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Comparative Analysis of Biodiversity Measurement Approaches for Public Development Banks

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Comparative analysis of biodiversity measurement approaches for public development banks

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Résumé

La perte de biodiversité apparaît comme un défi mondial majeur, avec des implications importantes pour la soutenabilité des résultats de développement. En réponse à cela, les banques publiques de développement (BPD) tentent de plus en plus de financer des opérations alignées avec les engagements mondiaux tels que le Cadre mondial pour la biodiversité (CMB), les recommandations du Groupe de travail sur les informations financières liées à la nature (TNFD) et la Directive de reporting extra-financier sur la durabilité des entreprises (CSRD). Dans le cadre de cet démarche d'alignement, la capacité à évaluer les impacts, les dépendances et les contributions en matière de biodiversité devient essentielle tant pour la prise de décision en matière d'investissement que pour la redevabilité sociétale.Cette étude comparative, menée par l'AFD et la Banque Européene pour la Reconstruction et le Développement (BERD), visait à évaluer la pertinence et la facilité d'utilisation de six outils de mesure de la biodiversité pour des opérations financées par des BPDs. Ces outils ont été testés sur des cas d'investissement réels dans différents secteurs (énergie, infrastructures, agriculture et eau) sur quatre continents. L'étude avait pour objectif d'évaluer comment ces outils peuvent être déployés à différentes étapes du cycle d'investissement, de l'identification du projet à la mesure de l'impact et à l'établissement de rapports d'analyse de portefeuille.Une conclusion importante de cette étude est que, même si la plupart des outils sont techniquement capables de fournir des évaluations significatives, leur utilisation efficace est souvent limitée par la disponibilité et la qualité des données spécifiques au projet. De nombreuses BPD doivent opérer sous contrainte de rapidité et doivent réduire la charge administrative pesant sur leurs clients, ce qui rend difficile la collecte systématique des données granulaires nécessaires à des évaluations précises. En conséquence, la plupart des applications s'appuient sur des données modélisées ou moyennes au niveau sectoriel, ce qui limite la capacité des outils à éclairer les décisions spécifiques aux projets financés. Ce n'est donc pas un défaut des outils eux-mêmes, mais plutôt le reflet des réalités opérationnelles qui empêchent leur plein potentiel d'être exploité.

Parmi les outils examinés, STAR et ABC-Map permettent de mener des évaluations localisées et détaillées sur le plan spatial, ce qui les rend particulièrement adaptés à l'identification des zones à forte biodiversité ou des possibilités de restauration. Cependant, ces outils nécessitent également des données géospatiales détaillées et sont moins pratiques pour les projets d'infrastructures localisées ou linéaires. Des outils tels que GBS, CBF et BioScope sont plus performants au niveau des entreprises ou des portefeuilles. Ils permettent aux institutions d'estimer l'empreinte écologique en matière de biodiversité sur la base de données d'investissement sectorielles, mais ils généralisent souvent les résultats, sans refléter les conditions réelles de la biodiversité sur le terrain. ENCORE est un outil de criblage utile pour explorer les dépendances aux services rendus par les écosystémes, bien que ses résultats soient de nature stratégique plutôt qu'exploitables au niveau des projets.

L'analyse comparative a également révélé des difficultés dans l'interprétation des résultats des outils. Les différences entre les indicateurs, les unités d'analyse et les systèmes de classification des impacts compliquent les comparaisons entre les outils. De plus, les facteurs d'impact suggérés par les outils doivent être interprétés avec prudence en fonction du contexte réel du projet. Sans cette contextualisation, les résultats peuvent sembler trompeurs ou non pertinents, en particulier lorsque les pressions modélisées ne correspondent pas aux contributions ou aux risques réels du projet. Cela était évident dans le cas des projets de préservation de la biodiversité et de dépollution, où les outils ont signalé des facteurs d'impact peu pertinents ou déjà traités par des mesures d'atténuation. Les effets favorables à la nature de certaines activités (agriculture durable, sylviculture durable, lutte contre le braconnage) étaient généralement mal reflétés dans les résultats des outils.

Malgré ces défis, les outils de mesure de la biodiversité restent précieux pour le criblage à grande échelle, l'évaluation initiale des risques et la planification préliminaire. Utilisés à bon escient, ils peuvent aider les PDB à aligner leurs investissements sur des objectifs positifs pour la nature et à identifier les interventions nécessitant des évaluations supplémentaires. Pour une utilisation plus efficace, il est toutefois nécessaire de renforcer les protocoles de collecte de données sur les interventions et d'intégrer davantage les considérations relatives à la biodiversité dans la conception des projets.

Cette étude conclut qu'aucun outil ne peut à lui seul répondre à tous les besoins des BPD en matière d'évaluation de la biodiversité. Cependant, une combinaison judicieuse d'outils, adaptée au type de projet, aux données disponibles et aux objectifs analytiques, peut apporter une valeur ajoutée significative. Les BPD sont encouragés à adopter une approche à plusieurs niveaux : commencer par un examen général à l'aide des outils disponibles, puis approfondir l'analyse à mesure que davantage de données deviennent disponibles et sur les projets examinés qui semblent poser davantage de problèmes. En outre, l'alignement du choix des outils sur les nouvelles exigences en matière de divulgation et de reporting contribuera à garantir la cohérence et la comparabilité entre les institutions.

À l'avenir, les PDB devraient s'attacher à renforcer leurs capacités internes, à améliorer l'accès aux données sur la biodiversité et à s'engager dans un apprentissage entre pairs afin d'affiner leur utilisation de ces outils. Cette étude fournit un point de départ pratique pour institutionnaliser la mesure de la biodiversité dans le financement du développement et contribue à l'effort plus large visant à placer la nature au cœur des stratégies de développement durable.

Mots-clés :

Métrique biodiversité, Pro-nature, Risques liés à la nature, Banques Publiques de Développement, Cible 15 du CMB, TNFD

Abstract

Biodiversity loss is emerging as a critical global challenge, with significant implications for long-term development outcomes. In response, public development banks (PDBs) are increasingly aligning their operations with global commitments such as the Global Biodiversity Framework (GBF), the Taskforce on Nature-related Financial Disclosures (TNFD), and the Corporate Sustainability Reporting Directive (CSRD). As part of this alignment, the ability to assess biodiversity impacts, dependencies, and contributions becomes central to both investment decision-making and accountability.

This comparative study, led by AFD and EBRD, was designed to assess the relevance and usability of six biodiversity measurement tools within the operational context of PDBs**.** These tools were tested against real-world investment cases across different sectors—energy, infrastructure, agriculture, and water—on four continents. The study aimed to evaluate how these tools can be deployed at different stages of the investment cycle, from project identification to impact measurement and portfolio-level reporting.

A key insight from this study is the recognition that while most tools are technically capable of delivering meaningful assessments, their effective use is often constrained by the availability and quality of project-specific data. Many PDBs operate under time constraints and the request to reduce the administrative burden on clients, making it difficult to systematically collect the granular data required for accurate assessments. As a result, most applications rely on modelled or average sector-level data, which limits the tools' capacity to inform project-specific decisions. It is therefore not a shortcoming of the tools themselves, but rather a reflection of operational realities that hinder their full potential.

Among the tools examined, STAR and ABC-Map offer location-specific and spatially detailed assessments, making them especially suitable for identifying high-biodiversity areas or restoration opportunities. However, these tools also require detailed geospatial data and are less practical for site-specific or linear infrastructure projects. Tools such as GBS, CBF, and BioScope perform better at the corporate or portfolio level. They allow institutions to estimate biodiversity footprints based on sectoral investment data, but often generalize results, failing to reflect actual on-the-ground biodiversity conditions. ENCORE serves as a useful screening tool to explore ecosystem service dependencies, although its outputs are strategic rather than actionable at the project level.

The comparative analysis further revealed challenges in interpreting tool outputs. Differences in metrics, units of analysis, and impact classification systems complicate cross-tool comparisons. Additionally, impact drivers suggested by the tools must be carefully interpreted against the project's real context. Without such contextualization, results may appear misleading or irrelevant, particularly when modelled pressures do not align with actual project risks or contributions. This was evident in the case of biodiversity preservation and depollution projects, where the tools flagged impact drivers that had little relevance or had already been addressed through mitigation measures. The pro-nature effects of some activities (sustainable agriculture, sustainable forestry, anti-poaching) were generally poorly reflected in the tools outputs.

Despite these challenges, biodiversity measurement tools remain valuable for high-level screening, initial risk assessment, and early-stage planning. When used judiciously, they can support PDBs in aligning investments with nature-positive goals and identifying where further assessments are needed. For more robust use, however, there is a need to strengthen data collection protocols and integrate biodiversity considerations more deeply into project design.

This study concludes that no single tool can meet all biodiversity assessment needs of PDBs. However, a thoughtful combination of tools—tailored to project type, available data, and analytical objectives—can provide significant value. PDBs are encouraged to adopt a tiered approach: starting with high-level screening using available tools, then deepening analysis as more data becomes available and on more potentially problematic screened projects. Additionally, aligning tool selection with emerging disclosure and reporting requirements will help ensure consistency and comparability across institutions.

In moving forward, PDBs should focus on building internal capacity, improving access to biodiversity data, and engaging in peer learning to refine their use of these tools. This study provides a practical starting point for institutionalizing biodiversity measurement in development finance and contributes to the broader effort of embedding nature at the heart of sustainable development strategies.

Keywords: Biodiversity measurement, Nature positive, Nature-related risks, Public Development Banks, GBF Target 15, TNFD

Areas: Worldwide

Acknowledgment

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Disclaimer

The study was conducted early 2024, based on the current state of development and testing of the tools and methods discussed. The findings, conclusions, and recommendations reflect the state of knowledge and the performance of the tools at the time of writing. Any future updates or developments in the tools or their functionality may impact the relevance and applicability of the information provided in this document. Therefore, we advise reviewing the latest versions of the tools or consulting updated documentation before making any decisions based on this work.

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1- Introduction

Public Development Banks (PDBs) are instrumental in financing sustainable development projects worldwide, particularly in sectors like energy, infrastructure, agriculture, and forestry. **At the same time PDBs are increasingly recognizing that their investments must align with biodiversity conservation goals, not only to meet regulatory requirements but also to reduce operational risks and improve long-term sustainability**[1]. Biodiversity loss poses significant risks to businesses and economies, particularly in sectors that rely heavily directly or through their value chains on ecosystem services, such as water provision or quality, soil fertility or erosion control, and climate regulation (Dasgupta, 2021; Richardson et al, 2024; WEF, 2025).

As a result, integrating biodiversity considerations into investment decision-making is crucial for PDBs to ensure the long-term viability of their projects and their contribution to sustainable development objectives. This trend is fuelled by assessment policy goals like the Target 15 of Kunming Montreal Global Biodiversity Framework[2], reporting guidelines like the Taskforce on Nature-related Financial Disclosures (TNFD, 2023) and regulatory frameworks like the Corporate Sustainability Reporting Directive (CSRD)[3] which require companies and financial institutions to assess and report on their impacts and dependencies on nature.

In response, PDBs are exploring various biodiversity measurement approaches to assess biodiversity performance and align their investments with global biodiversity goals. Biodiversity measurement approaches allow PDBs to better quantify the environmental impacts of their projects on biodiversity, identify key risks and dependencies, develop strategies to mitigate negative impacts and enhance positive ones. **However, selecting the most appropriate tools remains a challenge, as biodiversity is complex and context dependent and tools differ in costs, accessibility to staffs and input data intensity**. Different approaches offer varying levels of granularity, accuracy, and coverage, depending on their data sources, metrics, and intended applications.

In this context, AFD's ECOPRONAT research programme[4], initiated a study to prepare a comparative analysis of six biodiversity metrics submitted to Agence Française de Développement (AFD) and the European Bank for Reconstruction and Development (EBRD) by the consultancy firm The Biodiversity Consultancy, namely:

- **CBF** (Corporate Biodiversity Footprint)

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[1] See the Multilateral Development Banks' common principles for tracking nature-positive finance (https://the-docs.worldbank.org/en/doc/2172d705757311c25a67451763548735-0320012023/original/2023-0329-MDB-Common-Principles-V3.pdf) and the International Development Finance Club work Nature finance (https://www.idfc.org/news/idfc-taking-the-lead-on-nature-biodiversity-at-fics-2025/)

[2] https://www.cbd.int/gbf

[3] https://finance.ec.europa.eu/regulation-and-supervision/financial-services-legislation/implementing-and-delegated-acts/corporate-sustainability-reporting-directive_en

[4] https://www.afd.fr/en/ecopronat-research-promote-development-pro-nature-economy

- BFFI (Biodiversity Footprint Financial Institutions) implemented through **BioScope**
- **STAR** (Species Threat Abatement and Restoration)
- **ABC-Map** (Agriculture, Biodiversity, and Carbon Map)
- **GBS** (Global Biodiversity Score)
- **ENCORE** (Exploring Natural Capital Opportunities, Risks, and Exposure).

A preliminary study conducted in 2023 proposed several protocols for using these metrics and comparing their results, which were used to carry out the comparative analysis presented in this synthesis report (The Biodiversity Consultancy, 2023). These six biodiversity measurement approaches were selected for their relevance to PDBs operations and their ability to provide insights into both direct project impacts and dependencies toward biodiversity and value chain-level effects.

Indeed, there is a double materiality of the risks associated with the loss of biodiversity for PDBs, stated as follows:

Risks associated with the **dependence** of economic activities on biodiversity and ecosystem services suffering from chronic or sudden degradation;

Risks associated with the **impacts of economic activity** on the components of biodiversity that may be reduced by regulatory means, technological innovations or changes in consumer behavior;

These risks apply to the **direct** activities of the companies and financial institutions that finance them but may also concern **indirect** activities, through **the value chains upstream or downstream** of the financed activities (NGFS, 2023; Hadji Lazaro, 2025; Maurin et al, 2025).

The comparative analysis aims to provide an overview of the tools' performance in different project contexts, ranging from infrastructure development to agribusiness. The goal is to assess what these biodiversity measurement approaches can bring to the PDBs environmental diligences on direct and indirect impacts, negative and positive impacts measurement (pressure, dimensions, scopes), and how they can complement traditional processes, such as Environmental and Social Impact Assessments (ESIAs). The expected result of this study is to help PDBs to identify the added value of these tools for project selection, mitigation measures and impact monitoring, as well as for reporting on their financing activity.

This report first presents the methodology used to carry out the comparative analysis between tools, the results of nine concrete case studies, a discussion of what these tools can bring to current investment processes, limitations related to these tools in relation to PDBs' needs, and finally, recommendations for the use of these biodiversity measurement approaches by the PDBs.

2 - Methodology

The methodology used in this research study involves the comparative testing of six biodiversity measurement approaches — CBF, BioScope, STAR, ABC-Map, GBS, and ENCORE — across a selection of nine projects funded by PDBs. These "tools" were evaluated based on their capacity to assess biodiversity risks and opportunities, through economic activities impacts and dependencies toward biodiversity, as well as their ability to complement traditional due diligence processes, such as ESIAs. The testing process involved applying each tool to specific case studies, including projects in sectors such as energy, infrastructure, and agriculture.

Please note that, throughout this report, biodiversity measurement approaches are also referred to as "tools," although this terminology may not always accurately reflect their scope.

2.1. Description of the tested tools

This section provides a general overview of the six selected biodiversity measurement approaches[5]: **CBF** (Corporate Biodiversity Footprint), **BFFI** (Biodiversity Footprint Financial Institutions) implemented through **BioScope**, **STAR** (Species Threat Abatement and Restoration metric), **ABC-Map** (Agriculture, Biodiversity, Carbon Map), **GBS** (Global Biodiversity Score), and **ENCORE** (Exploring Natural Capital Opportunities, Risks, and Exposure).

The tools are categorized into two groups based on their scope: **direct operation tools** and **value chain tools**. Direct operations tools are designed to primarily focus on a project's or organization's direct impacts and dependencies (STAR, ABC-Map and ENCORE), whereas value chain tools extend the scope to include parts, or the entire supply chain (upstream, direct operations, downstream) related to a project or organization's operations or organization (GBS, CBF, BioScope).

Table 1. Overview of biodiversity measurement approaches described in this document.

	Tool name	Description
Value chain tools	Biodiversity Footprint Financial Institutions (BFFI), implemented through BioScope	Developers: ASN Bank / CREM / PRé Sustainability The BFFI is designed to provide an overall biodiversity footprint of the economic activities of a financial institution, a company or a site. The tool allows calculation of the environmental impacts of those activities based on scientific life cycle assessment (LCA) methodologies and the biodiversity footprint of an investment portfolio, company or site. In this study, BFFI was implemented through BioScope, a biodiversity screening tool which provides users with an estimation of where the most important impacts on biodiversity in their value chain (scope 1, 2, and 3 upstream) could be.
	Corporate Biodiversity Footprint (CBF)	Developer: Iceberg Data Lab

[5] The tools were selected from a previous study: Preliminary comparative analysis of biodiversity measurement approaches for public development banks | AFD - Agence Française de Développement

	Tool name	Description
		The Corporate Biodiversity Footprint measures the impact of corporates on biodiversity by means of a biodiversity footprint. It is designed to serve the needs of financial institutions to have a science-based and scalable approach capable of covering large portfolios with a bottom-up approach covering the most material impacts of constituents throughout their value chain.
	Global Biodiversity Score® (GBS®)	Developer: CDC Biodiversité The Global Biodiversity Score (GBS) is a corporate biodiversity footprint and dependency assessment tool which assesses the biodiversity impacts and dependencies of economic activities across their value chain, in a robust and synthetic way.
Direct operations tools	Species Threat Abatement and Restoration metric (STAR)	Developers: BirdLife International / Conservation International / IUCN / UNEP-WCMC STAR measures the contribution that investments can make to reducing species extinction risk. It can help the finance community and investors target their investments to achieve conservation outcomes and can measure the contributions these investments make to global targets such as the SDGs or target 4 of the Global Biodiversity Framework.
	Adaptation, Biodiversity and Carbon Mapping Tool (ABC-Map)	Developers: FAO / AFD The Adaptation, Biodiversity and Carbon Mapping Tool aims to find synergies between climate, biodiversity, and land restoration by providing users with a baseline situation of the area before the start of the project and looking at the potential impacts of the project's activities on the area, through a comparison of with and without project situation over a period of time.
	Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE)	Developers: Global Canopy / UNEP-FI / UNEP-WCMC ENCORE's nature capital module enables users to visualize how the economy potentially depends on and impacts nature and how environmental change creates risks for businesses, for each sector, sub-industry and production processes. For agricultural projects, the biodiversity module provides a quantified estimate of impact of agriculture and pasture based on information about cropland / pastureland area and country where it is located.

It is important to keep in mind for the rest of the study that most of these measurement approaches were not developed for the needs of PDBs but for evaluating the activity of a financial institution, a company, or a given site. Although these approaches are not specifically tailored to the needs of PDBs, it was decided to study them in this research because they have been recommended in various publications as useful for analyzing the dependencies and impacts of financial institutions' activities (Finance for Biodiversity, 2022; Lammerant, 2022).

2.2. Summary of the analyzed projects

The tools were tested on nine projects funded by AFD or EBRD in **various sectors** (energy, agriculture, forestry, infrastructure, water sanitation), and **geographies** (central America, central and west Africa, Asia and Europe). Each project represents different levels of biodiversity gains (through sustainable management of forest or pollutions reductions) and risks, from direct to indirect impacts relating to local species population, potential encroachment to deforestation in classified forest or risk of pollution into a sensitive environment. **Projects were selected by AFD and EBRD in order to be representative of the types of projects financed by development banks, in terms of geography and sector of intervention.**

Table 2. Brief projects descriptions

N° of project	Geography	Sector	Objectives	Main activities financed
1	Central Africa	Biodiversity/ Forestry	Supports the economic diversification of the forestry and agriculture sector by supporting its development at the local level, while promoting sustainable landscape management, the forests preservation and their biodiversity	- Sustainable forestry - Sustainable agriculture - Increased environmental patrols
2	West Africa (Sahel)	Forestry/Agriculture	Improve the sustainability of wood energy supply while reducing consumption by the main urban and peri-urban markets in 32 municipalities.	- Forest management activities - Restauration and assisted natural regeneration
3	Central America	Agriculture/ Rural development	Reduce the contribution of agriculture to greenhouse gases emissions while supporting more resilient agriculture by promoting sustainable agricultural and forestry.	- Solar panels on farmland - Drip irrigation system
4	Asia	Energy/Hydroelectricity	Combat greenhouse gas emissions, and thus global warming, by enabling the government to meet the growing demand for electricity without increasing its carbon intensity, through the use of renewable energy.	- Construction of a diversion dam and its power generation for a hydroelectricity project
5	West Africa (Sahel)	Energy	Increase the capacity for trading electricity (>600MW), reduce the cost of electricity supply, increase access to electricity and increase revenue from electricity trade.	- Construction of a 33km powerline around a major city
6	West Africa (Sahel)	Wastewater treatment (depollution)	Restore the quality of the coastal water near a major city by setting up wastewater collection and treatment infrastructure and discharging treated water into the sea, and by introducing the polluter-pays principle.	- Wastewater collection infrastructure (interceptor), primary wastewater treatment (STEP) and discharge of treated water into the sea (outfall) - Construction of the network connecting households and industries to the wastewater treatment system
7	Northern Africa	Energy/Renewable energy	Promote public-private partnerships in the power sector and increase the share of renewables in the energy mix in line with the country's green energy transition agenda and reduce reliance on costly hydrocarbon imports.	- Development of a 100 MW wind power project - Construction of two high voltage power lines over a length of 10 km
8	South-eastern Europe	Transportation	Improve connectivity between the two neighboring countries, and between the Western Balkans and the European Union, facilitating international transport and trade in the region.	- Construction of a 10.7 km-long road section
9	South-eastern Europe	Agribusiness	Enhancing and optimizing crop farming operations including through significantly enlarging the irrigated area and modernizing dairy operations with the aim of improving the quality of milk and milk yield through the replacement of the old dairy farms with state-of-the-art new ones.	- Investments in crop farming improvements - Construction of a new alfalfa factory and of an animal feed factory - Modernization of its dairy farms' operations.

2.3. Methodological steps and evaluation criteria

2.3.1. Prerequisites to run the tools

The first step in the research study was to understand the **data requirements and prerequisites for the implementation** of the test plan (The Biodiversity Consultancy, 2023). To this end, a cross-analysis was carried out to identify both the type of data required to run each tool and the type of data available for each of the selected projects, based on project appraisal and monitoring documents.

Data collection was the backbone of the test plan implementation. In fact, a proper understanding of the data required for each biodiversity measurement approach, as well as the process for collecting the required data, is paramount to conducting effective analyses with the selected tools. The results of this analysis are presented in part 0.

2.3.2. Assessment framework: The Biodiversity Measurement Navigation Wheel 2.0

The assessment of selected biodiversity measurement tools was conducted using **the Biodiversity Measurement Navigation Wheel 2.0** (Figure), a structured decision-making framework developed by Arcadis for the European Business and Biodiversity Platform (EU Business @ Biodiversity Platform, 2022). This framework is designed to support users in selecting the most suitable biodiversity assessment tools based on a set of key decision criteria, identified as critical in determining the selection of a measurement approach or tool by businesses or financial institution. Designed from a user-centric perspective, it allows organizations to prioritize and apply the criteria most relevant to their specific context.

The wheel involves a systematic elimination process, where approaches that do not align with the organization's preferred selection criteria are excluded. The framework provides full **flexibility**, as **no specific hierarchy exists among the criteria**. However, it is recommended to begin with the *Business Context criterion (see*

Table 3below for definition), as it facilitates the elimination of non-relevant approaches and lays the foundation for a well-informed selection process.

Once the Business Context criterion is applied, the remaining approaches can be assessed sequentially using the other decision criteria. The Wheel is divided into seven key criteria, covering various aspects such as the operational sector and the specific biodiversity pressures the user intends to evaluate. One of its primary advantages is its non-prescriptive nature—there is no mandatory step-by-step process for tool selection. Instead, users define their business context first and then refine their selection by applying additional criteria until they identify the most suitable tool for their needs.

This flexible and structured approach ensures that businesses and financial institutions can efficiently navigate the complex landscape of biodiversity measurement tools, ultimately supporting better integration of biodiversity considerations into decision-making processes.

For the purposes of this research study, the seven criteria of the Navigation Wheel were completed to reflect several specific considerations:

- ***Input data analysis:*** *to compare the requirements of each tool and the implication for PDBs (see section 0)*
- ***Coverage****: Tools were assessed for their ability to provide insights into biodiversity dependencies and positive biodiversity outcomes, such as species restoration or habitat enhancement. This part was integrated into the 0 section.*
- ***Emission scope****: Tools were assessed regarding the boundaries of what is included when measuring impacts (direct, indirect, value chain…). This part was also integrated into the 0 section.*

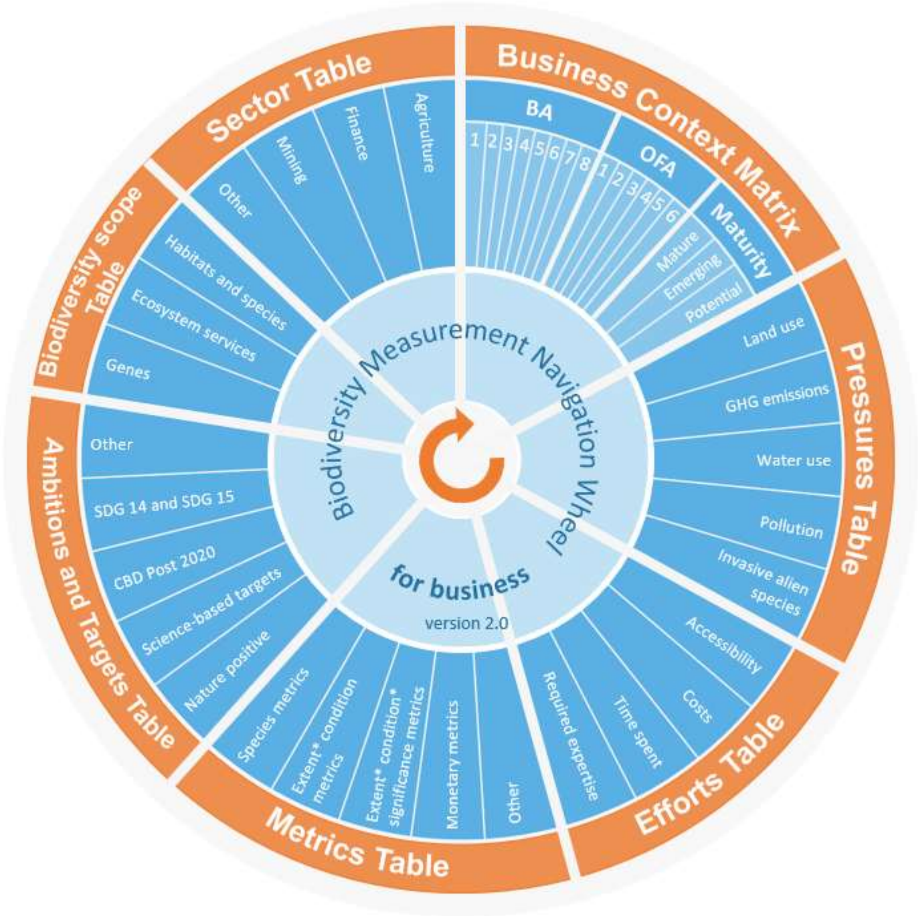


Figure 1. The Biodiversity Measurement Navigation Wheel 2.0 for Business. (Source : EU Business @ Biodiversity Platform, 2022).

Table 3. Brief definition of the seven criteria of the Biodiversity Measurement Navigation Wheel 2.0.

Criterion	Description
Business context	Composed of the business applications (BA) and organizational focus areas (OFA), it refers to the understanding of the underlying business objectives and strategies that drive a design project.
Biodiversity pressures	The impacts human activities have on biodiversity.
Biodiversity ambitions	Targets such as 'no net loss' or 'science-based targets for nature' against which progress can be measured.
Biodiversity scope	Biodiversity dimension (genes, species, or ecosystems) that is measured by the tool.
Biodiversity metrics	Units of measurement that reflect the state of biodiversity.
Level of efforts	Level of effort associated with each tool regarding level of expertise required to use the tool, its costs and accessibility.
Sector	The sector to which the measurement approach applies.

2.3.3. Policy recommendations

Based on the comparative analysis of six biodiversity measurement tools across diverse projects and geographies, this section outlines key policy recommendations to guide Public Development Banks (PDBs) in integrating biodiversity considerations into their operations more effectively.

The recommendations reflect lessons learned from the testing process and aim to support PDBs in selecting and applying appropriate tools for biodiversity risk assessment, impact management, and alignment with international biodiversity goals and disclosure frameworks.

3 - Results and discussion

3.1. General comparison of the different tools

3.1.1. Business context

This business context includes a combination of two key criterion for selecting a suitable measurement approach: business application (BA) and organizational focus area (OFA).

The concept of **Business Applications (BA)** in a natural capital context was introduced in the Natural Capital Protocol (2016)[6]. It is defined as “the intended use of the results of your natural capital assessment, to help inform decision making”. Because PDBs might have slightly deviating business applications from the private sector, the Business Application (BA), corresponding to the main issues that PDBs want to address in managing biodiversity-related risks and opportunities, were defined with AFD and EBRD, as follows:

[6] More specifically, see Table 1.2 in the Natural Capital Protocol: https://capitalscoalition.org/wp-content/uploads/2021/01/NCC_Protocol.pdf)

1. **Risk screening in site selection for new projects** (and comparing locations): identifying potential biodiversity risks associated with new project sites to make informed decisions that minimize negative impacts on biodiversity (avoiding transition risks related to legal compliance, reputation). In general, PDBs assess project financing when its location has already been chosen by its owner, based on existing feasibility studies. However, some PDBs sometimes have technical assistance resources available to certain project owners or developers, and may even provide consulting services to their clients, and may therefore be interested in this Business Application.

2. **Measuring biodiversity performance of new project developments**: measuring a biodiversity footprint figure of a project or assessing the biodiversity impacts of new projects either to ensure they meet standards and contribute positively to biodiversity conservation, or to identify opportunities for improvement. This can be done 'pre-construction' as well as 'post-construction'.

3. **Corporate biodiversity performance**: measuring corporate biodiversity footprints, such as those required by Article 29 in France[7], to evaluate and improve overall biodiversity performance, and to be compliant with disclosure requirements.

4. **Identifying material biodiversity issues in the supply chain of funded projects**: this remains a developing area for many PDBs[8], though it is expected to gain prominence as disclosure requirements evolve and biodiversity considerations become more integrated into supply chain due diligence.

5. **Balancing gains and losses of biodiversity to achieve Net Gain or No Net Loss at the project level**: This consideration is particularly relevant for PDBs with specific policies in place, and its importance is likely to grow as best practices and international expectations continue to advance.

The applicability of these business applications also depends on the user of the tool. Project managers might find the tools less valuable due to their detailed project knowledge (Environmental Impact Assessments, EIAs), whereas high-level tools are more relevant at the corporate level, such as for EBRD and AFD risks departments or strategic monitoring units.

A second filter that is used in the Biodiversity Measurement Navigation Wheel to select appropriate biodiversity measures, is the **Organizational Focus Area (OFA)**. The OFAs clarifies the different levels of analysis required to assess biodiversity risks and opportunities, depending on the needs, whether they be at (1) Site level, (2) Corporate (portfolio of projects) or (3) Supply chain.

[7] French Article 29 mandates ESG reporting for investors, expanding to more companies and focusing on biodiversity. From 2022, financial institutions must measure and reduce their impact on biodiversity through adjusted investment strategies. For more: https://www.tresor.economie.gouv.fr/Articles/2021/06/08/publication-of-the-implementing-decree-of-article-29-of-the-energy-climate-law-on-non-financial-reporting-by-market-players

[8] Note that EBRD requires to assess the core supply chains of all projects, including for biodiversity impacts.

Table 4 provides a first insight on how biodiversity measurement approaches can be combined in order to cover the range of business applications and organizational focus areas a PDBs is interested in. A good example is the application of risk screening tools as a first step, to be followed by more in-depth measurements by other tools. However, combining tools over different organizational focus areas for obtaining an outcome at corporate level will require additional insights such as aggregation potential of metrics and level of coverage of pressures.

Table 4. Business context matrix (BA-OFA matrix) of biodiversity measurement approaches covered in this report.

		Organizational Focus Area (OFA)		
		Site level	Corporate	Supply chain
Business Applications (BAs)	Risk screening in site selection for new projects	BioScope CBF STAR ABC-Map	/	/
	Measuring biodiversity performance of new project developments	BioScope CBF STAR GBS ABC-Map	/	/
	Corporate biodiversity performance	/	BioScope CBF STAR ENCORE GBS	/
	Identifying material biodiversity issues in the supply chain of funded projects	/	/	CBF ENCORE STAR BioScope GBS
	Balancing gains and losses of biodiver-sity to achieve Net Gain or No Net Loss at the project level	BioScope CBF STAR GBS	/	/

3.1.2. Input data

This criterion is not included in the Biodiversity Measurement Navigation Wheel 2.0 and was added to the comparative analysis by the authors of this report.

The data requirements for using these tools vary significantly in both type and level of detail. Broadly, the selected tools rely on three main categories of input data: geographical, sectoral, and investment-related (*Table 5*). While **all tools require some form of location data**, the level of specificity differs (*Figure 2*). Tools like STAR and ABC-Map depend on detailed, project-specific geographic data, which necessitates a greater data collection effort from PDBs. However, this granularity supports more accurate biodiversity assessments at the project level, where precision is critical.

Some tools, such as ENCORE and ABC-Map, go further by requiring more comprehensive input to complete their analyses. For instance, ENCORE's biodiversity module asks for the area of cropland or pasture in agricultural projects and the company name for mining projects. Similarly, ABC-Map needs detailed information on project activities location and management practices, which may exceed what is typically available at the PDB portfolio level (such data can be available for a set of specific or impacting projects for example, while more complex to access for the whole portfolio).

In contrast, in this research, tools like GBS, CBF, BioScope and ENCORE (in its core functionality) were applied using secondary data inputs – such as country, sector, and investment size – commonly available at PDB portfolio level. This approach made them more practical for broad, portfolio-level assessments or initial screenings where detailed data may not be accessible. For example, GBS can generate useful insights based on minimal inputs like sector and general location.

However, it's important to note that tools like GBS and CBF are capable of processing much more granular, primary data—such as specific activity-level consumption and emissions—allowing for significantly more detailed and site-specific assessments. The limited precision observed in this exercise reflects our chosen use of secondary data, not the inherent limitations of these tools. In contrast, BioScope is constrained to higher-level inputs and does not offer the same flexibility for incorporating detailed environmental data.

Ultimately, the accuracy and reliability of the tools' outputs are directly tied to the quality of the input data. High-quality data enhances the robustness of biodiversity assessments, supporting more informed and credible decision-making.

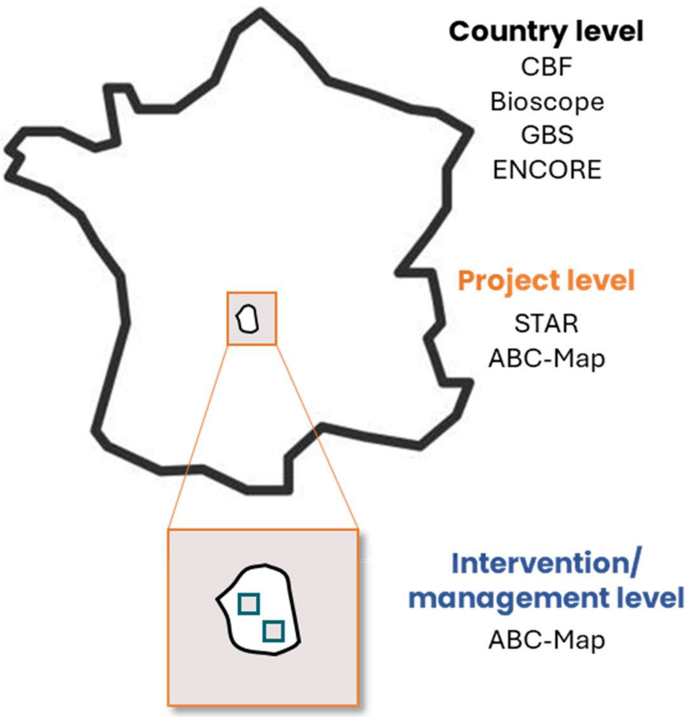


Figure 2. Variation in location data required by the tools (Source: Autors).

Table 5. Required minimum data input for the assessed tools. (X: required, O: not required)

	Corporate Biodiversity Footprint (CBF)	Biodiversity Footprint Financial Institutions (BFFI) implemented using BioScope	Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE)	Species Threat Abatement and Restoration metric (STAR)	Global Biodiversity Score (GBS)	Adaptation, Biodiversity and Carbon Mapping Tool (ABC-Map)
Project location	X Country level	X Country level	X Country for biodiversity module	X project location data	X Country level	X detailed project intervention location
Economic sector	X	X	X Natural Capital module	O	X	O
Investment volume	X	X	O	O	X	O
Management practice and location related to activities	O	O	O	O	O	X In-depth
Extent (area)	O	O	X Agricultural projects (biodiversity module)	O	O	O
Company's name	O	O	X Mining projects (biodiversity module)	O	O	O

STAR and ABC-Map are the only tools integrating detailed spatial data. STAR operates at a landscape level (5x5 km resolution) and thus is unsuitable for site-based or localized projects[9], or linear project such as road or powerline construction, making it ideal for high-level terrestrial conservation planning, although processing area is limited to 1 000 000 km². ABC-Map demands inputs as detailed project data and GIS skills to properly inputs detailed project activity's location. The inputs projects data can be difficult to match with the options provided within ABC-Map, and the level of precision of project activities (level of inputs on agriculture project, for instance) could be lacking to properly used the full functionalities of the tool. ABC-Map is suitable for project or regional scales but struggles with complex or extensive datasets[10] (i.e. complex polygon) – some data, like the MSA or the natural capital value, could not be fetched over some of the study areas.

3.1.3. Biodiversity pressures

To conduct the comparative analysis based on this criterion, the pressures identified by each tool were mapped against the five main drivers of biodiversity loss as defined by IPBES.

[9] The recommendation is to use a 50km buffer zone around the project site.
[10] This limitation will be corrected in further developments.

Table 6 and *Table 7* show the various pressures for respectively the direct operation tools, and the value chain tools, color-coded based on the IPBES drivers.

Table 6. Biodiversity pressures assessed by the direct operation tools. Corresponding impact drivers between tools are indicated by matching colors. Note that STAR and ABC-Map do not consider marine and freshwater drivers.

ENCORE	STAR[11]	ABC-Map
1. Water use 2. Terrestrial ecosystem use 3. Freshwater ecosystem use 4. Marine ecosystem use 5. Other resource use 6. GHG emissions 7. Non-GHG air pollutants 8. Water pollutants 9. Soil pollutants 10. Solid waste 11. Disturbances	• Residential & Commercial Development • Agriculture & Aquaculture • Energy Production & Mining • Transportation & Service Corridors • Biological Resource Use • Human Intrusions & Disturbance • Natural System Modifications • Invasive & Other Problematic Species, Genes & Diseases • Pollution 12. Climate Change & Severe Weather	• Land use • Disturbance by infrastructure • Habitat fragmentation due to land use and infrastructure • Human encroachment

IPBES Drivers of change:

- Land/sea use change
- Direct exploitation of resources
- Climate change
- Pollution
- Invasive alien species

Table 7. Impact drivers (pressures) assessed by the value chain tools. Corresponding impact drivers (pressures) between tools are indicated by matching colors.

	GBS®	BioScope	CBF
Terrestrial	• Atmospheric Nitrogen Deposition • Climate change • Ecotoxicity of metals • Ecotoxicity organics • Encroachment • Fragmentation • Land use	• Acidification • Ecotoxicity • GHG/Global warming[12] • Land use[13] • Ozone formation • Water consumption	• Air Pollution • Climate change (GHG) • Land Use • Water pollution
Freshwater, marine, aquatic[14]	• Ecotoxicity of metals • Ecotoxicity organics • Freshwater eutrophication Hydrological disturbance due to direct water use • Land use in catchment of rivers • Land use in catchment of wetlands	• Ecotoxicity (freshwater) • Ecotoxicity (marine) • Eutrophication (freshwater) • Eutrophication (marine) • GHG/Global warming (freshwater)Erreur ! Signet non défini.	

[11] IUCN Red List of Threatened Species

[12] Bioscope documentation refers to "Global warming", whereas Bioscope outputs include results for the "Climate change" impact driver; it is assumed that both terms refer to the same impact driver.

[13] The "land use" impact category in Bioscope is not explicitly classified under any specific ecosystem category, as explained earlier.

[14] The GBS only covers "aquatic" impacts; Bioscope covers "freshwater", and "marine" impacts.

	GBS®	BioScope	CBF
	• Wetland conversion	• Land use Erreur ! Signet non défini. • Water consumption (aquatic)	

The comparative analysis reveals several key findings and highlights discrepancies among biodiversity measurement approaches with respect to biodiversity pressures. These differences are observed in the following areas

- **IPBES drivers of change**: While all tools assess land use change, only STAR addresses all five IPBES drivers of biodiversity loss. However, pressures such as overexploitation and invasive alien species are generally underrepresented across tools. GBS® and CBF, which both rely on GLOBIO, show similar coverage in terms of pressures.

- **Ecological realm:** All approaches assess impacts on terrestrial biodiversity. Bioscope covers terrestrial, freshwater and marine ecosystems. CBF covers freshwater and terrestrial pressures, but does not make a distinction between both realms in its impact drivers results. Among the four pressures CBF covers, water pollution refers to biodiversity loss in freshwater ecosystems due to companies releasing chemicals.

- **Definition of biodiversity pressures:** Tools like STAR and ABC-Map assess pressures based on the physical location and footprint of a project, focusing on direct, site-specific threats. Conversely, tools such as ENCORE, BioScope, CBF, and GBS® define pressures at the sector level, using country or regional data. These tools base their assessments on complex models (e.g., EXIOBASE, NACE, GLOBIO) and databases, capturing both direct and indirect pressures across value chains. Therefore, the value chain tools results, as well as ENCORE results, are rather coarse, aligning with a sector-level materiality assessment rather than a detailed biodiversity footprint assessment. They provide sector-based results, often overlooking site-specific nuances. **However, both GBS and CBF allow for a more detailed data input than what was done for this assignment** (sector, investment, country). This is not the case for BioScope, which only allows these limited inputs.

- **Classification methods**: Variations in sector definitions and commodity classifications between tools can lead to inconsistencies or unexpected associations. Even when tools label drivers differently, closer analysis often reveals they reflect the same underlying impacts.

Overall, the analysis underscores the challenges in directly comparing biodiversity pressures across tools. These variations in scope, input data, and classification can lead to inconsistent outputs, potentially resulting in misleading interpretations if not properly contextualized.

Example of a wastewater treatment project in West Africa

To illustrate the various results on a similar project, we will look at the results for the wastewater treatment project in West Africa. The project is located in an urban coastal area.

<table>
<tr><th>Biodiversity assessment approach</th><th colspan="2">Information on biodiversity pressures/impacts drivers provided by the corresponding approach for the wastewater treatment in this area of West Africa</th></tr>
<tr><td>STAR (biodiversity pressure related to location of the project)</td><td colspan="2">• Biological resource use (hunting and collecting terrestrial animals)
• Pollution (agricultural and forestry effluents)
• Agriculture (livestock farming and ranching)</td></tr>
<tr><td>ENCORE Natural Capital module</td><td colspan="2">• Resources uses (water and ecosystems)
• Pollutants (soils and water)</td></tr>
<tr><td>GBS
(S3 = scope 3 total upstream)</td><td>Terrestrial:
• Climate change (S3, dynamic)
• Ecotoxicity of metals (S1+S3, static)
• Encroachment* (S3, static)
• Land use (S3, dynamic + static)</td><td>Freshwater, marine, aquatic:
• Ecotoxicity of metals (S1, static)
• Land use in catchment of wetlands (S3, static)
• Wetland conversion (S3, static)</td></tr>
<tr><td>BioScope
(S1, S2, S3 upstream)</td><td>Terrestrial:
• Climate change
• Water consumption*
• Acidification
• Land use</td><td>Freshwater, marine, aquatic:
• Eutrophication (freshwater)
• Land use</td></tr>
<tr><td>CBF</td><td colspan="2">• Air pollution (S1)
• Climate change (S1+S2)
• Land use (S1)</td></tr>
</table>

In terms of pressures and threats to biodiversity at the project site, the STAR tool identifies the main threats to species as biological resource use (e.g., hunting and collecting terrestrial animals), pollution from agriculture (effluents from cropland and forestry), and impacts from livestock farming. However, this assessment reveals a limitation: for this particular project, one would have expected urban development or domestic pollution to emerge as major threats—factors that would underscore the importance of a sanitation project in the area. Note that STAR does not consider marine environment and thus do not list any pressures related to the proximity with the ocean neither the marine species threat reduction thanks to the pollution reduction in the marine area due to improved water quality with the wastewater treatment with the project.

When looking at potential negative impacts of the project due to its activities or associated sector, the value chain tools and ENCORE provide more comprehensive insights. For this project, the ENCORE tool indicates that key contributors to environmental impacts include resource use (water and ecosystems) and pollution (affecting soil and water). This could suggest that the project may exacerbate existing pressures, especially since STAR identifies pollution and land use as the main local threats, which align with the impact drivers highlighted by ENCORE and the value chain tools.

To assess alignment between expected and identified impacts, each impact driver was evaluated. Those consistent with the project's context and intent are marked in green; those inconsistent are marked in red:

- Climate Change **(GBS, BioScope, CBF)**: this pressure is associated with emissions during construction and operations, though the calculated intensity remains unverifiable.

- **Ecotoxicity of Metals (GBS)**: this pressure appears less relevant as the plant mainly serve agri-food industries with low risk of metal discharge. The national entity would be responsible for screening industrial waste before connection. Any residual sludge would be sent to a landfill.

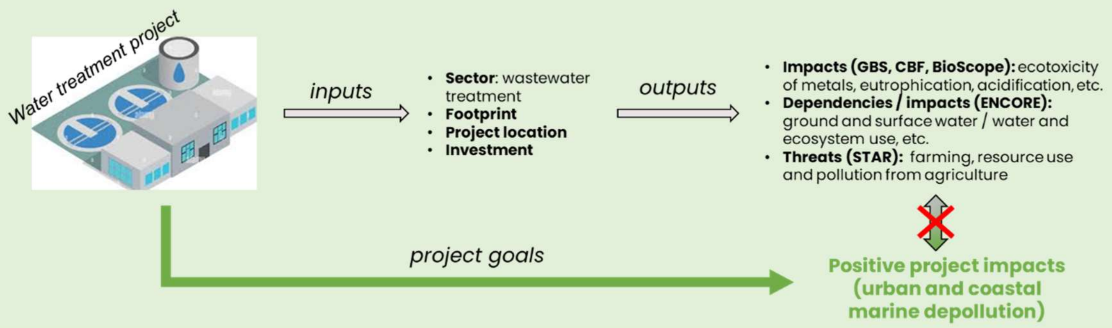
- **Freshwater Eutrophication (BioScope)**: this pressure seems irrelevant as mainly linked to paddy rice, which is not part of the upstream/downstream activities. The plant includes advanced treatment, discharging to the sea above regulatory standards.

- **Encroachment / Land Use (GBS, ENCORE, BioScope, CBF)**: this also appear irrelevant, as the plant occupies a small urban/industrial plot. No wetland or high-value ecosystems are affected. GBS assigns pressure from agricultural activities in upstream scope 3, which doesn't apply. Compensation was conducted for inhabited land affected.

- **Water Consumption (BioScope)**: Water input comes from the city supply network, and treated effluent is discharged at sea (as it was before, but untreated). No changes in freshwater flow result.

- **Acidification / Air Pollution (BioScope, CBF)**: Emissions may exist, but effects on terrestrial ecosystems are negligible.

Overall, while some tools highlight pressure drivers that could theoretically apply, many of them prove to be misaligned with the project's actual context. This highlights the importance of validating tool outputs with site-specific knowledge before drawing conclusions about project impacts.



3.1.4. Level of effort

The level of efforts to efficiently use the different measurement approaches differ considerably. Evidently this might be an important selection criterion. *Table 8* provides an overview of the level of effort associated with each tool, and should be interpreted as follows:

- **Accessibility** refers to 'open source' or 'commercial': however, cautiousness is required even with 'open source' tools as in some cases external support from the tool developer will still be required despite all technical information being publicly available.

- **Required expertise** refers to the type of technical skills and background knowledge that is needed to apply the measurement approach. In most cases this expertise (i.e. expertise in the field of biodiversity to ensure correct scoring, but also digital expertise such as GIS[15] for preparing spatial input data for STAR and ABC-Map for instance; for GBS, an officially trained assessor is necessary) will not be available in-house and will need to be hired. This is clarified in *Table 8*below with "INT" (available within the PDB) and "EXT" (not available within the PDB). Some tool developers offer training allowing the PDB to apply the tool themselves in future iterations (indicated with "EXT – T");

- **Costs** refer to: (1) costs for hiring external expertise, indicated with "COST EXT"; and (2) to necessary investments in license fees, trainings, etc. (cost for voluntary training is not included here) which is indicated with "COST Other". The purchasing of data from data providers (relevant for financial institutions) is another type of "COST Other". Costs do not refer to time investment by the company itself (this is covered under the "efforts" column). The cost level for COST EXT is marked with H (high, i.e. exceeding 20 man days), M (moderate, i.e. between 5 and 20 man days) and L (low, i.e. less than 5 man days) and applies to the cost for applying the tool on the first project; costs for subsequent projects/follow-up monitoring might be lower. It could also be that cost is similar for all projects or that cost is different according to size and complexity of projects. The cost level for COST Other is marked with H (high, i.e. more than EUR 10,000)[16], M (moderate, i.e. between EUR 4,000 and EUR 10,000) and L (low, i.e. less than EUR 4,000). The indicated values refer mainly to the first project, especially for upfront investments like licenses and training. However, data purchases may apply for every new project;

- **Efforts** refer to the time investment by the user and relates to the cost for applying the tool on the first project; costs for subsequent projects/follow-up monitoring might be lower. It could also be that cost is similar for all projects or that cost is different according to size and complexity of projects. In the table this is marked with H (high, i.e. more than 30 days), M (moderate, i.e. between 10 and 30 days) and L (low, i.e. less than 10 days).

Table 8. Effort table for the selected biodiversity measurements approaches.

Biodiversity measurement approach	Accessibility (Full Open Source; Open Source with Support; Commercial)	Required expertise (INT = most probably available within the PDB; EXT = external expertise most probably required; EXT – T: training is possible)	Costs (COST EXT H, M, L; COST Other H, M, L; no costs)	Efforts (H, M, L)
BioScope[17]	Open Source	INT Minimal expertise required	COST EXT: L COST Other: no costs	L

[15] Geographic Information System
[16] Purchasing of data from data providers by financial institutions is always marked as 'high cost'
[17] Open source. Cf. Test Plan – Table 10: 6.5 days consultancy work for submitting bioscope data, running the tool and interpreting the results for the high-level assessment of 9 projects (excl. data collection, report); this is an overestimation, as the actual days worked are closer to 1-2 days.

Corporate Biodiversity Footprint (CBF)[18]	Commercial (through Iceberg Data Lab)	EXT	COST EXT: L Cost Other: H	H
Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) – both modules[19]	Open Source with Support	EXT-T	COST EXT: L COST Other: L	L
Global Biodiversity Score® (GBS®)[20]	Commercial[21]	EXT-T	COST EXT H COST Other M	H
Species Threat Abatement and Restoration metric (STAR) [22]	Commercial (through IBAT)	EXT	COST EXT: H/M/L COST Other: H/M/L	H – M
Adaptation, Biodiversity and Carbon Mapping Tool (ABC-Map)[23]	Open Source	EXT-T	COST EXT: H/M/L	H - M

The level of effort required to implement each tool also depends on the complexity of the data input and the detail of the analysis. Across the tools, effort levels vary in a way that reflects both their intended use and technical sophistication.

At the **low-effort end of the spectrum, tools like BioScope and ENCORE are relatively easy to deploy,** requiring minimal training and relying largely on secondary data. These are particularly suited to initial screenings and portfolio-wide assessments where time and budget constraints exist.

Conversely, **tools like GBS and CBF represent high-effort options**. They are data-intensive, typically require external consultants or certified practitioners, and entail substantial costs related to licensing and training. CBF is implemented by the Iceberg Data Lab consultants, which comes at a cost. Access to GBS is granted through CDC Biodiversité and its use requires trained assessors.

In the middle, **STAR and ABC-Map require moderate to high levels** of effort depending on spatial complexity and data availability. STAR also requires a paid license (through IBAT[24])

[18] Subscription = €2,000; service cost = €12,000. Cf. Test Plan – Table 10: 5.5 days consultancy work for submitting data to Iceberg Datalab and interpreting the CBF results for the high-level assessment of 9 projects (excl. data collection, report); this matches the actual days worked.

[19] Open source. Cf. Test Plan – Table 6: 2 days consultancy work for data cleaning, uploading, and interpreting (excl. data collection and report) consultancy for the high-level assessment of 9 projects; this matches the actual days worked.

[20] Subscription = €6,500 per year (incl. €1,500 license cost) for B4B+ Club membership. Cf. Test Plan – Table 10: 2.5 days consultancy work for running the GBS and interpreting the results for the high-level assessment of 9 projects (excl. data collection, report); this matches the actual days worked.

[21] Previous version is open source.

[22] Commercial. Cf. Test Plan – Table 8: 3 days consultancy work for data cleaning, submission to IBAT platform and downloading report and data, and interpreting (excl. report) for the high-level assessment of 9 projects; this matches the actual days worked.

[23] Open source. Cf. Test Plan – Table 14: 12 days consultancy work for data cleaning, uploading, and interpreting for the in-depth assessment of the 3 projects (excl. data collection and report); this is an overestimation, as the actual days worked are closer to 8 days because location data was not provided as expected, thus the tool could not be used to its full capacity for the 3 projects. If location data was available, the time required to prepare and upload the data would have been higher.

[24] IBAT | The world's most authoritative biodiversity data

and requires some detailed primary data, which can be time-consuming to collect at PDBs level, such as ABC-Map does. That's said, once the input data is ready, STAR and ABC-Map are easy to implement and accessible for non-experts. The STAR scores for a site can be generated in a matter of hours and does not necessitate input from the user in the technical domain. If the user is unaware of the precise location of the project, a buffer area can be delineated directly with the tool.

3.1.5. Biodiversity metrics

The assessed biodiversity measurement approaches use different metrics for assessing biodiversity impact, each with its own advantages and disadvantages. The three metrics are detailed in *Table 9*.

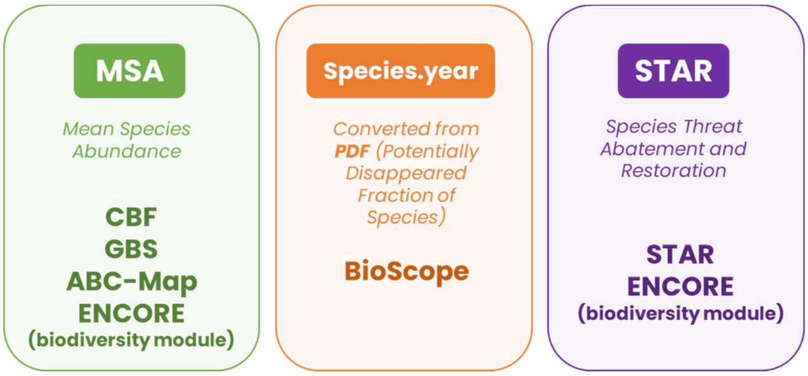


Figure 3. Metrics used by the assessed biodiversity measurement approaches.

It is important to understand that all these metrics provide an indication of potential biodiversity loss by modelling the potential (rather than observed) effects of a combinaison of pressures exerted (or alleviated) by a given project or activity. They provide an indication of potential biodiversity loss, with some metrics capturing the *condition* of biodiversity (MSA/PDF), while others assess the *significance* of the impact or potential gains from conservation actions (STAR).

Specifically, CBF, GBS, ABC-Map, and ENCORE Biodiversity module use the Mean Species Abundance (MSA) metric – a condition metric – which estimates the ***anticipated*** average abundance of original species relative to an undisturbed ecosystem, thereby indicating the ecological integrity of an area.

In this research study, BioScope was used to implement the Biodiversity Footprint for Financial Institutions (BFFI) methodology. **BioScope's outputs are measured in species.year**, a *condition metric* that quantifies the ***anticipated*** disappearance of vascular plants and lower organisms in terrestrial and aquatic environments due to human activities that cause an impact on ecosystems. This metrics is derived from *otentially* Disappeared Fraction of species (PDF), which reflects the proportion of species ***potentially*** lost in a given area and time frame[25].PDF is another form of *condition metric* that focuses on spatial and temporal dimensions of biodiversity loss.

In contrast, the **Species Threat Abatement and Restoration (STAR) metric** is a significance metric. Rather than measuring current or potential biodiversity condition, STAR identifies and quantifies ***potential*** reductions in species extinction risk through conservation actions. It leverages data from the IUCN Red List and provides values that highlight where interventions can have the greatest positive impact on species survival.

ENCORE's biodiversity module incorporates both types of metrics: MSA as a condition metric representing the ecological integrity, and STAR as a significance metric identifying where action can meaningfully reduce extinction risks.

Given biodiversity's multidimensional and complex nature,, no single metric can fully capture all relevant aspects. Therefore, researchers increasingly advocate for using a suite of complementary biodiversity indicators[26]. Recognizing the distinct roles of condition and significance metrics is crucial for constructing a robust biodiversity assessment framework.

In particular, **STAR's influence lies in its ability to prioritize conservation action by highlighting the significance of biodiversity components under threat**, thereby complementing condition metrics like MSA and PDF/species.year that focus on the extent of ecological degradation. An effective biodiversity measurement approach should ensure the chosen metric aligns with the intended use—whether evaluating ecological status or guiding conservation priorities—and meets requirements for applicability, accuracy, and cost-effectiveness.

Example of how the choice of metrics can greatly influence decision making processes for PDBs
MSA and PDF both serve as metrics of intactness, yet, like all biodiversity-related metrics, they offer only a partial view on the state of biodiversity. For example, they differ from species-focused metrics as they do not consider factors such as species' endangered status. A company considers transforming two patches of natural forest into intensive agriculture. Two patches of forest are considered for development – forest A and forest B. In the example, both are large patches of contiguous intact forest with healthy ecosystems. Forest A hosts a few hundred species and only one endangered species, while Forest B hosts a couple of thousands of species and many endangered species. Intactness metrics like MSA and PDF will consider both forests equivalent because they are both undisturbed. Thus, the company might decide to cut down the Forest B.

[25] https://www.government.nl/binaries/government/documenten/reports/2021/08/05/biodiversity-impact-and-ecosystem-service-dependencies/Dependencies+in+the+BFFI_UNEP_v1.1.pdf
[26] https://link.springer.com/article/10.1007/s11367-020-01846-1

Species-focused metrics like STAR metric will value the Forest B more because of its high number of endangered species.

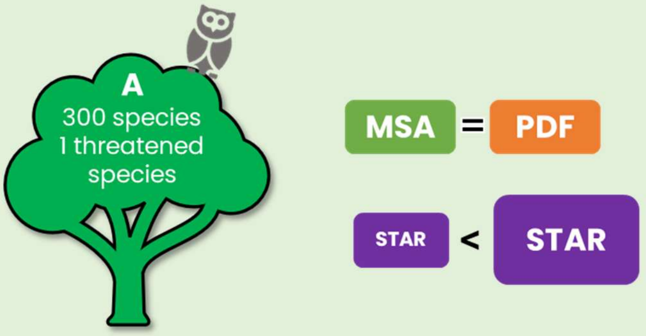


Table 9. Biodiversity metrics table [27].

Commonly used metrics	Unit of biodiversity	Key points	Used for	Scale of analysis
STAR (Species Threat Abatement and Restoration metric)	Globally threatened species	Measures opportunity to reduce species extinction risk; based on threats to CR, EN, VU, and NT species. Scores are weighted by threat status and the size of species ranges in a given area. The STAR metric includes two main components: Threat Abatement (STAR-T) which measures the reduction in extinction risk through actions aimed at mitigating direct threats, such as habitat loss or pollution, and Habitat Restoration (STAR-R) which quantifies the potential decrease in extinction risk achievable by restoring natural habitats.	Compare potential threat abatement and restoration actions, set science-based targets. Can be applied on various project scenarios.	Any scale
MSA Mean species abundance	All species	Arithmetic mean of all species abundances; all species weighted equally (so common species increasing can mask other species becoming extinct); based on regressions between the intensity of each pressure and their impacts on species abundances; impact data from a large and growing database of published studies. MSA can be calculated for a specific area by multiplying it by the extent of that area. For example, a Mean Species Abundance of 75 MSA.km^2, can be interpreted as the complete destruction (MSA of 0%) on 0.25 km^2, while the remaining 0.75 km^2 is untouched (MSA of 100%).	Impact assessment and Life Cycle Analysis using GLOBIO model	Project, portfolio or global scale
PDF Potentially disappeared fraction	All species	Local number of species (does not measure declines in species populations); all species weighted equally; based on regressions between the intensity of each pressure and their impacts on species persistence; impact data from a large and growing database of published studies. It expresses the proportion of species lost in a certain area, during a certain period, or alternatively, the area where a proportion of species is lost during a certain time frame. For example, 10 PDF.m^2.yr can be interpreted as : •10 m^2 has lost all its species during a year. •100 m^2 has lost 10% of its species during a year. •10 m^2 has lost 10% of its species over a time period of 10 years.	Impact assessment and Life Cycle Analysis using ReCiPe model (e.g. Impact World +;)	Project, portfolio or global scale

[27] Note this table is a summary version of the full Biodiversity metrics table accompanying the Biodiversity Measurement Navigation Wheel, taking into account the approaches and metrics assessed for this assignment.

3.1.6. Biodiversity ambitions

A growing number of organisations are committing to biodiversity-related goals such as "No Net Loss," "Nature Positive," and Science-Based Targets for Nature (SBTN). Tools are used to demonstrate compliance with biodiversity ambitions/targets and measure progress toward achieving them.

According to recent updates from the EU Business & Biodiversity Platform on biodiversity measurement approaches, **no single tool currently meets all requirements of the emerging biodiversity target frameworks**. However, none of the assessed tools should be excluded outright, as each offers partial relevance. A few key observations emerge:

- Marine biodiversity (e.g., SDG 14) remains insufficiently addressed by existing tools.
- The EU platform has introduced a working definition of what constitutes a 'nature positive' organisation, and Public Development Banks (PDBs) have expressed commitments to contributing to these outcomes.

According to the ALIGN project, which provides guidance on aligning financial practices with biodiversity goals, a 'nature positive' outcome refers to a measurable improvement in the state of nature that has not resulted from shifting negative impacts elsewhere. These outcomes are best evaluated at the landscape or seascape scale and cannot be attributed to an organisation per se, but rather to the aggregate impact of its actions. Measurable nature positive outcomes typically include:

- Increases in the extent, condition, and connectivity of ecosystems
- Improvements in species population trends and reduced extinction risks
- Enhanced genetic diversity
- Sustained or improved ecosystem services beneficial to society and businesses

To credibly claim contributions to nature positive outcomes, organisations must demonstrate measurable and direct improvements in biodiversity, ideally through a structured biodiversity accounting framework. While pressure-based tools (e.g., GBS, BioScope) offer useful insights, tools that focus on direct state measurements within the relevant landscape—such as STAR or ABC-Map—are generally more appropriate. However, even tools like STAR are currently limited by outdated or incomplete datasets, reducing their reliability for tracking real-time biodiversity changes at the project level.

Therefore, while several tools provide partial support, none of them fully meet the standards required for robust measurement of nature positive outcomes. This highlights the importance of tool integration, investment in better biodiversity data, and alignment with state-based indicators going forward. As these frameworks continue to evolve, it is expected that **PDBs will need to rely on a combination of tools tailored to their objectives and operational contexts**.

3.1.7. Scope and coverage

Biodiversity scope

Biodiversity has multiple dimensions, and biodiversity measurement approaches can measure various dimensions, e.g. only habitats/species or also ecosystem services, which would lead to different biodiversity assessment.

Table 10 below provides insights on the biodiversity scope covered by the assessed biodiversity measurement approaches. These insights show that **all six assessed biodiversity measurement approaches cover habitats and/or species**, and to a lesser extent ecosystem services. None of the approaches address genetic diversity, however this scope would not have been of use for any of the tested projects. In practice, ecosystem services are usually measured by means of a specific ecosystem services measurement approach.

Table 10. Biodiversity scope table.
(X: covered; O: not covered)

Biodiversity measurement approach	Habitats / Species	Ecosystem Services	Genes
BioScope	X	O	O
Corporate Biodiversity Footprint (CBF)	X	X (dependencies)	O
Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE)	X	X	O
Global Biodiversity Score® (GBS®)	X	X (dependencies)	O
Species Threat Abatement and Restoration metric (STAR)	X	O	O
Adaptation, Biodiversity and Carbon Mapping Tool (ABC-Map)	X	X (natural capital value)	O

Emission scope

The boundaries of what is included when measuring impacts and/or dependencies differs for the measurement approaches. This can be demonstrated by means of emission scopes (see *Table 11*).

- 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 non-fuel energy impacts resulting from land use changes, fragmentation, etc.
- Scope 3 – upstream: Impacts which are a consequence of the activities of the project but occur from sources not owned or controlled by the project's owner, upstream (supply chain) of its activities.

- Scope 3 – downstream: Impacts, which are a consequence of the activities of the project but occur from sources not owned or controlled by the project's owner, downstream (consumption and waste) of its activities.

Table 11 below provides insights on the scope of impacts covered by the biodiversity measurement approaches assessed in this study. Most of the tools include Scope 1, referring to direct, on-site impacts such as land use change, habitat disturbance, and localized pollution. A number of tools – namely BioScope, CBF, ENCORE and GBS – also incorporate Scope 3 upstream impacts, typically through modeled estimates based on sectoral data. These upstream impacts account for pressures such as land use or resource extraction embedded in supply chains. However, **Scope 2 impacts** – which relate to **indirect emissions from purchased energy (e.g. electricity or heat)** – are only **explicitly** addressed by GBS and CBF. These tools integrate Scope 1, 2, and 3 emissions into biodiversity impact pathways, ensuring that purchased energy use is reflected in their models. In contrast, tools such as ENCORE, STAR, ABC Map, and BioScope **do not explicitly adopt scope-based accounting**. While some (like ENCORE and BioScope) may capture energy-related pressures indirectly through sectoral or life-cycle assumptions, others (like STAR and ABC Map) are not designed to address such emissions. Consequently the extent and relevance of Scope 2 coverage vary significantly, depending on the tool's methodological design and intended application.

Table 11. Emission scopes covered by the assessed measurement approaches. (X: covered; O: not covered)

Biodiversity measurement approach	Scope 1	Scope 2	Scope 3	
			Upstream	Downstream
BioScope	X	X	X	O
Corporate Biodiversity Footprint (CBF)	X	X	X	X[28]
Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE)	X	X	O[29]	O
Global Biodiversity Score® (GBS®)	X	X	X	X[30]
Species Threat Abatement and Restoration metric (STAR)	X	O	X	X
Adaptation, Biodiversity and Carbon Mapping Tool (ABC-Map)	X	O	O	O

[28] If no impacts for Scope 3 downstream are calculated, it is due to the nature of the project considered; mainly use phase and processing.

[29] At the time the Test Plan was written and the assessment described in this report was conducted, ENCORE did not include value chain links. However, the latest ENCORE update from July 2024 now includes key value chain links. For an overview of the updates, see https://encorenature.org/news/major-upgrade-for-encore-launches-july-2024.

[30] Downstream impacts are not covered when footprints assessments are based on financial data that do not include downstream financial data.

Impacts and dependencies coverage

Biodiversity measurement approaches can focus on either negative or positive impacts on biodiversity, or on the societal dependencies linked to ecosystem services. Table 12 below provides a comparative overview by tool.

All tools reviewed can assess potential negative impacts on biodiversity. However, assessing positive impacts tends to be more complex. Among the direct operation tools, STAR stands out for its ability to identify high-priority areas for conservation and restoration, supporting nature-positive outcomes. ABC-Map can help locate areas of interest through its MSA (Mean Species Abundance) mapping, which may highlight where conservation or restoration could be beneficial. However, it offers limited guidance for translating those insights into concrete actions. It also provides spatially explicit assessments of environmental impacts, useful for identifying synergies and trade-offs between biodiversity, climate, and land-use goals. The ENCORE biodiversity module offers strategic-level guidance on aligning with biodiversity goals but lacks detail for site-specific application.

Value chain tools such as GBS and CBF are, in theory, suitable for tracking progress and estimating positive impacts through scenario modelling. For instance, in a hypothetical case where a coal-fired power plant is replaced by a solar field, these tools can estimate generalized impacts based on the sector classification, region, and investment value. However, these estimates are often derived from sectoral impacts rather than detailed, activity-specific modelling. As such, the tools do not directly quantify avoided impacts resulting from sustainability measures unless those measures are distinctly representing in their underlying databases.

To assess the benefits of a transition project, a common approach is to conduct a double-run analysis: one using a business-as-usual scenario (e.g., conventional land use or unsustainable practices), and another using the sustainable alternative. The difference between these outputs theoretically approximates the avoided impact or biodiversity gain attributable to the project.

However, in practice, **our study revealed that tools often struggle to simulate or differentiate sustainable practices.** For example, in the case of the Central Africa agriculture/forestry project (see *Table 2*), tools were unable to account for key pro-biodiversity interventions such as low-pesticide agriculture, sustainable forest management, or anti-poaching activities. These limitations stem from the fact that such practices are either not explicitly represented in sector-level databases or are aggregated into broader land use categories that do not distinguish between conventional and improved practices.

This means that while scenario modelling is conceptually attractive, its practical application is currently constrained by the tools' structural reliance on generalized data and the absence of dynamic, customizable input options that reflect nuanced sustainability measures. **This limitation underscores the need for complementary assessments and**

more refined tools capable of integrating the specific ecological and management context of nature-positive projects.

Regarding biodiversity dependencies, only GBS, CBF, and ENCORE explicitly establish direct links between economic sectors and their reliance on biodiversity and ecosystem services. These tools integrate dependencies into their analytical frameworks by identifying how specific sectors depend on key ecological functions—such as pollination, water regulation, soil fertility, or climate regulation—for their operations and long-term viability.

ENCORE is particularly designed around this concept, mapping sectoral dependencies on ecosystem services and flagging the associated risks if those services are degraded. CBF and GBS similarly incorporate dependencies by assessing how different stages of the value chain may rely on biodiversity and natural capital, though with a stronger focus on quantifying biodiversity pressures. However, their ability to reflect context-specific or localized dependencies remains limited, as they largely rely on generalized sectoral data and modelled assumptions.

Table 12. Coverage of impacts and dependencies by the assessed measurement approaches.
(X: covered, O: not covered)

Biodiversity measurement approach	Negative impacts	Positive impacts	Dependencies
BioScope	X	O	O
Corporate Biodiversity Footprint (CBF)	X	X	X
Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE)	X	O	X
Global Biodiversity Score® (GBS®)	X	X	X
Species Threat Abatement and Restoration metric (STAR)	X	X	O
Adaptation, Biodiversity and Carbon Mapping Tool (ABC-Map)	X	X	O

3.1.8. Sector Applicability

Several measurement approaches are specifically designed to support certain industry sectors. According to the EU Business & Biodiversity Platform on biodiversity measurement approaches, the most common sectors to be assessed by tools are finance, agriculture and mining. Indeed, among the six assessed tools, only ABC-Map is specifically directed to map the impacts of agricultural projects, land use and forestry projects. All other tools can be used for a broad range of sectors.

Table 13. Sector applicability table.
(X: covered, O: not covered)

Biodiversity measurement approach	Agriculture	Mining	Financial institutions	Other[31]
BioScope	X	X	X	X
Corporate Biodiversity Footprint (CBF)	X	X	X	X
Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) – both modules	X	X	X	X
Global Biodiversity Score® (GBS®)	X	X	X	X
Species Threat Abatement and Restoration metric (STAR)[32]	X	X	X	X
Adaptation, Biodiversity and Carbon Mapping Tool (ABC-Map)	X (AFOLU)	O	O	O

However, the sectors classification contained within the tools is sometimes difficult to match with the real activities of the projects funded by PBDs. For instance, **it is challenging to assess conservation or nature-positive projects, since they are not classified as 'impacting' sectors**. Tools sector types are designed for business operations rather than investment projects.

3.2. Limitations

Limitations related to input data and tools functionalities

Some tools also face technical limitations. For example, STAR operates at a coarse spatial resolution (5x5 km) and is not suitable for site-specific or linear infrastructure projects such as roads or powerlines. Similarly, ABC-Map can be used at regional or project scales but struggles with processing complex spatial datasets or polygons. In some cases, it could not retrieve data (such as MSA or natural capital value) for entire study areas.

Importantly, none of the tested tools could provide robust baseline information on the state of biodiversity at project locations. ABC-Map offers limited context via MSA values, and ENCORE's biodiversity module provides general ecological integrity scores at regional scales—not at project sites.

Difficulties in interpreting the outputs

Interpreting the outputs of biodiversity measurement tools can be challenging, especially without sufficient context or baseline data. While tools like STAR identify threats to species, their outputs could miss locally relevant pressures that would support the rationale for nature-based or depollution projects.

[31] All other sectors are covered here. So if an approach covers the "Other" sectors, it means that the approach can be applied to all sectors.
[32] STAR is not sector-specific but location-specific and thus can be applied on various sectors.

Some tools also fail to differentiate between phases of the project lifecycle (e.g., construction vs. implementation), meaning the results may not reflect the real biodiversity impacts or benefits of a specific project. For example, sector-based tools attribute impacts to standard activities within a sector, overlooking unique conditions or mitigation efforts in the actual project.

Additionally, the specificity of each tool's methodology (e.g., MSA, species.year) and the variety of metrics used make comparative analysis complex. For instance, GBS and CBF use MSA.km² and distinguish between terrestrial and aquatic ecosystems, whereas BioScope relies on species.year, limiting comparability. Although a unified impact classification system has been developed for GBS, applying it across tools still requires approximation and interpretation.

Inadequations to the PDBs' Uses

It is essential to distinguish between the intrinsic limitations of biodiversity assessment tools and the practical constraints faced by Public Development Banks (PDBs) in applying them effectively.

Despite their analytical potential, most tools are not tailored to the practical needs and constraints of PDBs. **Many tools are too data-intensive to be applied consistently across large, diverse portfolios.** The data required for high-resolution assessments—such as precise inputs and outputs, spatial extent, and sector-specific operational details—are often unavailable or too costly for PDBs to collect across their portfolios.

Consequently, PDBs rely heavily on default inputs and modelled data, which undermines the precision of the tools at the project level. The outputs, while useful for initial high-level screenings, often require substantial additional analysis to be meaningful in decision-making. For example, **tools may identify impact drivers that appear material based on sectoral assumptions but prove irrelevant when assessed against actual project conditions**. This was observed in case studies involving sanitation or biodiversity restoration projects, where post-analysis revealed several identified pressures to be misaligned with on-the-ground realities.

Furthermore, **many tools focus on negative impacts and offer limited insight into positive outcomes, such as those resulting from ecosystem restoration or sustainable land use**. Tools like STAR can identify priority areas for conservation but still fall short in capturing the full spectrum of positive impacts. Value chain tools offer broader impact estimations but do not reflect real changes resulting from the project unless supported by extensive primary data.

Overall, biodiversity measurement tools remain valuable for PDBs in guiding strategic priorities and identifying general risks and opportunities. However, to fully integrate them into investment decision-making, further adaptation to the operational context and data availability of PDBs is necessary—alongside improved interpretation frameworks to contextualize the results.

4 - Recommendations for PDBs

4.1. Leverage tools for early-stage risk screening, site selection, and complementing traditional due diligence

Public Development Banks (PDBs) can use tools like STAR, ABC-Map, ENCORE, CBF, GBS, and BioScope during the early stages of project development, to complement traditional due diligence. These tools support initial high-level screening, help identify potential impact hotspots, and reveal indirect biodiversity risks that may otherwise remain undetected.

Location-based tools such as ABC-Map and STAR can help in identifying areas of high conservation priority, enabling developers (not PDBs) to avoid locations near critical conservation areas, thereby reducing negative biodiversity impacts and future mitigation or conservation costs[33]. Sector-based tools, such as CBF, GBS and ENCORE are useful for high-level biodiversity impact screenings, but they lack the level of detail and site specificity required for robust biodiversity assessments like expected in ESIAs. These tools typically attribute impacts to general economic sectors rather than to specific investments or projects, resulting in generalized outputs

It is therefore important to note that while these tools are effective for high-level screening and prioritization purposes, they are not designed – nor recommended – for orienting investment decisions or capital allocations, especially at the project level. Their outputs are not sufficiently granular, site-specific, or validated to support the allocation of financial resources without additional, in-depth analysis. These tools should be viewed as directional aids that help identify areas for further investigation, not as conclusive assessments upon which funding decisions are made.

Nevertheless, this approach is particularly beneficial for large portfolios where data availability is limited, as these biodiversity footprinting tools can be used based on very limited data inputs. Additionally, some tools also offer insights into value chain impacts and dependencies, supporting evolving disclosure requirements under frameworks such as CSRD, TNFD, and GRI 101. When incorporated effectively, **these tools guide more targeted and efficient use of resources for detailed due diligence and primary data collection.**

4.2. Ensure comprehensive understanding of tools and their underlying data sources to avoid misinterpretation

While biodiversity assessment tools like STAR, ENCORE, CBF, GBS, and BioScope offer valuable insights into project impacts, it is essential that users possess a clear understanding of their assumptions, methodologies, and limitations. These tools are primarily designed to provide

[33] Although PDBs generally assess project financing once the project owner has already selected a location, based on existing feasibility studies, some banks may be interested in providing advice / consulting to project owners on site selection.

high-level overviews and risk screenings rather than in-depth, project-specific assessments.

Misinterpretation can arise when these tools are used outside of their intended context. Many rely on generalized data from global or sector-level datasets, which may not reflect the specific ecological realities or localized biodiversity impacts of a particular project. For instance, CBF, GBS and ENCORE based their calculations on modelled linkages between sectors and biodiversity pressures. This can obscure site-level variability in species richness, habitat conditions, or conservation measures. Without understanding these limitations, users might overestimate the accuracy or relevance of the results.

Moreover, these tools do not inherently measure positive biodiversity impacts. While some tools highlight risks and dependencies, **they struggle to quantify the benefits of biodiversity-enhancing measures** like reforestation or habitat restoration, which are often critical to nature-positive investments. As a result, they may present an incomplete or skewed picture of a project's overall biodiversity performance — especially for initiatives that actively seek to improve ecological outcomes.

Therefore, relying solely on these tools can present an incomplete picture. **Combining them with primary data and detailed assessments, such as those found in traditional due diligence processes like Environmental and Social Impact Assessments (ESIAs), is essential for a balanced understanding of biodiversity impacts and opportunities**. This ensures that both risks and potential benefits are accurately captured, and misinterpretations are minimized.

4.3. Tailor tool selection to project needs and sector

PDBs should select tools based on the specific needs and sector of each project, as well as the gaps that the tool can cover in current due diligence processes.

Public Development Banks (PDBs) should adopt a strategic and context-specific approach when selecting biodiversity assessment tools. Rather than seeking a one-size-fits-all solution, it is essential that PDBs tailor their choice of tools to the specific characteristics and sectoral focus of each project. This includes considering the environmental sensitivity of the project location, the type of impacts expected (e.g. land use change, pollution, supply chain dependencies), and the data availability at both the project and institutional levels.

Furthermore, tools should be selected not only for their technical capacity, but also for their ability to fill identified gaps in existing due diligence processes. For example, some tools may complement traditional Environmental and Social Impact Assessments (ESIAs) by offering early-stage biodiversity risk screening or value-chain level insights that are not captured in standard procedures. Others may help quantify biodiversity outcomes post-implementation or support reporting in line with international standards (e.g. CSRD, TNFD).

By aligning tool selection with both the strategic objectives of the PDB and the operational realities of each project, banks can strengthen the integrity, transparency, and effectiveness of their biodiversity risk management and sustainability strategies.

4.4. Use tools to recognize indirect and non-obvious impacts

Biodiversity footprint assessment tools such as GBS and BioScope are valuable for uncovering indirect risks along the value chain — especially those embedded within complex value chains. These tools can help identify less obvious impacts, such as how agricultural runoff from upstream suppliers might degrade downstream ecosystems, or how energy consumption in manufacturing might lead to habitat degradation in distant source regions.

Such tools help expand the spatial and temporal scope of biodiversity assessments beyond immediate project boundaries. However, the outputs provided by these tools remain indicative and should not be used as conclusive evidence when deciding where to invest or how to allocate capital. Instead, they should serve to flag potential areas of concern and inform further inquiry, particularly in sectors with extensive or complex value chains.

4.5. Ensure adequate time and resources for data collection

The successful implementation of tools such as GBS and ABC-Map hinges on the availability of robust and comprehensive data. These tools are designed to assess biodiversity-related risks and impacts based on a range of project-specific inputs. As such, they require significant time, coordination and resources to gather, validate and structure the necessary data appropriately.

For example, conducting a full GBS assessment involves collecting detailed financial information, geographical data and project parameters. This process necessitates close collaboration between the client and project managers. In many cases, multiple rounds of communication and clarification are needed to ensure that the data provided is aligned with the input specifications of the selected tool. This remains crucial even when the tools are used with a limited set of high-level data for screening purposes.

Given that many of these tools depend on complex input datasets, **Public Development Banks (PDBs) must actively plan for and allocate adequate resources—both human and financial—for data collection efforts**. This includes fostering strong coordination among project developers, local authorities, biodiversity experts, and possibly third-party data providers. Ensuring the quality and granularity of the data is critical to the credibility of biodiversity assessments and to the informed decision-making that follows.

Additionally, tools like GBS, CBF, BioScope, and ENCORE require information on sector classification of the project (e.g. EXIOBASE or NACE). However, these classification systems are typically designed for general economic activity and business operations rather than the unique characteristics of investment or infrastructure projects. As a result, a direct mapping between project activities and sector codes is not always straightforward.

To address this, in-depth discussions with project managers and technical teams are often necessary. These conversations can help determine the most appropriate sector(s) to associate with the project and, where relevant, assign appropriate weightings to multiple sectors to better reflect the project's composition. This process enhances the accuracy of the resulting biodiversity impact assessments and ensures that the outputs generated by the tools are as relevant and decision-useful as possible.

In summary, ensuring sufficient time and resources for data collection is not merely a logistical consideration—it is a strategic requirement. High-quality data underpins the credibility of biodiversity tools and ultimately strengthens the integration of nature considerations into project design, risk assessment, and investment decision-making.

4.6. Apply a combination of tools for comprehensive insights

Effectively assessing biodiversity-related risks and impacts requires a multidimensional approach. No single tool or metric captures all aspects of biodiversity, especially when considering both site-level and broader, indirect effects that may occur across supply chains, financial portfolios, or operational contexts. Therefore, applying a combination of tools is essential to gain a more holistic understanding of biodiversity dependencies, pressures, and potential outcomes.

By using multiple tools in tandem — such as ENCORE, CBF, and GBS —practitioners can generate complementary insights that, together, paint a fuller picture of a project's biodiversity footprint. Each tool has unique strengths that, when strategically combined, help overcome individual limitations and expand the range of relevant information for due diligence, risk assessment, and decision-making processes.

For instance, ENCORE could help identify ecosystem services dependencies and impacts on ecosystem services across sectors and value chains. It helps financial institutions and project developers understand which ecosystem services a business activity relies on, and what risks may arise if those services are degraded. This tool provides a foundational understanding of how environmental change may affect a project's long-term viability and risk exposure.

Meanwhile GBS provides biodiversity footprint figures, translating environmental impacts into scientifically grounded biodiversity loss metrics. When used together, ENCORE and GBS not only identify material ecosystem dependencies but also measure the actual biodiversity impacts—both direct and indirect—across the life cycle of the project or investment.

In addition, STAR can be used to assess how a project might contribute to reducing global extinction risk for species, based on its geographical location and potential conservation actions. STAR is especially useful for projects located in areas of high biodiversity value or where threatened species are present. However, STAR's utility is limited when it comes to sector-specific inputs or indirect impacts, as it is primarily focused on spatial data related to species threat abatement opportunities. For this reason, its results are most effective when interpreted alongside more detailed sectoral or project-specific tools. For instance, STAR could be used to determine whether a project is located in a region where conservation actions could contribute meaningfully to species recovery, while ENCORE helps assess how the same project's operations might depend on and affect key ecosystem services. The combination provides both a conservation opportunity perspective (via STAR) and a risk/dependency profile (via ENCORE). Similarly, integrating GBS results offers a quantitative baseline for understanding the magnitude of biodiversity pressure associated with the project, enabling more targeted mitigation and compensation strategies.

In practice, combining tools should be guided by the nature of the project, the stage in the project cycle, data availability, and the specific goals of the assessment—whether for screening, due diligence, portfolio-level reporting, or risk management. Using a mix of high-level and detailed tools allows users to triangulate results, fill knowledge gaps, and enhance the credibility of biodiversity assessments.

Ultimately, adopting a tool-agnostic, integrative approach—where multiple frameworks and methodologies are used in concert—strengthens biodiversity risk assessment and ensures more robust and comprehensive environmental integration in project planning and investment decision-making.

However, combining multiple metrics will involve higher transaction costs for a PDB. The decision to combine these approaches must therefore ultimately be made by weighing up the additional transaction costs against the gains in understanding and relevance for decision-making.

4.7. Incorporate ecosystem services in assessments

Understanding and accounting for ecosystem services is a critical component of comprehensive biodiversity risk assessment. Ecosystem services—the benefits that people and economies derive from nature, such as water purification, pollination, climate regulation, and soil fertility—are often undervalued or overlooked in traditional project evaluations. However, disruptions to these services can lead to significant operational, financial, and reputational risks for investment projects, especially in sectors with high environmental dependencies.

Tools like ENCORE are specifically designed to address this gap. ENCORE helps identify the ways in which each economic activities rely on and impact various ecosystem services. By mapping these dependencies and highlighting where they may be at risk due to ecosystem degradation, ENCORE provides valuable insights into potential vulnerabilities across the value chain—from upstream resource inputs to downstream service delivery.

For PDBs, integrating ENCORE into project assessments represents a strategic opportunity to enhance biodiversity risk management. While traditional biodiversity assessment tools often focus on species, habitats, and site-level impacts, ENCORE complements these by offering an understanding how ecosystem services affect project operations, both upstream and downstream. This broader perspective helps PDBs identify not only where a project may cause harm to ecosystems, but also how the degradation of natural systems could, in turn, threaten the project's success.

For example, a water-intensive infrastructure project may appear low-risk from a species impact perspective, but ENCORE might reveal critical dependencies on freshwater regulation services from upstream forests. If those forests are under pressure from deforestation or land-use change, the project's water security—and therefore its long-term viability—could be at risk. Identifying such links early allows decision-makers to take preventative measures, such as enhancing upstream conservation efforts or redesigning the project to reduce reliance on vulnerable services.

Incorporating ecosystem service assessments also supports more sustainable and resilient project design. By explicitly considering nature as a provider of essential inputs and functions, PDBs and their partners can identify opportunities to safeguard or even enhance ecosystem services through nature-positive investments. This aligns well with broader environmental, social, and governance (ESG) goals, climate adaptation strategies, and emerging frameworks such as the Taskforce on Nature-related Financial Disclosures (TNFD).

In summary, incorporating ecosystem services into biodiversity assessments enables PDBs to develop a more complete understanding of environmental risks and dependencies. Tools like ENCORE provide a structured way to do so, offering insights that go beyond species conservation to include the functional value of nature in supporting development outcomes. By embedding this perspective into project planning and evaluation processes, PDBs can better manage risk, increase resilience, and contribute to the protection and sustainable use of natural capital.

Use value chain tools for supply chain and corporate performance assessment

As biodiversity-related risks and impacts increasingly extend beyond the boundaries of individual project sites, it is essential for PDBs and other financial institutions to adopt a value chain perspective in their assessments. Projects often operate within complex supply chains that span multiple sectors, geographies, and governance contexts, making it critical to evaluate not only direct impacts but also the broader, systemic biodiversity implications across upstream and downstream activities.

In this context, tools like GBS, CBF, and BioScope are are particularly well-suited. These tools offer capabilities to assess biodiversity risks and pressures along entire value chains or across corporate portfolios, helping institutions to understand cumulative impacts and identify priority areas for mitigation, adaptation, or strategic engagement.

In the current study, six tools were evaluated for their applicability to PDB operations. However, it is important to recognize that the universe of biodiversity tools is much broader. For example, assessing risks at the counterpart or country level is of particular relevance for Multilateral Development Banks (MDBs), especially when financing sovereign or quasi-sovereign projects. In this case, tools like the WWF Country Risk Profiles can provide valuable information on the biodiversity risk exposure of specific countries, helping institutions prioritize geographic areas for engagement, safeguard design, or portfolio diversification.

Given the rapidly evolving nature of the biodiversity tools landscape, staying informed about new tools, data sources, and methodological innovations is crucial. New platforms, databases, and decision-support systems are regularly emerging, often designed to address specific challenges such as geospatial risk mapping, sector-specific impacts, or financial materiality. Institutions should therefore invest in ongoing training, establish internal knowledge-sharing mechanisms, and consider partnerships with research organizations or biodiversity initiatives to ensure that the most appropriate and up-to-date tools are used.

5 - Conclusions

Biodiversity measurement tools represent a critical innovation for Public Development Banks seeking to better understand, assess, and manage the complex and multifaceted relationship between nature and development finance. As biodiversity loss accelerates and regulatory and disclosure expectations tighten, these tools can help bridge the gap between high-level biodiversity commitments and operational decision-making. However, their effective deployment hinges on thoughtful integration into institutional workflows, realistic expectations about their capacities, and a commitment to continual learning and improvement.

This study has shown that no single tool can comprehensively address the issue of accountability for reporting the impacts and dependencies of PDBs activities in accordance with the Target 15 of the global biodiversity framework, the implementation of the TNFD recommendations or the obligations of the European CSRD.

While no single tool can comprehensively address all biodiversity-related needs of PDBs, a strategic and complementary use of multiple tools can yield valuable insights across different stages of the investment cycle. For instance, tools like STAR and ABC-Map offer detailed, location-based assessments well-suited for project-level screening and restoration planning. Meanwhile, value chain tools such as GBS, CBF, and BioScope are more effective for corporate-level and portfolio-wide biodiversity footprinting, enabling PDBs to assess indirect risks and align with emerging reporting frameworks like TNFD and CSRD.

Despite their promise, biodiversity measurement tools must be applied with caution. The majority of tools depend heavily on the availability and quality of input data, and many rely on sector-level assumptions that may not reflect on-the-ground realities. In some cases, tools may misidentify risks or fail to capture the positive impacts of nature-based or biodiversity-enhancing projects. Consequently, their outputs should not be interpreted in isolation but contextualized with site-specific knowledge, stakeholder input, and traditional due diligence such as Environmental and Social Impact Assessments (ESIAs).

To unlock the full potential of these tools, PDBs should invest in building internal technical capacity, strengthening collaboration between project developers and biodiversity experts, and improving access to standardized, high-quality biodiversity data. Equally important is the development of internal protocols for interpreting tool outputs, ensuring that decision-makers understand what each metric represents—and what it does not.

Looking forward, the role of biodiversity measurement tools will only become more prominent as international frameworks move from voluntary guidelines to mandatory disclosure regimes. In this evolving context, PDBs are encouraged to:

- Adopt a tiered approach, beginning with high-level screenings and progressively incorporating more detailed assessments as data becomes available;
- Tailor tool selection to project types, geographies, and sectors to maximize relevance and impact;
- Continuously update institutional practices in line with innovations in biodiversity science and technology;
- Engage in peer learning and knowledge-sharing, contributing to a community of practice around biodiversity integration in finance.

Ultimately, biodiversity measurement tools should not be viewed as ends in themselves, but as enablers of a more strategic, data-informed, and proactive approach to aligning development finance with nature-positive outcomes. When used as part of a broader suite of assessments and engagement strategies, these tools can significantly enhance the ability of PDBs to reduce ecological risks, unlock new opportunities, and ensure that their investments contribute meaningfully to global biodiversity goals.

Acronyms

AFD: Agence Française de Développement

BA: Business Applications

BFFI: Biodiversity Footprint Financial Institutions

CBF: Corporate Biodiversity Footprint

CSRD: Corporate Sustainability Reporting Directive

EBRD: European Bank for Reconstruction and Development

EIA: Environmental Impact Assessment

ENCORE: Exploring Natural Capital Opportunities, Risks and Exposure

ESIA: Environmental and Social Impact Assessment

EU: European Union

GBF: Global Biodiversity Framework

GBS: Global Biodiversity Score

GIS: Geographic Information System

GRI: Global Reporting Initiative

IBAT: Integrated Biodiversity Assessment Tool

IPBES: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

IUCN: International Union for Conservation of Nature

LCA: Life Cycle Assessment

MDB: Multilateral Development Bank

MSA: Mean Species Abundance

NACE: Nomenclature of Economic Activities

OFA: Organizational Focus Area

PDF: Potentially Disappeared Fraction

PDB: Public Development Bank

SDG: Sustainable Development Goals

STAR: Species Threat Abatement and Restoration

SBTN: Science-Based Targets for Nature

STEP: Station d'Épuration des Eaux Usées (Wastewater Treatment Plant)

TNFD: Taskforce on Nature-related Financial Disclosures

UNEP: United Nations Environment Programme

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