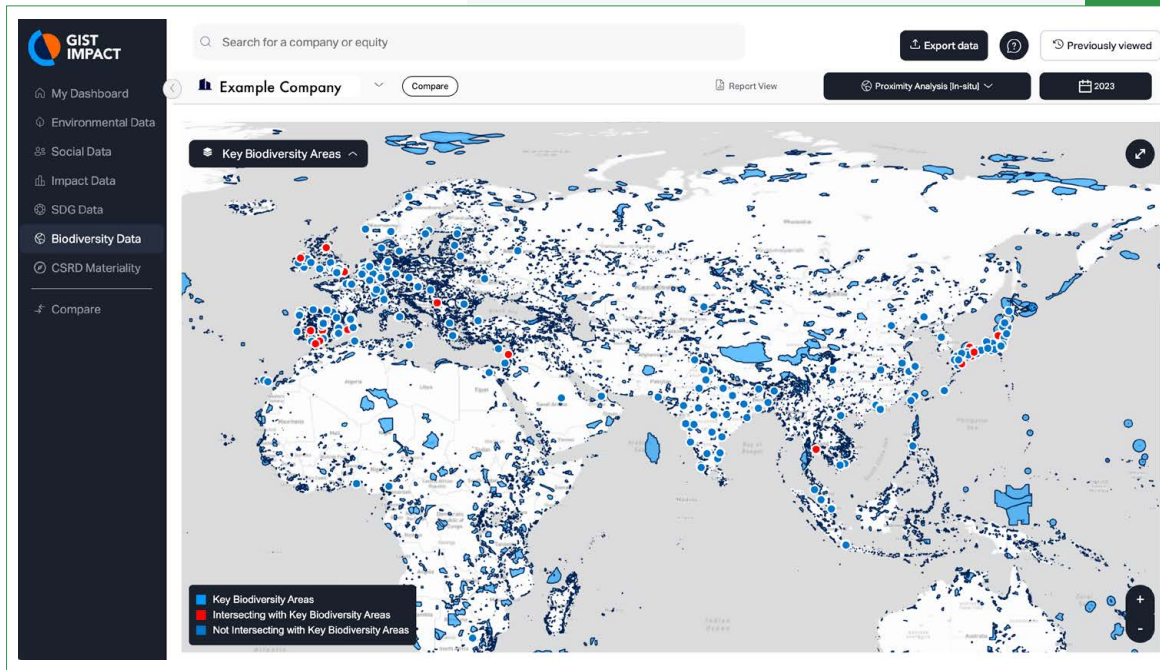
Output visuals SLAM

The GIST Impact Sensitive Location Assessment and Mapping (SLAM) Tool identifies business assets and activities that interface with ecologically sensitive locations, as defined by TNFD. This view shows asset proximity to Key Biodiversity Areas, data sourced from IBAT.





Exposure to sensitive locations is summarised at the company level and aggregated up sector and portfolio levels.



DIRO 360

DIRO 360 is a suite of analytic tools to quantify and contextualise Nature Dependencies, Risks, Impacts, and Opportunities (DIRO) from the level of individual assets up to global portfolios, aligned with TNFD guidance and best practices. Financial Institutions perform portfolio analysis and counterparty deep-dives using our database of DIRO metrics for over 15,000 companies, and Corporates apply DIRO 360 to their own data to build a robust nature strategy and efficient disclosures.

The DIRO360 assessment is carried out at a company level and can be aggregated at a portfolio level.

- **Dependencies on Ecosystem Services:** The dependency scores (very low to very high) are sourced from ENCORE as well as from company disclosures and take into consideration all 25 ecosystem services (ESS) included in ENCORE as well as supported by TNFD.
- **Impacts on biodiversity:** The Impact scores (very low to very high) are calculated at a company level based on their operational biodiversity footprints and their deviation from sectoral benchmarks along with other qualitative parameters. This leverages the GIST Impact Biodiversity and Global Extinction Risk (BIGER) Footprint Tool.
- **Biophysical Risks:** GIST Impact calculates physical and risk scores (very low to very high) for more than 20 risk layers including water stress, water variability, forest area change, temperature variability, drought risk, flood risk, heatwave, earthquake etc., at a company level, that can be aggregated at a portfolio level. Furthermore, transition risks are calculated based on country-specific regulatory and social conditions.

- **Opportunities:** Based on the impacts and risk exposure of the company, opportunity areas are highlighted for each impact category and risk type.
- **Natural and Human Capital Impacts:** GIST Impact calculates the Natural Capital and Human Capital impacts (USD) of a business based on disclosed financial, social, and environmental data, in alignment with the frameworks and guidance of the Capitals Coalition and the Value Balancing Alliance.

Organisations and reviewers

The methodologies for DIRO 360 are based on peer reviewed papers (for Biodiversity footprints and Risks) or publicly available datasets (such as ENCORE, WRI Aqueduct, etc.). Value Factors for Natural and Human Capital Impacts are publicly available.

Transparency of method

The methodologies are based on publicly available, peer-reviewed processes and data sources. GIST Impact provides customers with end-to-end documentation of all methodologies.

What is the main purpose of this tool?

The tool aims to help companies identify their dependencies on ecosystem services, impacts on biodiversity, exposure to physical and catastrophic risks, and opportunities for improvement.

The tool will be useful for companies and financial institutions to report on multiple sub-stages of TNFD LEAP.



What does it measure?

1. The dependency scores measure the company's dependency on 25 ESS based on their type of operations and business activities; if a company has multiple business activities they are proportionally represented in the dependency scores.
2. The impact score quantifies the company's biodiversity impacts relative to peers and sector, with granular details on 8 environmental pressures (see BIGER Footprint).
3. The biophysical risk scores highlight the degree of exposure of company assets to 20 physical and catastrophic risks, and sector-specific transition risks.
4. The opportunity scores indicate the type and degree of opportunities for a company to optimise its potential dependencies on ESS and to reduce biodiversity impacts.
5. Natural and Human Capital Impacts measure how a business affects human well-being in monetary terms, allowing a standardised assessment of sustainability performance and integration into financial workflows.

What input data are needed?

As GIST Impact maintains a robust asset location database, the following data points are marked optional for calculation of DIRO 360 scores:

- Company's asset locations (optional)
- Asset type classification (optional)

What other tools are most complementary to this tool?

GIST Impact BIGER Footprint
GIST Impact SLAM
ENCORE

How can the tool be used for TNFD reporting?

DIRO 360 supports the TNFD LEAP framework, predominantly on stages of Evaluate (E2, E3, and E4), and Assess (A1, A3, and A4), and Prepare (P3).

Current stage of development

All elements of the DIRO 360 tool have been applied by leading global financial institutions ranging from multiple top 20 Asset Managers and Sovereign Wealth Funds to bespoke impact-oriented wealth managers.

Main strengths and limitations

Strengths:

- Provides a holistic view of company- or portfolio-level relationship with nature aligned with the TNFD LEAP Framework
- Leverages latest ENCORE dependency materiality ratings (methodology released in July 2024)
- Uses location-specific data for calculation of risks and opportunities
- Impact scores are based on biodiversity footprint and their comparison against peers

Limitations:

- Limited by the accuracy and completeness of data about asset locations and types
- Dependency scores are currently based on sectors and business processes; enhancements for location-specific ESS dependencies are coming in Q1 2025

What are the costs?

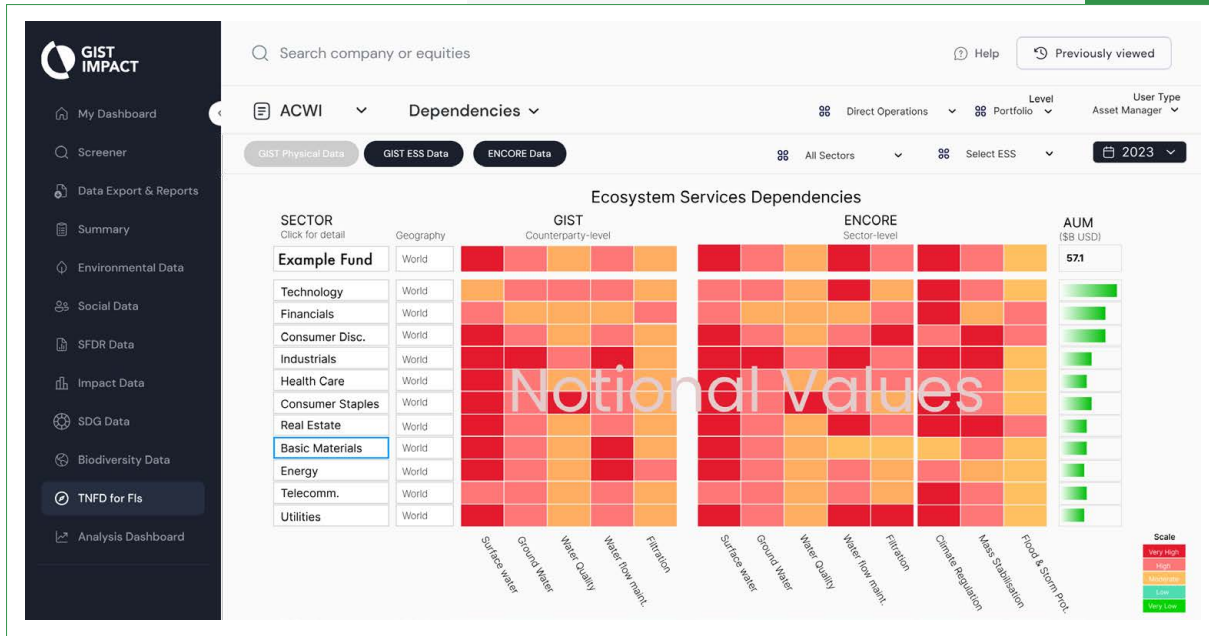
Financial Institutions: Annual license includes underlying input data (environmental drivers, geographic apportioning, company business activity details (NACE-4)); cost varies by portfolio size, number of use cases, and packaging with complementary offerings (BIGER Footprint, SLAM). Cost Level M (€4000 to €10000) to H (> €10000)

Corporates: Annual license, customer provides input data as available, missing data can be modelled by GIST Impact; cost varies by volume of use cases, extent of operations, and

number of assets to be assessed, as well as by packaging with complementary offerings (BIGER Footprint, SLAM). Cost: M (€4000 to €10000) to H (> €10000)

Output visuals DIRO 360

GIST Impact DIRO 360 offers a comprehensive assessment of the Dependencies, Impacts, Risks, and Opportunities that characterise a company's or portfolio's relationship with nature, aligned with the TNFD LEAP Evaluation process. This figure illustrates Ecosystem Services Dependency analysis and financial exposure (portfolio and scores are notional).



GIST Impact DIRO 360 Natural, Human, and Produced Capital metrics measure how 15,000 companies affect human well-being in monetary terms from 2016 to present, in alignment with TNFD LEAP (E3, E4, A4, P3).

	Unit	2019	2020	2021	2022	2023
TOTAL NATURAL CAPITAL	USD	-78M	-75M	-79M	-75M	-67M
GHG Emissions	USD	-50M	-47M	-49M	-48M	-44M
Air Pollution	USD	-1.6M	-1.6M	-1.8M	-1.7M	-1.5M
Water Consumption	USD	-1.7M	-1.7M	-1.8M	-1.7M	-1.6M
Water & Land Pollution	USD	-14M	-13M	-14M	-14M	-13M
Waste Generation	USD	-11M	-12M	-12M	-9.6M	-7.3M
TOTAL HUMAN CAPITAL	USD	330M	310M	440M	430M	430M
TOTAL PRODUCED CAPITAL	USD	12B	13B	18B	17B	28B

6. Case studies

The case studies in this chapter show how and why FIs have used some of the measurement approaches described in this guide.

Risk assessment with IBAT by Allianz

Since 2012, Allianz has continuously worked on implementing [processes](#) to manage sustainability-related risks across our business. This included introducing guidelines for the management of such risks across property and casualty insurance and non-listed investment transactions. When an underwriter or investment manager identifies a potential risk based on one of the sustainability guidelines, the transaction is referred for review by one of Allianz's sustainability centres of competence. These teams then use a variety of sustainability-risk data sources to assess potential risks. IBAT is one of these data sources. It is used to assess the biodiversity impacts of insurance clients or potential investment targets on their local environment, mainly related to physical assets (e.g., infrastructure investments, real estate, renewable energy). For this, the teams need to understand threatened species, protected areas, and other indicators of biodiversity. Should risks be identified, they will be evaluated and may lead to additional conditions to Allianz's insurance offers or investment proposals to mitigate such a risk. If no viable mitigation options are found, Allianz might decline the transaction. Among the data sources used by Allianz's sustainability centres of competence, IBAT is the only geo-location-based tool for biodiversity-related information. The other data sources are focused on cross-company ESG risk information or reputational risk information.

Allianz France recently published the results of a biodiversity risk assessment performed on their investment portfolio in their [Sustainable Investment Report 2021](#). The underlying data for the analysis was in part based on IBAT's data for Key Biodiversity Areas and the IUCN Red List. Although sovereigns (representing a considerable share of Allianz France's portfolio) could not be covered, IBAT's information layers proved useful to develop a risk matrix of investee companies' scope 1 potential impacts on biodiversity.

LFDE's use of BIA-GBS

In 2021, La Financière de l'Echiquier (LFDE) subscribed to the BIA-GBS database aiming for two objectives: to be able to measure the impact of its portfolios on biodiversity, and to provide quantitative information to investment teams for their investment decisions, especially for LFDE's impact fund '[Echiquier Climate & Biodiversity Impact Europe](#)'. LFDE selected BIA-GBS because of the robustness of the methodology based on the expertise of CDC Biodiversité, the online platform, and the complementarity and consistency with climate data.

LFDE is satisfied with the coverage rates of BIA-GBS, ranging between 18% to almost 100% depending on portfolios' strategies (average of 67% for all LFDE holdings). In 2022, LFDE released its first [Climate and Biodiversity Report](#). Using BIA-GBS, the organisation was able to report on the biodiversity footprint of all its funds. The tool has comprehensive and illustrative measurements for clients. BIA-GBS was found to be an interesting tool for portfolio managers to understand sectoral impacts on biodiversity.

At present, the main limit of BIA-GBS (and other footprinting tools) is the absence of bottom-up analysis, which prevents FIs from comparing competitors on their real impacts or identifying positive impacts and thus companies providing solutions to biodiversity loss.

In conclusion, BIA-GBS can be used for estimating portfolio impact, monitoring, and screening biodiversity risks, and training portfolio managers. However, it is too early to use it in an investment process for stock picking. LFDE is currently experimenting with combining the BIA-GBS results with qualitative data used in an internal and proprietary scoring.

Biodiversity footprint at portfolio company level with GBS-FI by France Invest

In 2023, the members of the biodiversity working group of France Invest's Sustainability Commission wanted to go further in integrating biodiversity-related issues by launching a pilot study on measuring the biodiversity footprint. The objective was to assess the feasibility of measuring the biodiversity footprint for the private equity sector by developing a methodology that is accessible to SMEs and can be replicated on the scale of a portfolio of several dozen companies. Four Private equity managers chose to work together with CDC Biodiversité on this innovative project and tested the GBS on four of their portfolio companies from the energy, cosmetics and agrifood sectors.

The GBS methodology was used to translate the activity data from each of the pilot study participants into one main result: the quantification of the total impacts on biodiversity generated by all their activities expressed in MSA.m². These results were used to identify hotspots of impacts along the whole value chain of the companies assessed, and thus action levers that could contribute to reducing their biodiversity footprint.

This pilot study has made it possible to determine a course of action for measuring the biodiversity footprint of non-listed portfolios. Private Equity managers can use biodiversity assessments made on their portfolios using GBS-FI to feed regulatory reporting which require the disclosure of impacts and dependencies on biodiversity. This reporting can be based on both screenings of entire portfolios and deep dives on a handful of priority companies: those with high biodiversity risks but also characteristics that make the exercise feasible.

For more details on this case study, please see [GUIDE BIODIVERSITE 2024 ENG P30 \(franceinvest.eu\)](#) from page 13 and [Bridging finance and nature: the role of the Global Biodiversity Score | CDC Biodiversité \(cdc-biodiversite.fr\)](#) section 3.3.

HSBC using CBF to create a biodiversity-screened index

In 2021, HSBC [launched](#) the Euronext ESG Biodiversity-screened Index, the world's first broad-based biodiversity screened equity index. The aim of the Biodiversity-screened Index is to allow investors to consider the impact on natural capital in their trading and investment decisions. It provides a benchmark for investors as to which stocks to include in their portfolios and which to exclude, based on how a company's overall activities impact nature.

The Euronext ESG Biodiversity-screened Index has been constructed following a broad and encompassing screening approach, starting from the Euronext World Index (1500 companies) and consisting of the following methodological steps (full rulebook available [here](#), under 'Theme indices'): 1) financial screening (exclusion of small companies), 2) SRI screenings (exclusion of companies involved in controversial activities), 3) ESG screening (exclusion of companies with a high ESG risk score), and 4) biodiversity screening. For this last screening step, the CBF approach was used to identify and exclude the 33% highest-impact companies per sector, based on the relative impact score (expressed in km².MSA/MEUR invested). HSBC chose to use the CBF approach because it covers companies' full value chain and is based on the MSA metric. Of the retained companies, the 500 biggest capitalisations are included in the World Biodiversity-screened Index.

The index is updated quarterly, with biodiversity scores being updated annually. Compared to the Euronext World Index, the Biodiversity-screened index has a 53% lower weighted CBF intensity, and a 53% lower weighted GHG intensity. Furthermore, ESG Risk is considered 14% lower. Economic performance of the index portfolio over time does not deviate much from that of the total world index.

European Investment Bank's project finance application of the BFFI

In 2023, the European Investment Bank (EIB) pilot-tested the Biodiversity Footprinting for Financial Institutions (BFFI) method, carried out by PRé Sustainability and reflected by the Partnership for Biodiversity Accounting Financials (PBAF). This arose out of the bank's need to assess both [biodiversity dependency and impact risks](#) at project level.

A conceptual flowchart was developed to distinguish five types of assessments based on the available time and resources, or the outcomes achievable within those constraints.

The method was applied to four case studies of infrastructure projects in different locations and industries with diverse characteristics: an agriculture site in sub-Saharan Africa, an offshore wind park in the EU, a hydroelectric power plant in sub-Saharan Africa and a mining and processing plant in the EU. The flowchart developed was used to showcase each type of assessment illustrating what types of data are necessary for completing different types of biodiversity footprints. This showed that a full assessment which requires weeks of time, investment in LCA software and advanced footprinting knowledge can give the most detailed results, which can be used for in-depth analysis of root causes, scenario analysis

and inclusion of positive impact. A high-level portfolio assessment, which can take a few hours with free software such as BioScope can only give an indication of hotspots within infrastructure investments. Regarding data, it was found that site-level Environmental Impact Assessments give a limited amount of data – usually scope 1 and scope 2 data and are typically described in a quantitative manner.

Following PRé Sustainability's assessment of using the BFFI, the recommendations for the European Investment Bank are to determine the intended use of the results of the footprint, analyse relevant impacts to include, choose an assessment level based on data availability, and obtain associated resources and expertise.

Despite the challenges, for EIB the BFFI method emerges as the most straightforward solution for project-level application and closely aligns with existing environmental and social due diligence processes. The methodology can focus on critical aspects and allows the use and integration of multiple types of data, including supply chain impacts and climate assessment data. Finally, being an open-source methodology designed for continuous improvement, it is imperative that researchers and practitioners continue to work on improving the tool.

ABN AMRO's use of GID in impact reporting

ABN AMRO has reported for 4 years in a row on the monetized impact of its portfolio on six different types of capital. Natural Capital is one of the 6 capitals reported on in the [Impact report 2021](#) and is mainly underpinned by the GID tool. ABN AMRO also used the GID to publish a [report](#) in May 2022 on the specific biodiversity impact of its lending and investment activities. Comparison of the 2020 with the 2021 data showed a decrease of the negative Impact on biodiversity as a result of a change in strategy.

By using the GID to measure and value the impact on biodiversity, ABN AMRO was able to better understand its negative impact on biodiversity and to identify which of the sectors within its portfolio generate the largest impact. It also gave insight into the geographical location of the impact on biodiversity. This will improve policies and makes engagement with clients and other stakeholders more effective. The dataset also gives insights into the indirect impact of clients through their supply chain.

The GID expresses the effects of different drivers of loss in single units: the loss of a hectare with pristine biodiversity (biodiversity ha) and monetary units (€). This allows for aggregation and comparability and helps ABN AMRO to put its biodiversity impact into the context of the wider impact measurement and to integrate it into existing tools.

ISS STOXX® Biodiversity indices using BIAT output

The [ISS STOXX® Biodiversity indices](#) were introduced in April 2023, offering a comprehensive approach to integrate biodiversity challenges into investment portfolios. The indices address three different biodiversity goals (avoid, minimise, enable) and incorporate an additional climate objective.

The indices are classified into two categories: "Biodiversity" and "Biodiversity Leaders." The former tilt exposure to companies with high scores in seven biodiversity- and climate-related SDG objectives, while the latter include companies with high revenues derived from activities aligned with SDGs. A key component of the ISS STOXX Biodiversity framework is the Potentially Disappeared Fraction of Species (PDF), an output of ISS ESG's Biodiversity Impact Assessment Tool. PDF seeks to measure how corporates affect our natural world by considering a set of environmental pressures on species and habitats across the entire value chain and different geographical locations. PDF is divided by each company's Enterprise Value Including Cash (EVIC) to avoid size biases. The indices select the top 80% companies in each ICB Sector by PDF/EVIC.

Nature-related impacts and dependencies assessment with NRP by a leading Asia-based financial institution

An Asia-based financial institution joined the Partnership for Biodiversity Accounting Financials (PBAF) to collaborate with international organisations on addressing nature-related issues. This institution was among the first in its home country to join the TNFD. The risk management team aimed to assess the institution's nature-related impacts and dependencies and publish a report in line with TNFD recommendations, making them the first in their home country to do so. They sought specialists to support this analysis.

The risk management team required external support to assess the nature-related impacts and dependencies of their investment assets and assets under operations, and to publish the first TNFD report in their home market following the LEAP approach (Locate, Evaluate, Assess, and Prepare).

The S1 analytics solutions and product group discussed a four-step process that would draw on the **S&P Global Nature & Biodiversity Risk data** solution, built on the Nature Risk Profile open-source methodology launched by the UN Environment Programme (UNEP) and S&P Global. This solution covers 20k+ public and private companies with over 1.6 million assets mapped to corporate owners and provides

130+ decision-grade metrics to assess a company's impact and dependencies on nature as recommended by the GBF and in line with the TNFD LEAP approach.

The process entailed a four-step approach:

- 1 Evaluating the ecosystem footprint
- 2 Determining the ecosystem significance
- 3 Creating a dependency score
- 4 Helping to prepare the TNFD report

S1 collaborated with the risk management team to collect essential data that covered both the company's own operational assets, plus the assets it was financing. S1 leveraged its Nature & Biodiversity dataset to evaluate the nature-related impacts and dependencies of these assets, and then aggregated the results to the portfolio level. The assessment covered 159 major asset and operating sites across industries within the financial institution's home market. There were regular meetings during the engagement to help the risk management team understand the data collection process, methodology, and results. The results were then integrated into a TNFD report.

Making Oceans Count project

The objective of the 'Making Oceans Count' project is to have risks and opportunities related to marine ecosystems better accounted for by key Nordic financial actors, by:

- Raising awareness and offering support to enhance the understanding, assessment and management of these risks and opportunities; and
- Investigating solutions to further integrate ocean data and metrics into financial decision-making and academic training.

Supported by the Velux Foundation, the project has been implemented by a consortium comprising the Green Digital Finance Alliance, WWF Denmark, and the Copenhagen Business School, with the participation of key Nordic FIs including Finance for Biodiversity Pledge signatories such as PensionDanmark, PKA and DNB.

The project suggests an integrated approach following three steps: 1) exploring and prioritising, 2) assessing, and 3) responding to FIs' exposure to marine risks and opportunities. It demonstrates that the potential levels of direct and indirect exposure to marine biodiversity risks are significant, and stem from a wide range of economic activities. The project focusses on offshore renewable energy, food production, pharmaceuticals, coastal infrastructure, marine transportation and supporting financial services. It analyses the contribution of these sectors to drivers of marine biodiversity loss and their dependence on marine ecosystem services. The approach was piloted in the Nordic region, but has global applicability.

Furthermore, the project has assessed key opportunities for FIs in terms of using ocean-relevant data and metrics. By engaging with data platforms and investors, the project developed blue metric concepts that could fill the current gaps in marine biodiversity data for FIs, such as metrics for assessing geolocated exposures to marine-sensitive zones. These concepts will be shared to inspire data providers and users to develop market applications.

Accelerating the nature strategy of a Leading Global Asset Manager using the GIST Impact Nature & Biodiversity Suite

A Top 20 global asset manager is using GIST Impact's Nature & Biodiversity Suite to accelerate and expand its industry leading nature commitments. The Firm's priorities are managing nature risks, developing nature-positive investment strategies, investee engagement, and TNFD reporting. The Firm has initially focused on three themes: biodiversity, deforestation and water.

The BIGER Footprint tool was used to compare the Firm's funds against various benchmark funds and indexes. Global Species Extinction Risk per \$M USD investment was quantified for each company and compared by sector, counterparty, environmental driver, and affected ecosystems. The Firm used company-reported data from 2016 to 2024 to identify nature leaders and laggards, and applied attribution analysis to model sector allocation and counterparty selection effects for portfolio optimisation.

Deforestation and water analysis was accomplished using the SLAM geospatial analysis tool, which assesses location-specific risks for 2.8 million physical assets. Exposure to deforestation hotspots was assessed for each corporate asset, complementing value chain deforestation risk analysis. Company water usage was compared with exposure to localised factors including water stress and water supply depletion. Sector and portfolio aggregation was compared with benchmarks to prioritise segments for further analysis and engagement.

The GIST Data Portal was used for deep-dive analysis of specific companies, whereas portfolio analysis was performed in the Firm's own preferred analytic environment.

Within 3 months, GIST data and analytics have been applied to support all of the Firm's nature priorities, demonstrating the value of a robust, bottom-up data foundation to support evolving nature strategies.

7. Biodiversity data types and sources

The biodiversity measurement approaches outlined in this guide provide FIs with meaningful and decision-useful information. This chapter describes the types of data sources that are available as well as innovations in the field of biodiversity data. It builds largely on the [B&B Platform Thematic report on Biodiversity Data](#) and lessons learned within the FfB Foundation, which is building a Biodiversity Data Platform to guide FfB members in selecting the right data points and providers for specific objectives.

7.1 A broad variety of data sources

Data used by biodiversity measurement approaches include the following:

- **Financial data**, e.g., a company's turnover and purchases.
- **Physical flows**, e.g., a company's greenhouse gas emissions and water withdrawal
- **Pressure on biodiversity**, e.g., linkage to deforestation and land use change
- **State of biodiversity**, i.e., the state of species (population size, global extinction risk) and ecosystems (extent, condition).
- **State of ecosystem services**, i.e., the supply of provisioning, regulating, supporting and cultural services by natural assets.
- **Quality of management response**, e.g., product certification, measures taken to mitigate negative biodiversity impact.

This data can come from a wide variety of sources, including ecological surveys, corporate disclosures, governmental and NGO-driven databases, and scientific literature.

7.2 Data sources and models used by footprinting tools

The approaches described in this guide rely on different data sources, including economic and biophysical company-level data (such as the footprinting tools), qualitative information (such as ENCORE), among others. With this data, the associated impacts on biodiversity and dependencies on ecosystem services are calculated.

The following table provides an overview of the measurement approaches described in this guide, including the type of data, unit of measurement, coverage, last update, and link to source:



APPROACH	ENCORE	IBAT	BRF	BIA-GBS	GBS-FI	CBF	BFFI	GID	MBFM	BIAT	NRP	GIST NBS
Type of data	Scientific and grey literature	Reported/ bottom-up (spatial) data	Modelled data	Modelled data	Modelled data	Modelled data	Modelled data	Modelled data	Reported data + modelled data	Modelled data	Reported data + company financials + asset level disclosures + modelled data	Reported (traceable to source) + Asset Level + Financials + Bottom Up (spatial) Data + Scientific + Modelled
Unit	Various qualitative and quantitative	Km ² ; PDF	Risk score (unitless)	MSA.km ²	MSA.km ²	MSA.km ²	PDF.ha.yr	US Dollar; True Price method to monetise impacts	PDF; MSA.km ²	PDF.km ² .yr; MSA.km ²	Impact: High Significant Area; Ha.eq Dependency: Dependency Score 0-1	Impact: PDF and LCE (km ²); Risk and Exposure Scores (unitless)
Coverage (e.g., number of companies)	~ 8 000 users ³	280	> 50 000 companies (note: this value is for both WRF & BRF combined in RFS platform)	> 7 000 companies + sovereigns	> 7 000 companies + sovereigns	> 8 500 companies & 100 + sovereigns	No info	MSCI World Index > 1 500 companies	MSCI All Country World Index (ACWI)	> 17 000 issuers	> 20 000 Company coverage (98% of Global Market Cap covered). Large Cap: 70% Mid Cap: 20% Small Cap: 7%	> 15 000 companies (98% of global investible market)
Last update	2024	2024	2024	2023	2024	2024	No info	2023	2024	2024	2024	2024
Source	Link	Link	Link	Link	Link	Link	Link	Link	Link	Link	Link	Link

³ Academia/research, business, finance sector (including banking, insurance, investment, and others), government, intergovernmental organisation, multi-stakeholder groups, and NGO/Civil Society.

Underlying datasets and models used by footprinting tools

Footprinting tools have a considerable presence in this guide. These estimate impacts using input-output databases and biodiversity models. Their resulting company-level impact figures represent potential rather than actual, on-the-ground measurements. In some cases, models and calculations are enriched with reported data on pressures or management responses from companies, thus making results more closely aligned with a company's real biodiversity impact.

EXIOBASE – EXIOBASE is a global, detailed Multi-Regional Environmentally Extended Supply-Use Table and Input-Output Table, developed by the EXIOBASE consortium consisting of NTU, TNO, SERI, Universiteit Leiden, WU, and 2-0 LCA Consultants. Developed by harmonising and detailing supply-use tables for many countries and estimating emissions and resource extractions by industry, EXIOBASE provides detailed information on the flows of goods and services between different sectors and regions of the world economy. This database is valuable for high-level analysing the environmental and socioeconomic impacts of global supply chains, allowing to assess the interconnectedness of economies and make informed decisions on sustainability and resource management. For more information on EXIOBASE, please refer to: <https://www.exiobase.eu>.

GLOBIO – The GLOBIO model (developed by PBL, UNEP GRID-Arendal, UNEP-WCMC, Radboud University Leiden and Wageningen University) was developed to feed into scenario analysis. It calculates the impacts of anthropogenic pressures on biodiversity based on scientifically underpinned cause-effect relationships. The main GLOBIO model focuses on impacts on terrestrial biodiversity, whereas the GLOBIO-Aquatic model calculates the impacts on freshwater biodiversity. Both terrestrial and aquatic biodiversity are represented by the MSA metric. Although the GLOBIO model was developed to cover global developments, the dose-response relationships can be applied at other geographical levels as well. The GLOBIO model is used by CBF, BIA-GBS, GBS-FI, MBFM and GID (for land use) to translate pressures into potential biodiversity impacts. For more information on GLOBIO, please refer to: www.globio.info.

ReCiPe – The ReCiPe model (developed by the National Institute for Public Health and the Environment (RIVM), Radboud University Nijmegen, Leiden University, PRé Consultants and Norwegian University of Science and Technology (NTNU Trondheim) was originally developed for LCA. It calculates the effects of emissions and resource extractions on ecosystem quality, damage to human health and resource scarcity, based on a number of environmental models. The effects on ecosystem quality are expressed in terms of terrestrial, aquatic and marine biodiversity loss. Biodiversity is represented by the PDF.m².yr (for terrestrial biodiversity) and PDF.m³.yr (for freshwater and marine biodiversity) metrics. Both can be aggregated into one metric (PDF.m².yr), although this conversion brings along uncertainties. ReCiPe's biodiversity module is used by BFFI and GID (for emissions) to translate pressures into potential biodiversity impacts. For more information on ReCiPe, please refer to: <https://www.rivm.nl/en/life-cycle-assessment-lca/recipe>.

Source: Assessment of biodiversity measurement approaches for businesses and financial institution. Annex 1 to Update report 2. December 2019, Business & Biodiversity Platform.

7.3 Innovative data collection methods

With continuous technological developments, new data sources are becoming available that offer more direct information on the state of biodiversity than biodiversity footprinting tools do.

Environmental DNA (eDNA)

Animals, plants and bacteria constantly leave DNA traces behind in the environment (e.g., cells, hairs, etc). This environmental DNA (eDNA) can be retrieved from environmental samples such as water, air, soil, etc. and used to identify which species are or have been present in the sampled environment. eDNA monitoring thus offers an innovative and cost-effective way to collect primary data on biodiversity, for example at sites where companies have their operations. Furthermore, it can assist in ground truthing the predictions of biodiversity footprinting models and help measure progress towards restoration and net positive targets.

Bioacoustics

Bioacoustics consists of the analysis of animal sounds. Various types of microphones can be used to capture the sounds in a landscape at different frequencies. Species and taxonomic groups can be identified from these soundscape recordings; a process which is automated through artificial intelligence technologies. By comparing soundscape recordings over time and by overlaying them with baseline soundscapes, the biological integrity of a landscape can be assessed. Furthermore, bioacoustics could be used to monitor human activities as well, for example tracking illegal activities by monitoring gunshots related to poachers or chainsaws in the case of illegal logging.

Remote sensing

In remote sensing, information about a landscape or object is gathered based on its reflection and/or emission of radiation (i.e., visible light, infrared and microwave radiation). Satellite imagery is the most widespread example of remote sensing, but data could also be collected by drones or aeroplanes. The number of remote sensing sensors, platforms and applications has increased significantly over the past years. The availability of geospatial asset data (i.e., information on the exact location and ownership of commercial assets) is key to making remote sensing data useful to FIs. This type of data is currently mainly limited to primary industries, such as mining, oil and gas, shipping, etc., whose impacts are directly linked to operations. For sectors more downstream in the value chain, geospatial asset data covering suppliers is often limited. Tools such as [Deepview](#) work to fill this gap and map the relationships between producers, traders, and goods manufacturers, such that remote sensing data can be linked to asset data and used to provide insight in value chain impact and risk.

Further reading:

- [Resource Watch & UN Biodiversity Lab](#): Overview of major publicly available geospatial datasets that can be used to provide ESG insights on environmental variables and biodiversity impacts and risks.
- [Satelligence & SarVision](#): Offer remote sensing services that provide insight in deforestation and forest degradation.



8. Measuring marine biodiversity

Marine biodiversity is only partially covered by the measurement approaches described in this guide, and often not addressed by FIs. This chapter outlines what type of resources are available and how FIs can go about to start assessing their impacts and dependencies on marine biodiversity.

8.1 Addressing the marine realm

Marine ecosystems are highly material for FIs to integrate in their assessments. Firstly, due to the critical ecosystem services they provide, and secondly, because of the multiple pressures on marine biodiversity caused by a wide range of ocean and land-based activities, either directly or indirectly. The key pressures highlighted in marine environmental frameworks and scientific literature for causing decline in marine biodiversity include:

- Sea use and physical impacts: disturbance of seabed and loss of habitats
- Pollution: due to nutrient and organic matters, contaminating compounds, marine litter (including micro litter), noise, light and heat
- Climate change: leading to ocean warming and acidification
- Living resource exploitation: extraction and disturbance of species
- Invasive species and pathogens: spread of non-indigenous species and microbial pathogens

Currently none of the measurement approaches developed for the finance sector adequately address impacts on marine ecosystems. The quantitative methodologies that have been developed for biodiversity assessment of investments are mainly land-based, facing limitations in terms of pressure

and impact coverage when it comes to marine ecosystems. Nonetheless the measurement approaches described in this guide are planning or are already able to provide assessments for some critical pressures, impacts and dependencies, such as:

- BFFI: coverage of marine ecotoxicity and eutrophication; integration of the overexploitation of fish species under development
- GID: coverage of marine eutrophication as a category of water pollution
- ENCORE: coverage of marine-related natural capital assets, impact drivers and ecosystem dependencies, as well as relevant spatial maps
- STAR and IBAT: STAR will be extended to marine species (in addition to mammals, birds and amphibians) and IBAT provides access to marine biodiversity datasets for project finance

In order to develop further measurement approaches, there is a wide availability of primary data on marine ecosystems' pressures, state of biodiversity, impacts and ecosystem services that can already be explored. There are several marine data platforms which provide extensive information (e.g., [European Marine Observation and Data Network](#), [Marine Biodiversity Observation Network](#) for North America and global regions, and UNEP-WCMC's global [Ocean Data Viewer](#)). However, this environmental data needs

to be related to the invested activities of the FIs which is made challenging by the relatively poor state of corporate disclosures on marine impacts and dependencies. There are already several opportunities that can be explored by FIs in terms of:

- A Assessing their overall exposure to material ocean impacts and dependencies;
- B Conducting 'deep dives' into the most material sectors' risks and opportunities; and
- C Assessing their geolocated exposure to marine sensitive zones.

8.2 Measuring the overall exposure of portfolios to material ocean impacts and dependencies

Datasets on critical marine impacts and dependencies related to specific economic activities and production processes may be used for portfolio assessment. These datasets can be complemented by multi-regional input-output models and LCA tools to integrate indirect exposures. Mapping these linkages can help FIs identify the potential risks and opportunities they are exposed to, as well as prioritise sectors/ areas for actions and further data collection. Natural capital tools such as ENCORE can be used as a starting point to analyse the materiality of potential dependencies and

impacts on marine ecosystems of particular sub-sectors and production processes. This includes information on:

- Impact drivers: Marine ecosystem use, as well as other impact drivers of marine biodiversity loss relevant for production processes of exposed industries, such as water pollution, solid waste, disturbances, GHG and non-GHG emission and other resource uses.
- Dependencies on ecosystem services: dependencies of exposed industries on marine-related provisioning services (such as direct physical inputs of genetic and other materials), regulation and maintenance services as enablers of production processes, protection from disruption or mitigation of direct impacts (including the critical climate regulating function of marine ecosystems).

This analysis can be complemented by more specific resources for the marine environment.

- Marine activity/pressure/impact linkages: The [Linkage framework](#) developed under the European Commission's 7th framework project 'Options for Delivering Ecosystem-Based Marine Management' (ODEMM) provides linkages between specific sectors' activities and 24 marine pressures.
- Resources developed for specific ecoregions: The [Ecosystem Overviews](#) by the International Council for the Exploration of the Sea (ICES) analyse the key marine pressures and impacting activities per ecoregion in scope.

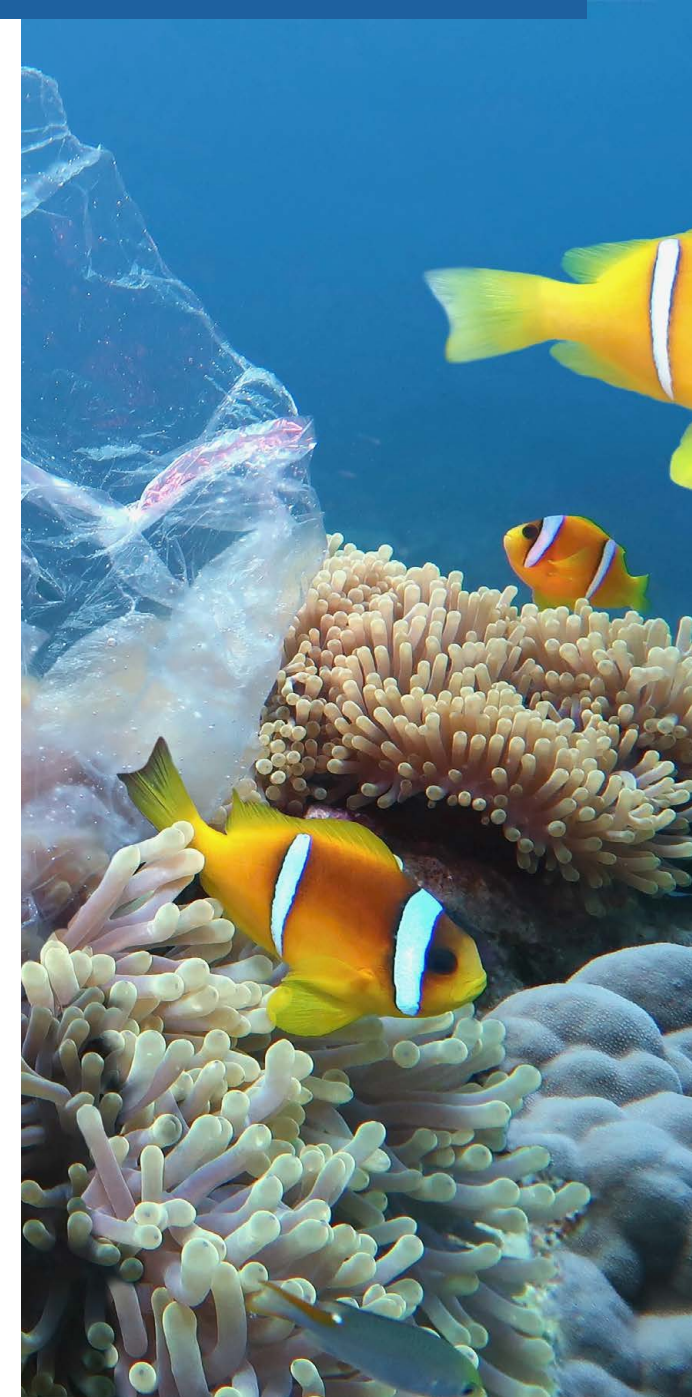
8.3 Conducting 'deep dives' for key sectors and activities

Portfolio analysis should be complemented with sector level expertise to gain greater insights into risks and opportunities. A key resource that has been developed for the financial sector is the UNEP FI guidance [Turning the Tide: How to Finance a Sustainable Ocean Recovery](#). Five key ocean sectors are explored in the guide, chosen for their established connection with private finance: seafood, shipping, ports, coastal and marine tourism, and marine renewable energy. Two additional sectors (coastal infrastructure and waste prevention and management) have been added in 2022, and more sectors are expected to be included.

For each key sector, the guide provides an overview of:

- Its key environmental and social impacts and dependencies
- Its relationship to other sectors of the blue economy
- Related materiality assessments
- Detailed criteria for sustainable financing, with annexes providing indicators, verification, actions, recommendations and links to the [Sustainable Blue Economy Financing Principles](#)
- Risks and opportunities

For the respective industries, further expert studies and literature may be explored. Furthermore, for specific industries, data on their contribution to some key marine pressures can be explored. For instance, estimations of emissions, including air pollutants, nutrient and organic enrichment or marine ecotoxicity from databases (such as EXIOBASE) may be used.



8.4 Assessing geolocated exposure to marine sensitive zones

In order to further assess the risks, integrating a geolocated dimension with marine investments and spatial planning is critical. [A global map of human impact on marine ecosystems](#) reported that a large fraction of marine ecosystems (41%) is strongly affected by multiple anthropogenic drivers. First, extensive geolocated datasets exist that can be used to assess the proximity and possible impact on Marine Protected Areas (MPAs) and other sensitive areas provided the companies' asset location is known:

- Protected areas: UNEP-WCMC's [World database on protected areas](#), also integrated into IBAT, is the most comprehensive global database on terrestrial and marine protected areas.
- Sensitive areas: IBAT includes [Key Biodiversity Areas](#) (KBA) and species data covering marine zones. Datasets on the [Ecologically or Biologically Significant Marine Areas](#) defined by the Convention on Biological Diversity (CBD) can be used as well.

This geospecific data on the environmental status of marine zones can be overlaid with data on physical assets, observational or estimated data on the pressures originating from these assets, as well as financial ownership data. This can already be explored for a number of material ocean-based industries such as:

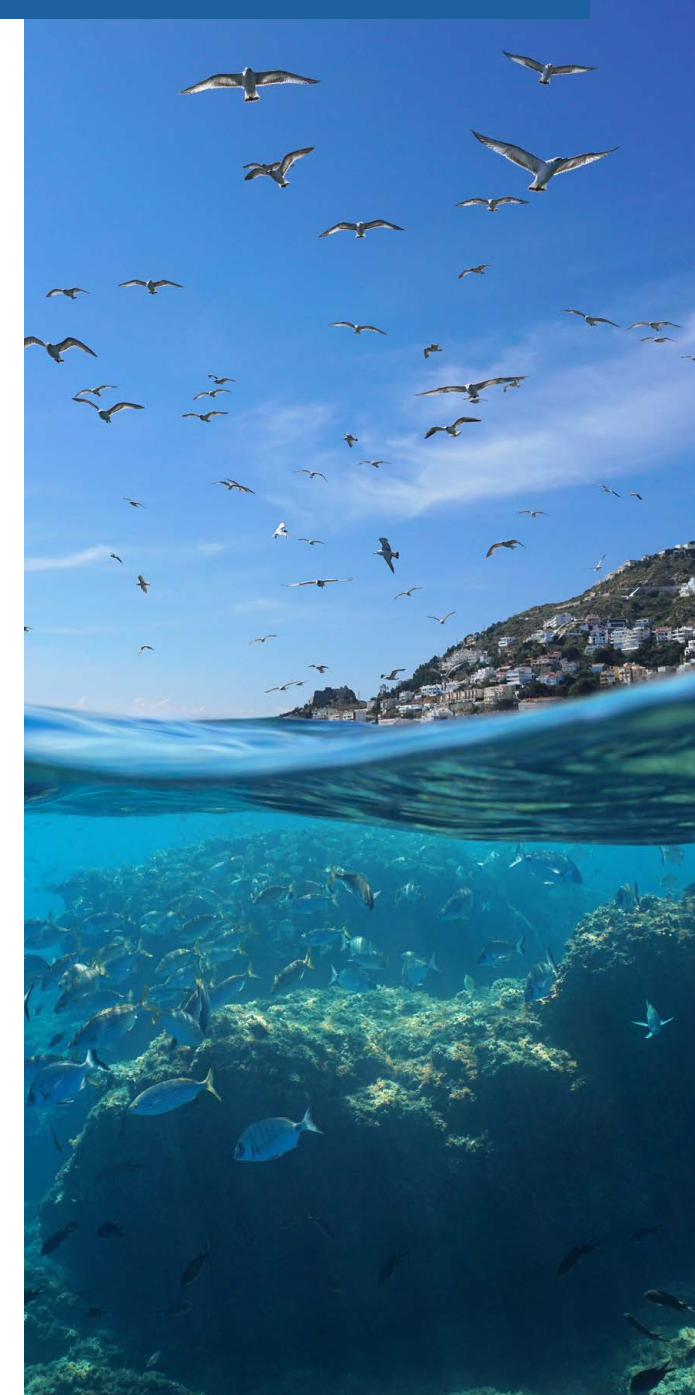
- Offshore renewables: Asset-level data on sites, licences, operators and equipment is generally accessible through national agencies, and regional and industry portals, and can be linked to specific companies and projects
- Marine transportation: Automatic Identification System (AIS) data, tracking the position of vessels, as well as

vessel characteristics' data, is widely available and can be connected to relevant transportation activities, companies and investments

- Ports and coastal infrastructure: Data on key ports' activities and infrastructures can be leveraged, as well as shipping data connected to ports.
- Offshore extractives: For oil and gas activities, geolocated data on sites, licences, pipelines and operators is generally available, accessible through national agencies' portals and regional portals. For aggregates and mineral extraction, disclosures on main points and areas for extraction may be used when available. For the sensitive issue of deep-sea mining, the International Seabed Authority (ISA) [Deep Seabed and Ocean Database](#) has been set to cover exploratory contracts' activities in the high seas.

8.5 Ways forward

In order to better integrate marine biodiversity into financial decision-making, there is a need to develop a wider set of methodologies that can be used to measure the impacts and dependencies of economic activities on the marine biodiversity of different ecoregions. The development or extension of environmental and cumulative impact assessment models to cover a wider set of marine pressures and impacts is needed to translate data on economic activities into more comprehensive assessments of their impacts on marine biodiversity. In conjunction, there is a need for enhancing corporate disclosure in material sectors, including geolocated and site-specific data. All these initiatives should pave the way for the integration of fit for purpose blue metrics into the landscape of tools used by FIs. At the same time, FIs can start to assess their impacts and dependencies on marine ecosystems with the data and tools that are already available.



9. Next steps

This guide is one of the many steps in the journey towards measuring the biodiversity impacts and dependencies of investments and finance activities. We encourage FIs to test and apply the tools currently available. Through the F&B Community under the EU B&B Platform and the FfB Foundation we will continue to share knowledge and best practices while consolidating new market insights. More information on how to get started with assessments and how to integrate biodiversity into operations and decision-making for FIs can be found in the '[Act Now](#)' guide.

This review includes new tools and methodologies to assist FIs in understanding their relationship with nature. Such tools bring in different perspectives and data that are helpful to investment decision making. Specifically, they should expand to incorporate mainstream data providers in the finance sector, as well as data that sheds light on nature-related risks and opportunities.

9.1 Using the approaches wisely

The biodiversity measurement approaches included in this guide are a *useful way to understand where potential impacts and dependencies might lie* and to focus attention and effort within a portfolio of investments. Additionally, which nature-related risks derive from the interactions of portfolio companies with biodiversity. We encourage FIs to use these measurement approaches by keeping two things in mind:

Firstly, some of the tools described in this guide currently assess *potential (modelled) impacts and dependencies*, rather than actual, on-the-ground measurement of impacts and dependencies on biodiversity. The actual impact a company exerts on biodiversity might deviate from the

modelled potential impact. Furthermore, some tools, such as ENCORE, are based on sector averages rather than company-level data. Making wise use of modelled impact data implies:

- Using the results only for purposes for which they can be usefully employed, such as estimating portfolio impacts and dependencies, monitoring and screening biodiversity risks and opportunities, investor engagement programs, training portfolio managers, and understanding the relative contribution of different drivers of loss, scopes, asset classes, value chains and sectors to focus efforts on reversing and halting biodiversity loss.
- Data on potential, estimated impacts and dependencies can and should not be used for 'stock picking'.**
- Supplementing biodiversity footprinting tools with geolocation tools, such as IBAT, and/or data on companies' involvement in ESG-related incidents or controversies. This would help identifying issues linked to location or corporate action not currently covered in footprinting assessments.
 - (Collectively) engaging with companies for further disclosure of company-specific information which can improve the accuracy of the tools, by replacing modelled data with actual company data (as is already occurring with greenhouse gas emissions data) and to provide information on company locations.

Secondly, *not all the drivers of biodiversity loss and scopes are covered* by all the biodiversity measurement approaches. For instance, most approaches underrepresent impacts on the marine environment and do not yet include impacts of alien invasive species. Furthermore, some tools do not include resource exploitation beyond water use, or downstream impacts. Furthermore, the biodiversity impacts of marine sectors (shipping, aquaculture, fisheries etc), construction, chemicals, agriculture, and transportation might be understated by the biodiversity footprinting tools described in this guide. Making wise use of their outputs implies:

- Knowing and disclosing which pressures and scopes are excluded and included by the approach that is used.
- Supplementing tools and methodologies with qualitative data on the pressures not covered by the tool and the sectors for which these are material.

Please, see the [FfB Multi-tool study report](#) (Recommendations p19-23) for a comprehensive description of the challenges, implications and recommendations for FIs, companies, tool developers and data providers on the biodiversity measurement and data fields.

9.2 Collaborating on further developments

The field of biodiversity impact and dependency assessment is relatively new and rapidly evolving. The current diversity of approaches provides valuable innovation in this space. This, coupled with sharing of lessons learned across the measurement tools, is needed to enable a step change in our ability to measure our interactions with biodiversity.

In addition, we believe the following areas for alignment in relation to biodiversity impact and dependency measurement would be useful:

- Agreement on appropriate scopes to include for each sector, particularly in relation to scope 3 downstream impacts.
- Agreement on the basic coverage of drivers of loss that should be considered (quantitatively or qualitatively).

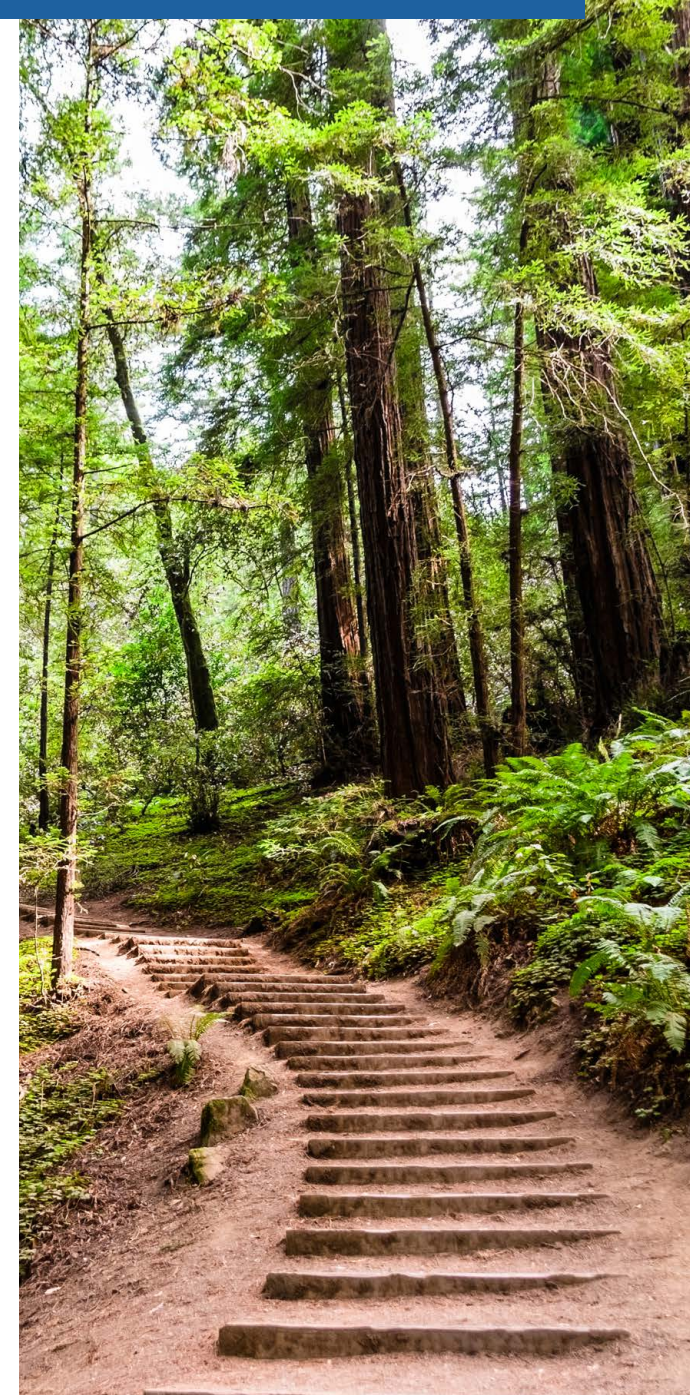
Furthermore, collaboration and further development is needed in the following areas:

- Until corporate disclosures improve, there is a need to agree upon a standard way of addressing data gaps in revenue data and of allocating company revenue to subsectors and geographies. For this, the creation of an open-source facility for key data sets of companies' revenue (e.g., revenue data, sector attribution and land assets in different regions) is recommended.
- Securing enhanced corporate disclosure of companies' contributions to pressures, which can provide robust and actual data inputs into the models.

- Ultimately, creating an open-source facility with disclosed company-level data (e.g., emissions, land assets in different regions, value chains, etc.) to be used as input into biodiversity footprinting calculations. In this regard, some existing efforts, such as TNFD's Public Data Facility or FfB Foundation's Biodiversity Data Platform, could provide more clarity for this purpose.
- Incorporating a broader range of pressures in key models global nature-related public data facility and signalled its intentions to continue to evaluate the concept further such as GLOBIO or ReCiPe, e.g., drivers of biodiversity loss in the marine environment.
- Extending from the assessment of negative impacts to the assessment of dependencies, (potential) positive impacts, and opportunities for systemic change.

Initiatives such as PBAF and TNFD are actively working to address some of these areas for collaboration and alignment, alongside the FfB Foundation.

Meanwhile, we will continue to update this guide on a regular basis, as the measurement approaches and their applications evolve.



10. Sources and more readings

[Act Now! guide - The why and how of biodiversity integration by financial institutions](#). December 2022, Finance for Biodiversity Foundation (FfB Foundation)

[Additional guidance for financial institutions](#). July 2024, Taskforce on Nature-related Financial Disclosures (TNFD)

[Assessment of Biodiversity Measurement Approaches for Businesses and Financial Institutions: Update Report 1](#). November 2018, EU Business & Biodiversity Platform

[Assessment of Biodiversity Measurement Approaches for Businesses and Financial Institutions: Update Report 2](#). December 2019, EU Business & Biodiversity Platform

[Assessment of Biodiversity Measurement Approaches for Businesses and Financial Institutions: Update Report 3](#). March 2021, EU Business & Biodiversity Platform

[Assessment of Biodiversity Measurement Approaches for Businesses and Financial Institutions: Update Report 4](#). December 2022, Business & Biodiversity Platform

[Assessment of Biodiversity Measurement Approaches for Businesses and Financial Institutions: Update Report 5](#). October 2024, EU Business & Biodiversity Platform

[Biodiversity Finance Metrics for Impact Reporting](#). October 2024, International Finance Corporation (IFC)

[Biodiversity measurement approaches for businesses and financial institutions](#). Thematic report: Biodiversity Data. March 2022, EU Business & Biodiversity Platform

[Biodiversity disclosures initiatives](#). Thematic report. Updated version August 2022, EU Business & Biodiversity Platform

[Biodiversity footprinting approaches for Financial Institutions](#). May 2024, Taskforce on Nature-related Financial Disclosures (TNFD)

[Briefing paper: Top 10 biodiversity-impact ranking of company industries](#). April 2023, Finance for Biodiversity Foundation (FfB Foundation)

[Common ground in biodiversity footprint methodologies for the financial sector](#). October 2018, CREM, PRé Consult, CDC Biodiversité, ASN Bank and ACTIAM

[Engaging finance on biodiversity](#). Workstream Finance, EU Business & Biodiversity Platform

[EU Business & Biodiversity \(EU B&B\) Platform](#). European Commission

[Finance for Biodiversity \(FfB\) Pledge](#). Finance for Biodiversity Foundation (FfB Foundation)

[Findings of a high level scoping study exploring the case for a global nature-related public data facility](#). August 2023, Taskforce on Nature-related Financial Disclosures (TNFD)

[Guide on biodiversity measurement approaches \(3rd edition\)](#). February 2024, Finance for Biodiversity Foundation (FfB Foundation) and the EU Business & Biodiversity Platform

[Guidance on the identification and assessment of nature-related issues: the LEAP approach](#). October 2023, Taskforce on Nature-related Financial Disclosures (TNFD)

[Guidance to the Finance for Biodiversity Pledge](#). December 2020, Finance for Biodiversity Foundation (FfB Foundation)

[Investing in a Biodiversity-Integrated Manner](#). June 2022, World Economic Forum

[Measuring your impacts and dependencies on biodiversity](#). Workstream Methods, EU Business & Biodiversity Platform

[Multi tool study – Assessment of the biodiversity impacts and dependencies of globally listed companies](#). October 2024, Finance for Biodiversity Foundation (FfB Foundation)

[Nature's Dangerous Decline 'Unprecedented' Species Extinction Rates 'Accelerating'](#). May 2019, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)

[Nature in a Haystack: Leveraging Public Nature-related Data in Disclosure Frameworks](#). April 2022, UNEP FI

[Open-source Biodiversity Data Platform Initiative](#). Technical scoping paper. February 2022, Finance for Biodiversity Initiative

[PBAF Standard v2023 – Dependencies](#). Partnership for Biodiversity Accounting Financials (PBAF)

[Recommendations of the TNFD](#). September 2024, Taskforce on Nature-related Financial Disclosures (TNFD)

[Initial guidance for business](#). September 2020, Science-based Targets for Nature (SBTN)

[Sector guidance: Additional guidance for financial institutions](#). September 2023, September 2023, Taskforce on Nature-related Financial Disclosures (TNFD)

[State of Nature Metrics](#). Nature Positive Initiative (NPI)

[Taking biodiversity into account. A biodiversity standard for the financial industry](#). June 2022, Partnership for Biodiversity Accounting Financials (PBAF)

Colophon

This guide is produced by the Finance & Biodiversity Community (F&B Community, part of the EU Business & Biodiversity Platform) together with the Finance for Biodiversity Foundation, the tool developers and in collaboration with the Workstream Methods of the EU Business & Biodiversity Platform. This fourth edition was published in October 2024 based on input from the tool developers.

European Business & Biodiversity Platform

As part of the EU Business & Biodiversity Platform, the members of the Finance and Biodiversity Community have been sharing practices on measuring biodiversity impact since 2017. In addition, the Workstream Methods has been assessing different measurement approaches that are under development and in use. This guide is aligned with other reports developed by the Workstream Methods. Both the F&B Community and the Workstream Methods collaborate closely and are part of the EU Business & Biodiversity Platform.

Finance for Biodiversity Foundation

In September 2020, members of the F&B Community launched the Finance for Biodiversity Pledge, encouraging other Financial institutions in their network to join. In 2021, the Finance for Biodiversity Foundation was set up to further facilitate collaboration amongst the Pledge signatories. A first summary on measurement was included in the [Guidance document](#) accompanying the Pledge. This guide provides further information as an annex to the Guidance document. In 2022, a [Multi-tool analysis](#) was performed by the FfB Foundation in collaboration with the biodiversity footprinting tools. Additionally, in 2024 a second [Multi-tool study](#) was released by the Finance for Biodiversity Foundation, covering both impacts and dependencies for more than 2,300 companies from both developed and developing markets.

Invitation to join

Financial institutions from all continents are encouraged to measure the impacts on biodiversity and dependencies on ecosystem services from their portfolios, investments and loans. They are invited to share practices under the EU Business & Biodiversity Platform and collaborate under the Finance for Biodiversity Foundation to help shape the next steps towards reversing nature loss in this decade.

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