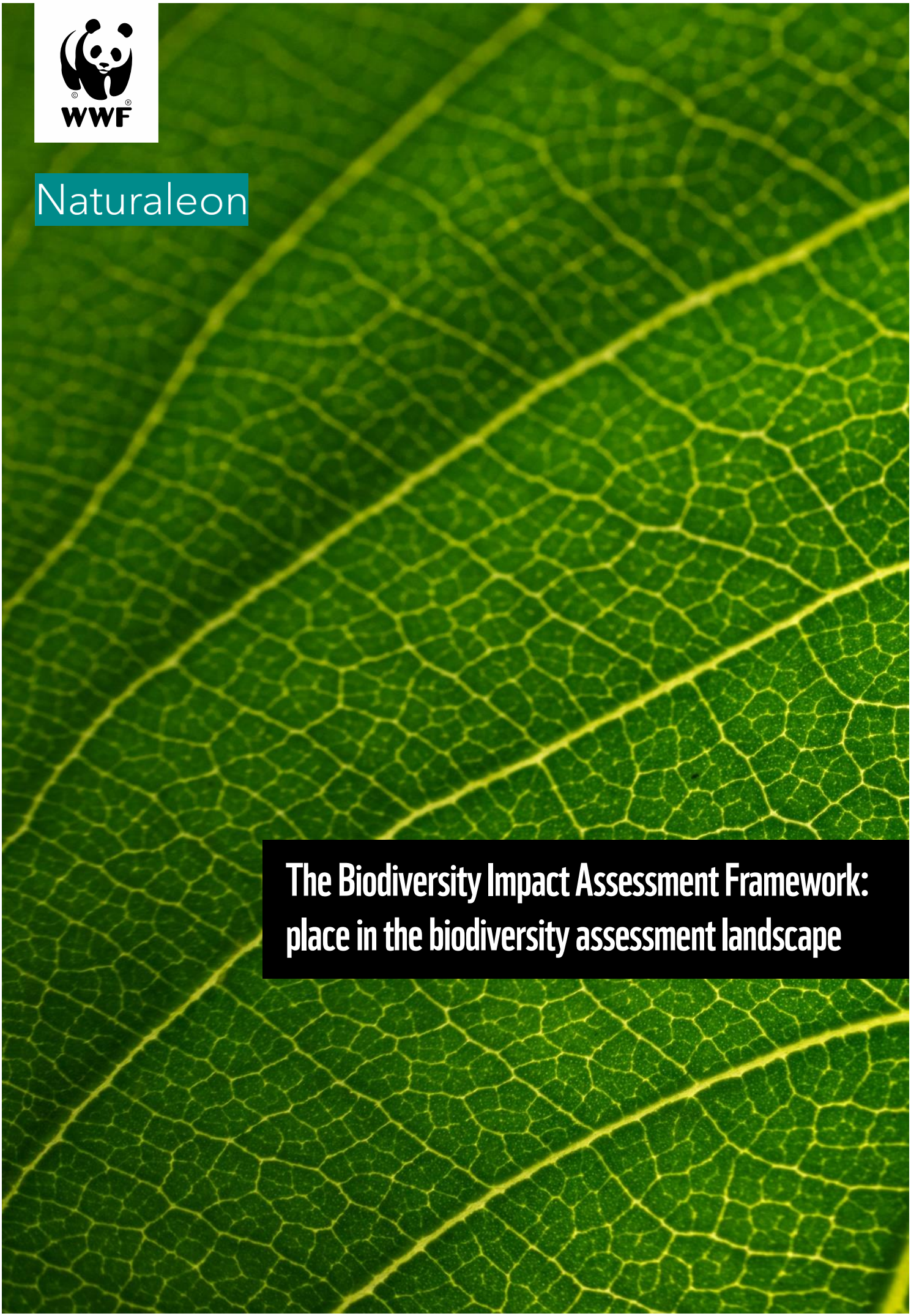

Naturaleon

The Biodiversity Impact Assessment Framework: place in the biodiversity assessment landscape

Report produced by WWF Switzerland

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1 Introduction

1.1 Context

The Biodiversity Impact Assessment Framework (BIAF) is a methodology developed by WWF Switzerland, and The Biodiversity Consultancy, to assess the potential biodiversity impact of investments, projects or interventions, especially those aiming to achieve positive impacts.

The BIAF methodology and case study examples were published in 2024. WWF Switzerland has been leading a process to understand user needs, scope technical requirements for an assessment tool based on BIAF, develop a prototype user interface, engage institutional collaborators and secure resources for further development of BIAF.

BIAF has a wide range of potential users, including Public Development Banks (PDBs)[1], especially in the context of the MDB Common Principles for Tracking Nature-Positive Finance. WWF Switzerland's interviews with PDBs and other organisations show that a variety of nature-related assessment frameworks, tools and methods are being used or considered for use in nature finance investment decisions and tracking. The Kunming-Montreal Global Biodiversity Framework, including its finance-related targets (CBD 2022), has increased the impetus to expand, target, track and assess nature finance (Box 1). However, organisations are also often unclear about which approach to apply when, and how BIAF may interact, complement or compare with other assessment approaches.

Box 1: What is 'nature finance'?

'Nature finance' does not have a single agreed definition, but is generally considered to be finance that directly or indirectly contributes to halting and reversing nature loss, and enhancing nature's contributions to people. This could be through delivering measurable positive outcomes for nature and/or enabling the transition of economic activity away from practices that drive nature loss (World Bank Group 2023; see chapter 8 for further detail).

While 'nature' is a broad concept, the term 'nature finance' is most often applied to biodiversity (the living component of 'nature') and the ecosystem services that it supports.

1.2 Purpose and structure

This report aims to clarify BIAF's place in the overall biodiversity assessment landscape vis-à-vis other initiatives, and where and how BIAF could add value for nature finance assessment. It outlines the state of play for nature finance assessment, considering methods, tools and frameworks (collectively termed 'approaches') across a set of broad

[1] In the context of this report, we understand Public Development Banks (PDBs) to be national or multilateral development banks that promote and finance sustainable development in the private or public sector.

categories, covering both site- and non-site-based interventions and all potential sectoral applications.

A brief overview of the BIAF methodology (chapter 2) is followed by a summary overview of the assessment landscape for nature finance (chapter 3), which was informed by identified user needs (outlined in chapter 4). Chapter 5 summarises findings from the review of assessment approaches. The review itself is presented for each category of approaches in chapter 6, with selected illustrative examples explained in more detail. Annexes outline how PDBs, in particular Development Finance Institutions (DFIs), are starting to categorise nature finance so as to identify nature-positive finance (chapter 8), BIAF's user needs assessments (chapter 9), and further technical details for one of the example approaches, S&P's Nature Risk Profile methodology (chapter 10).

2 BIAF: current methodology and plans for development

2.1 The BIAF methodology

The Biodiversity Impact Assessment Framework (BIAF) aims and methodology are detailed in Borner et al. (2024).

BIAF provides a standardised, quantified and transparent method to measure the impact of investments, projects or interventions that anticipate producing positive outcomes for biodiversity. BIAF assesses net positive and negative impacts against a 'business as usual' baseline.

For pre-investment, the approach involves defining an overall theory of change, defining distinct impact pathways linked to the five key drivers of biodiversity loss, screening for materiality, then quantifying predicted biodiversity impacts using a biodiversity extent, condition and significance (BECS) scoring approach.

For post-investment (yet to be developed) the approach will involve assessing realised gains using the BECS approach and appropriate monitoring metrics.

2.2 BIAF iterations

In its current form, BIAF is a documented methodology, including a scoring framework, that has general application to nearly any[2] proposed investment, project or intervention, whether focused at a particular site or on value chains. Applying the methodology currently requires a good understanding of biodiversity and environmental science.

The plan is to develop this version, BIAF-1, into a semi-automated tool, BIAF-2. This will require less time and expertise to apply, and will extend to post-investment assessment. Initially, BIAF-2 is expected to focus on one sector (yet to be chosen).

[2] To apply BIAF, at least one potentially positive, quantifiable impact pathway must be defined within a credible theory of change: see Borner et a. 2024.

A further iteration, BIAF-3, is planned for the future. This will extend BIAF to assess a number of other sectors, particularly those relevant for nature-positive finance, within a fully developed online tool.

These anticipated iterations of BIAF are summarised in Table 1.

Table 1. Summary of planned BIAF iterations

Version	Key features	Investment stage
BIAF-1 *Current version (2025)*	• Methodology and scoring framework, with supporting materials and worked examples	Pre-investment
BIAF-2 *Fundraising phase*	• Functionalities extended to illustrate tool capabilities for **one focal sector** (or for a limited set of functionalities across a range of sectors) • Linked with relevant frameworks and initiatives • Includes all key functionalities • User interface for data entry • Semi-automated processes and decision-support • Integrated with supporting datasets • In-built customisation options • Guidance material	Pre- and post-investment
BIAF-3 *Planned for future*	• Fully-specified online tool (and coded method) • Covering all sectors relevant for nature finance	Pre- and post-investment

3 The assessment landscape for nature finance

Datasets, methods, frameworks and tools for biodiversity assessment are rapidly developing. Drivers for this include new regulatory requirements, growing recognition of nature-related business risks, evolving stakeholder and investor expectations and the emergence of the 'nature positive' concept aligned with global biodiversity goals (CBD 2022, zu Ermgassen et al. 2022, WBCSD 2023, Arcadis et al. 2024, Booth et al. 2024, McKenzie et al. 2025; see also chapter 8). More than 200 datasets, methods, frameworks and tools to support nature-related assessment and disclosure are now listed in the TNFD tools catalogue (as of April 2025), and the EU Business and Biodiversity Platform's recent update on biodiversity measurement approaches for businesses and financial institutions (De Ryck et al. 2024) reviews 37 distinct approaches.

These approaches have very diverse characteristics and applications. The "Biodiversity Measurement Navigation Wheel" (version 3.0) in De Ryck et al. (2024) categorises approaches by business context, ambitions, scope, sector, pressures, metrics, data types and effort required. For mapping the nature finance assessment context in which BIAF fits, we have used a simpler categorisation with six broad (though overlapping) categories, adapted from Borner et al. 2024:

- Biodiversity footprinting tools (chapter 6.2)
- Dependency, impact, risk and opportunity (DIRO) assessment tools (chapter 6.3)
- Disclosure, reporting and target-setting frameworks (chapter 6.4)
- Impact assessment and nature finance frameworks and taxonomies (chapter 6.5)
- Nature credits frameworks (chapter 6.6)
- Integrative tools (chapter 6.7).

Figure 1 shows an updated overview of the biodiversity landscape relevant to nature finance, and the position and interconnections of BIAF within this.

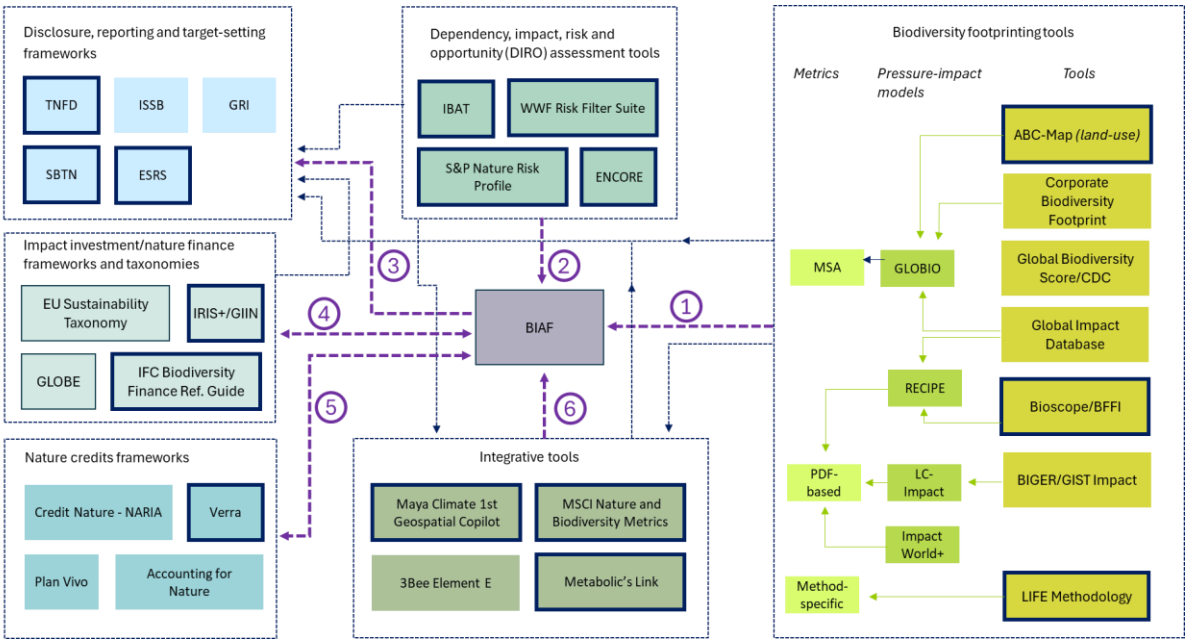

Figure 1. Overview of the biodiversity assessment landscape relevant to nature finance (updated from Borner et al. 2024). Example methods, frameworks and tools are shown for each category; approaches discussed in this report are outlined in bold. Inter-relationships within and between categories are indicated by arrows. For BIAF linkages with categories (arrows numbered 1-6), see text.

Current or potential BIAF linkages with each category are shown by arrows numbered 1-6 in Figure 1 and can be summarised as follows (for more detailed discussion see chapter 4):

1. BIAF already draws on outputs from biodiversity footprinting tools, and these could be more systematically integrated with BIAF in future
2. Risk information from DIRO tools can provide locational context to support BIAF assessments
3. BIAF can inform planning, decision-taking, target-setting and reporting for business responses to evaluation of nature-related risks and opportunities
4. BIAF complements current frameworks and taxonomies by providing a standardised method to assess and quantify net positive impacts relative to a 'business as usual' scenario. These approaches could also inform specification of impact pathways and pressure metrics in BIAF
5. BIAF assessments could be used to measure gains in future nature credits frameworks, especially for non-site based interventions, while nature credits methodologies could inform future development of BIAF
6. BIAF could draw on, or potentially be integrated with emerging automated or semi-automated approaches that synthesise a range of datasets, metrics and assessments.

4 User needs for nature finance assessment cases and the role of BIAF

Interviews with impact investment managers and advisors, and with PDBs, in particular DFIs, identified a suite of key user needs and desired attributes for a nature finance-focused tool for biodiversity impact assessment (Annex 9). While many needs and attributes were mentioned, the most important and frequently-cited of these were:

Key user needs (what users want to do with an assessment tool):

- Scale and compare both negative and positive impacts
- Identify, understand and compare pathways to impact
- Identify opportunities to enhance impact and manage risks
- Categorise nature finance and identify nature-positive finance (see Annex, chapter 8)
- Report and communicate on the investment case and realised impacts

Key desired attributes (how users want the assessment tool to operate):

- Standardized structure and process for assessments
- Can produce meaningful outputs even when data are limited
- Integrates key supporting datasets
- Uses publicly available or easily sourced data
- Assessment depth and methods can be customized
- Assessment scores can be broken down for detailed interpretation
- Can incorporate context-specific information
- Interoperable with other widely-used tools and frameworks
- Can be used without substantial biodiversity expertise
- Provides guidance on assessment and interpretation

Based on the assessment presented in chapter 6, Table 2 summarises how far different categories of biodiversity assessment tools and frameworks currently meet identified user needs and desired attributes for nature finance assessment. The table provides a generalised overview for each category, since many different tools and frameworks are now available in each category and their capabilities can vary substantially. Note also that the rating for BIAF-2 and BIAF-3 are based on current plans for development, which could change or not be fully realised, rather than existing tools.

Since BIAF was designed specifically to meet user needs for nature finance assessment, it is not surprising that it ranks highly compared to other approaches. However, it is notable that existing approaches all show substantial gaps in how well they can support nature finance assessment, highlighting the need for further development of tools in this space.

Table 2. Summary of how far different categories of current biodiversity assessment tools and frameworks can meet identified user needs and desired attributes for nature finance assessment. ✓, fully meets need/attribute; ≈, partially meets need/attribute; blank, does not meet need/attribute. *Note that the extended functionality of BIAF-2 compared to BIAF-1 is for one focal sector, and the assessment for BIAF-2 and BIAF-3 is based on current development plans.*

Key user need	Footprinting tools	DIRO assessment tools	Disclosure and reporting frameworks	Impact investment frameworks	Nature credit frameworks	Integrative tools	BIAF-1	BIAF-2 (planned)	BIAF-3 (planned)
Scale and compare both negative and positive impacts	≈	≈			≈	≈	✓	✓	✓
Identify, understand and compare pathways to impact	≈	≈		≈	≈	≈	✓	✓	✓
Identify opportunities to enhance impact and manage risks	≈	≈	✓	≈		≈	✓	✓	✓
Categorise nature-positive financing			≈	≈	≈		≈	✓	✓
Report and communicate on realised impacts			✓	✓	✓	≈		≈	✓
Desired attribute									
Standardized structure and process for assessments	✓	≈	≈	≈	✓	✓	✓	✓	✓
Produce useful outputs even when data are limited	✓	✓				✓	✓	✓	✓
Integrates key supporting datasets	≈	≈				✓		≈	✓
Uses publicly available or easily sourced data		≈				✓		≈	≈
Assessment depth and methods can be customized	≈		≈			≈	✓	✓	✓
Assessment scores can be broken down for detailed interpretation	≈	≈			✓	≈	✓	✓	✓
Can incorporate context-specific information	≈		≈	≈	✓	≈	✓	✓	✓
Interoperable with other widely-used tools and frameworks	≈	≈	≈			✓		≈	✓
Can be used without substantial biodiversity expertise	✓	✓		≈		✓		≈	≈
Provides guidance on assessment and interpretation	≈	≈				≈		✓	✓

5 BIAF's place in the assessment landscape

An analysis of each broad category of assessment approaches (chapter 6, below) in relation to BIAF leads to the following general conclusions:

- There continues to be rapid development of biodiversity assessment methods, frameworks and tools.
- The broad categories of approaches already overlap and these overlaps are expanding, with tools becoming available that integrate a range of existing methods (e.g. different kinds of footprinting) and datasets (e.g. for dependency and impact screening), with automated outputs relevant to disclosure and reporting frameworks.
- There is also evidence of trade-offs between increasing automation and the transparency of tools, with the detailed methods and algorithms of commercial 'push-button' approaches often not publicly available.
- Overall, developments in the assessment landscape show a strong emphasis on the requirements of disclosure and reporting frameworks, especially evaluation and assessment of dependencies, impacts, risks and opportunities. There is a particular focus on footprinting to assess negative impacts, and on screening for risks.
- As yet, few tools are available to measure and track the positive biodiversity impacts of investments, projects or interventions, and thus to support assessments and decisions related to nature finance.
- BIAF effectively sits in the category of 'impact investment frameworks and taxonomies' category. It fills a niche that no other approach currently occupies, providing a methodology for standardised quantitative assessment of net positive impacts relative to 'business as usual'. BIAF therefore supplements existing frameworks and taxonomies that are largely qualitative or do not measure state-of-nature changes.
- By design, the BIAF methodology supports not only outputs but processes, enabling investment teams to identify nature finance investment opportunities, and environment and sustainability/impact teams to identify the positive impacts on nature.
- BIAF is also unusual in assessing over a defined time frame, encompassing both place-based and non-place based outcomes, and (with further development) both the pre- and post-investment phase.
- BIAF can clearly address (either now or in future iterations) a suite of currently unmet user needs related to nature finance assessment, with particular relevance for impact investors and PDBs.
- In future, a broader range of businesses is anticipated to have similar user needs, as companies progress from evaluating dependencies and negative impacts, and assessing risks and opportunities, to planning, target-setting and implementation of nature-positive actions.

- The transparency of the BIAF approach is also important, given growing business and finance concern about anti-greenwashing regulation and scrutiny, and the need to demonstrate that their actions make a real positive difference. The BIAF methodology requires specification of an explicit theory of change and impact pathways, and documentation of evidence and assumptions.
- As BIAF develops from a 'manual' methodology to a more sophisticated tool, with greater functionality, automation and dataset integration, there is much that can be learned or incorporated from elsewhere, notably the technical developments among integrative tools in automating processes and incorporating AI support for users.

6 Categories of biodiversity assessment approaches and their relationship to BIAF

6.1 Introduction

This chapter describes each of the broad categories of biodiversity assessment approaches outlined in chapter 3, delineating:

- What they actually are
- What they can be used for
- Their key characteristics (in relation to nature finance assessment and the user needs outlined in chapter 4)
- Their relationship to BIAF.

For each category, one or more frameworks, tools or methods are described in more detail as examples of how the approaches work. These examples were selected both for their illustrative value and based on their current use in nature finance assessment, as mentioned during interviews with DFIs and with impact investment asset managers and advisors (Annex, chapter 9).

6.2 Biodiversity footprinting tools

6.2.1 What they are

Biodiversity footprinting is an approach to assess the overall biodiversity impacts of a project, product, service, company or portfolio. Footprinting provides a quantitative, aggregated assessment in a standardised unit, based on generalised relationships between pressures and impacts (TNFD & PBAF 2023).

Many but not all footprinting tools use Life Cycle Assessment (LCA) to assess resource use and emissions, and resulting pressures on biodiversity, over the whole life cycle of an activity or product. Their key components are:

- An environmentally extended input-output (EEIO) model, that can relate financial flows or activity volume in a particular sub-sector to the scale of environmental pressures (e.g. freshwater ecotoxicity) on a regional basis
- Pressure-impact models, that use empirical data on the relationship between specific pressures and ecosystem condition to estimate biodiversity loss using a standard metric, such as Potentially Disappeared Fraction of species (PDF).

Footprinting tools vary in their coverage of realms (some are only terrestrial) and different pressures (some focus narrowly on land-use).

6.2.2 What they can be used for

Footprinting has many potential applications for business and finance, but is most often used to highlight where the most significant negative impacts occur in value chains. This provides a guide to further investigation and action for impact reduction.

The results from footprinting are quantitative, comparable and scalable; indicate the main impact pathways; and point to where risks and negative impacts may need further management.

In principle, footprinting tools can be used to compare scenarios and assess the magnitude of positive change for biodiversity. Depending on the scenarios and the tools applied, this may require detailed information (e.g. on reduction of specific pressures compared to business-as-usual), access to the underlying models in footprinting tools, and technical expertise. Additional information, beyond footprinting results, would also usually be needed to categorise nature-positive financing.

6.2.3 Relevant characteristics

- ✓ Versatile and can produce meaningful outputs with limited data, including just financial information, and only limited biodiversity expertise
- ✓ Footprinting tools using LCA approaches provide a comprehensive overview of impacts across the full life-cycle and across a wide range of pressures
- ✓ Can easily be applied at different operational scales and for different sets of investments or activities
- × Tools have gaps in the coverage of different kinds of pressures, so impact pathways are not comprehensive
- × Different LCA models can produce substantially different footprinting results (Bromwich et al. 2024)
- × Tools typically apply regional/sectoral averages and generalised pressure-impact models, so location- or management-specific context is not taken into account
- × Footprinting is focused primarily on negative impacts. Comparing estimates for different scenarios to assess positive impacts may require data on pressures ('impact drivers') and technical expertise
- × Footprinting metrics do not include a biodiversity significance measure or other locational context for impacts, although this can be incorporated separately.

6.2.4 Relationship to BIAF

The BIAF methodology does not produce a biodiversity footprint (as an absolute measure of impact) but rather assesses the pathways and scale of impact of a change in activity from business-as-usual. This enables quantification and comparison of material positive or negative impacts along specific impact pathways, and supports the categorisation of nature finance (see Annex chapter 8). Biodiversity footprinting can also be deployed in this way, but this requires additional steps and information beyond a simple footprint calculation.

BIAF is focused on particular project investments or project interventions, and is less easily applied to investment portfolios, at corporate level or across a set of sectoral activities. However, BIAF outputs also use a unitary metric so are in principle scalable and additive.

BIAF can use elements of footprinting tools and analyses as inputs. For land-use type and intensity, BIAF-1 case studies applied average Mean Species Abundance ecosystem condition scores from the GLOBIO pressure-impact model. Where appropriate, these were modified for local context and management approach based on expert judgement.

BIAF-2 and BIAF-3 may link directly to footprinting tools to use models for other pressures. BIAF users will have the option to fine-tune scores to take into account management practices when these are evidenced to change impacts, an approach that could be semi-automated for some practices.

Even in future partly-automated iterations, BIAF is likely to be more demanding of time and expertise than existing footprinting tools, as assessments require explicit definition of a theory of change and impact pathways, and documentation of key assumptions being made. However, as a result the outputs may be more straightforward to understand, interpret and justify in the context of nature-positive finance.

6.2.5 Example approach: Biodiversity Footprint for Financial Institutions (BFFI) and Bioscope

BFFI is an LCA-based footprinting method that has been operationalised through the Bioscope web platform, which is free to access following registration.

Bioscope uses Exiobase v 3.4 as its input-output (EEIO) model to scale quantities of finance or materials into impact drivers (pressures). Exiobase v3.4 covers more than 160 defined sectors across 44 countries and five Rest of World regions. Pressures are translated into biodiversity impacts using an updated version of the Recipe2016 model (Huijbregts et al. 2017).

The pressures covered in ReCiPe include climate change, land use, ozone formation, eutrophication or acidification, ecotoxicity, and water consumption, as appropriate across terrestrial, freshwater and marine ecosystems. For some but not all pressures, the translation into impacts is adjusted for the region where they occur, by using region-specific LCA characterization factors. Granularity of the regionalisation (e.g. by country or continent) varies for different pressures.

Like other LCA methods, ReCiPe uses 'potentially disappeared fraction' (PDF) – the proportion of species made locally extinct – as a metric for ecosystem condition. The way that PDF is assessed varies between pressures, but mostly focuses on vascular plants on land and invertebrates in water (Huijbregts et al. 2017, Partnership Biodiversity Accounting Financials and PRé Sustainability 2022). PDF is integrated over space and time and expressed in units of pdf.m^2.year. To allow impacts to be added up or compared across terrestrial, freshwater and marine realms, these units are multiplied by the estimated density of species on land or in water, to give reported impact units of species.year – equivalent to the number of species locally disappearing for the course of one year. The global species density estimates are very approximate and based on many assumptions. However, they provide a standard multiplier for each realm (as local variations in species

density are not considered) so do not change the relative magnitude of impacts estimated within a realm.

Impact estimates made using Bioscope/BFFI, as with other LCA methods, involve many uncertainties (Bromwich et al. 2025). The approach has been primarily applied for broad-brush assessment of potential biodiversity impacts across investment portfolios, including identification of impact hotspots and potential to reduce impacts (e.g. for ASN Bank: PRé Sustainability & CREM 2022). It can be used for broad quantification of 'avoided impacts' by comparing investments in sustainable approaches to a business-as-usual scenario (CREM and PRé Sustainability 2019). For example, ASN Bank assessed positive impacts from its renewables investments by assuming that "power from solar and wind replaces power from other electricity generating technologies, like fossil fuels" (PRé Sustainability & CREM 2022).

For individual investments, a more granular and reliable assessment of positive impacts could be obtained by replacing sector-average values in EXIOBASE with data specific to particular locations, processes or products (Kovacs 2023). This, effectively, is the approach that is used in BIAF when assessing impact pathways. At present, it is not possible to do this within the Bioscope tool.

6.2.6 Example approach: ABC-Map

The Adaptation, Biodiversity, and Carbon Mapping Tool (ABC-Map) is a geospatial tool to assess the impact (positive or negative) of policies, plans and investments in the agriculture, forestry, and other land-use (AFOLU) sector.

The three components (Adaptation, Biodiversity and Carbon) can be assessed separately. For the current review, the biodiversity component and its application to investments are relevant.

ABC-Map is described as "a spatially explicit, land-based accounting system" (Dionisio et al. 2024). Users need to:

- Delineate a spatially explicit area of interest (AoI), which will provide the baseline for assessing project impacts
- Define the area(s) within the AoI where particular project activities will take place
- Define the project activities, specifying the time-frame, anticipated final land use and management practices. ABC-Map provides a limited set of drop-down options for this, relating to different land uses and land-use intensities.

ABC-Map then assesses biodiversity impacts against both a static and a dynamic (based on historic trends) baseline. Impacts are assessed using the GLOBIO pressure-impact model (version 3.5, Schipper et al. 2019), taking into account four land-related pressures: impacts of land use, disturbance by infrastructure, habitat fragmentation from land use and infrastructure; and human encroachment. ABC-Map also highlights any overlap with Key Biodiversity Areas or Protected Areas and provides an economic natural capital valuation using data from the Ecosystem Services Valuation Database (de Groot 2021).

Biodiversity impacts – positive or negative – are summarised as the change in Mean Species Abundance[3] across the project area of interest, and MSA changes are also mapped. ABC-Map does not provide an overall impact measure in MSA.km^2 units but users can readily calculate this from the outputs.

ABC-Map provides a powerful and easy-to-use tool for predicting biodiversity impacts of land-management interventions in a defined area. Because broad land use/intensity combinations are used, applying the GLOBIO 3.5 global averages for MSA (see Annex I in Dionisio et al. 2024), and input options for land management are limited, changes in management practices will not necessarily be reflected in changed MSA scores.

The tool uses a suite of global land-cover datasets, with their land-cover classes cross-walked to the defined ABC-Map classes and then the land use/intensity combinations used in GLOBIO. The baseline layers include a global map of the Forest Landscape Integrity Index (Grantham *et al.*, 2020), but how the integrity of non-forest ecosystems is defined is not explained in the technical guidance (Dionisio et al. 2024). Because classification errors occur in all land-cover maps, ABC-Map might not produce reliable outputs for very small-scale interventions.

For BIAF, ABC-Map could provide useful inputs for scoring impact pathways involving changes in land use or management. It would need to be supplemented for assessing other impact pathways, for instance where reduction in agricultural inputs improved biodiversity on cropland but also had positive impacts on aquatic ecosystems, and for considering upstream or downstream impacts.

6.2.7 Example approach: LIFE Methodology for Business and Biodiversity

The LIFE Institute is an international non-profit standard-setting organization that has developed and manages a suite of methodologies, certifications and credits related to business and biodiversity.

Among these, the LIFE Methodology for Business and Biodiversity is a type of footprinting tool. It is unusual in explicitly assessing both positive and negative impacts, and in its distinct conceptual approach. The methodology has been developed for application in two geographic regions so far: Brazil and Europe. The method for Europe is documented in LIFE (2024, 2025). LIFE provides an automated calculation tool in the LIFE Key software.

The method assesses the positive biodiversity impacts of a business from conservation-directed actions. This is balanced against an assessment of negative impacts from pressures exerted by the actual business on biodiversity, and a scaling of the conservation efforts needed to compensate for these.

Assessment of positive impacts includes actions with both direct and indirect effects (the latter covering a range of actions from awareness-raising through alternative production systems, and including the organization's own sustainability plans and impact mitigation). Actions are classed hierarchically into four groups and three cross-cutting themes relating to implementation stage. These hierarchies are translated into weightings for scores.

[3] For an explanation of MSA, please see the BIAF Methodology report (Borner et al. 2024)

The assessment uses a taxonomy of actions and a suite of further weightings ('qualifiers') and scores set out in detailed tables for specific variables (e.g. jurisdictional coverage of programmes, protected area management category and ecoregional biodiversity importance). These are applied according to the target and context of particular conservation actions.

From all these weightings and scores an overall Biodiversity Positive Performance (BPP) score is calculated, summing the scores of "actions that are current and additional to legal requirements".

To assess impacts, the methodology assesses a corporate Biodiversity Pressure Index (BPI). This considers the relative quantity and severity of five pressures (waste generation, water consumption, energy consumption, land-use and GHG emissions). The methodology varies by pressure but, in summary, quantity is calculated as the company's share of the overall regional total, and severity relative to a benchmark value. Quantity and severity scores are multiplied, standardised to a 0-1000 scale, and averaged across pressures to give the BPI.

From the BPI a Biodiversity Minimum Performance (BMP) score is then calculated, scaled by US dollar turnover and defined calibration factors. This represents the minimum BPP score the company should aim to achieve, so as to compensate for its negative impacts. This balancing is notional, as the negative and positive impacts are assessed differently and each summed into a dimensionless score that is not based on real-world units.

The LIFE methodology is comprehensive and granular. It applies a complex set of values, thresholds, scores, weightings and calculations, based mainly on expert input. However, the rationale for decisions on thresholds, scores and weightings, and explanation of what these decisions mean for the calculated indices, are largely undocumented, so it is difficult to understand the assumptions involved and how far these may be justified. Unlike more widely-used footprinting methods, the methodology does not have a clear, unitary conceptual framework. Scoring is based on indices rather than real-world units, and positive and negative impacts are assessed in quite different ways. This makes it hard to apply a common-sense interpretation to the resulting scores, or to be sure that it is meaningful to compare the calculated Biodiversity Minimum Performance and the Biodiversity Positive Performance values.

6.3 Dependency, impact, risk and opportunity assessment tools ("DIRO")

6.3.1 What they are

For businesses to understand and manage nature-related risk, and align with nature-positive goals, they must locate and evaluate their dependencies and impacts, and assess the associated risks and opportunities (-> DIRO: Dependency, Impact, Risk, Opportunity).

This process is central to voluntary or regulatory disclosure, target-setting and reporting requirements (chapter 4.4).

A growing number of tools exist to support DIRO evaluation and assessment. These provide streamlined access to key relevant datasets (including derived products, such as relative risk scores) and a variable degree of interpretation or decision-support. The tools are diverse in terms of the type and granularity of information they provide. Review of the TNFD tools catalogue shows there is a rapid increase in semi-automated, proprietary tools aiming to support corporate disclosure and reporting (chapter 6.4), which may incorporate a DIRO element. These 'integrative' tools are discussed in chapter 6.7.

6.3.2 What they can be used for

DIRO tools can provide information on likely dependencies, the scale of impacts (positive or negative, potential or actual), priorities for improved risk management and opportunities for positive impact.

This information usually requires substantial expert interpretation and/or combination with other information sources for meaningful evaluation and assessment.

By themselves, these tools provide only limited information to compare and scale impacts in a standardised way, to understand impact pathways, to categorise nature-positive finance or to report on realised impacts.

6.3.3 Relevant characteristics

- ✓ Provide streamlined access to key datasets, with some level of derived scores, built-in interpretation and/or guidance
- × For meaningful interpretation, expertise, and often additional information is required
- × Outputs of some tools can be very broad-brush

6.3.4 Relationship to BIAF

DIRO tools can provide useful inputs for BIAF assessments. Dependency information is not relevant for BIAF, but risk information may provide locational context for assessing condition change and significance in BIAF's BECS scoring.

For instance, BIAF-1 case studies drew on

- The STAR metric available in IBAT (in derived form for administrative units) as a global metric for relative biodiversity significance.
- Freshwater scarcity, quality risk and biodiversity significance from the WWF Water Risk Filter, used to scale condition change and significance values for impact pathways involving change of water use and pollution.

Future iterations of BIAF are expected to link automatically to relevant derived datasets provided by these (and potentially other) DIRO tools.

6.3.5 Example approach: WWF Risk Filter Suite

WWF's Risk Filter Suite (WWF 2024; methodology documents available at https://riskfilter.org/) provides screening tools along with associated information and guidance for rapid assessments of potential water- and biodiversity-related risks.

The WWF Biodiversity Risk Filter (BRF) covers both physical risks (broadly, those related to business dependencies on ecosystem services) and reputational risks (broadly, those related to potential business impacts on biodiversity).

The Biodiversity Risk Filter adopts a hierarchical approach to risk. At the lowest level, 71 metrics are used, built upon 61 global data sets, mainly public and peer-reviewed. These are synthesized, spatially aggregated or disaggregated to an assessment unit, and translated to consistently-scaled risk scores ranging from 1-5 to form 33 indicators. These are further grouped into eight risk categories and then into the two broad risk types (physical or reputational).

The tool can assess risks for single or multiple sites, spatially defined and entered by the users. It displays assessment outputs over an interactive global map and provides summary data in a dashboard format. Information is also available for each individual risk indicator for every site, which can be downloaded as an Excel table.

The tool also provides overview information on the intensity of dependencies and impacts by industry sector, global maps of risk, and summary values for national and sub-national administrative units.

The Water Risk Filter (WRF) takes a broadly similar approach, considering risks of three types: physical (relating to the quality and quantity of water), regulatory (related to governance, regulation, management and infrastructure) and reputational (related to factors that could influence stakeholder or local communities' perceptions).

As for biodiversity risk, water risk assessment is hierarchical. A set of 42 risk indicators is aggregated into a set of risk categories (12 in total), then into the three risk types. As with biodiversity risk, water risk indicators are scored from 1-5 (very low to very high risk) for each level 7 HydroBASIN, and aggregated and averaged to provide scores for risk categories and risk types.

For water risk and terrestrial biodiversity risk, the assessment unit is based on HydroBASIN level 7 drainage catchments, an intermediate catchment size. For marine areas, Marine Ecoregions of the World (MEOW) are used for coastal areas and FAO Major Fishing Areas for the high seas.

Though individual assessment units vary greatly in area, they are often quite large: many level 7 HydroBASINS are in the order of 1,000-10,000 km^2. So, while the WWF BRF (free to use) summarises data from IBAT (payment to use) on sensitive sites and significance of locations for species, it does not provide the same level of spatial granularity as IBAT.

Most indicators in the WWF BRF and WRF are not immediately useful for scaling and comparing biodiversity impacts. However, some indicators could be applied for assessing impact pathways in BIAF, or can provide context for interpretation. For example, water scarcity and water quality indicators show the potential for ecosystem condition improvement from practices that reduce water use or water pollution. Overall scores for

these risk categories were used in the case study for company C in Borner et al. 2024. Also in this case study, significance scores for freshwater were based on combined WWF WRF indicators for endemism and species richness of freshwater fish. Similarly, range-rarity scores in the WWF BRF could be used as a significance score for terrestrial locations.

6.3.6 Example approach: ENCORE

ENCORE (Exploring Natural Capital Opportunities, Risks and Exposure) is a free-to-use online tool and knowledge base for screening potential dependencies and impacts on nature. ENCORE's main module was substantially improved and updated in 2024 and applies to all components of nature and all industry sectors, covering 271 economic activities classified according to the UN's International Standard Industrial Classification for All Economic Activities (ISIC).

ENCORE's biodiversity module looks in more detail at biodiversity specifically. The current version focuses on the agriculture and mining sectors, allowing an initial estimate of a portfolio's impact on ecological integrity and its potential to contribute to reducing species' extinction risk.

The main ENCORE module is based on an extensive knowledge base that can be visualised for a particular sector within the online tool, or separately downloaded. For a defined economic activity, ENCORE shows the link to natural capital (components of nature and broad ecosystem types, or biomes) via (1) dependencies of the activity on ecosystem services, and (2) pressures created by the activity that could impact the state of nature (Figure 2. Structure of the updated ENCORE knowledge base (adapted from UNEP-WCMC 2024)). ENCORE provides ratings for the materiality of dependencies and impacts, based on a simple five-level scale from very high to very low. Links and ratings are based on extensive literature review and expert input.

ENCORE's knowledge base also tabulates:

- The most important upstream and downstream links between an economic activity and other activities in its value chain.
- Potential impact pathways (pressures to mechanisms to natural capital elements), evidenced by citation of relevant literature.

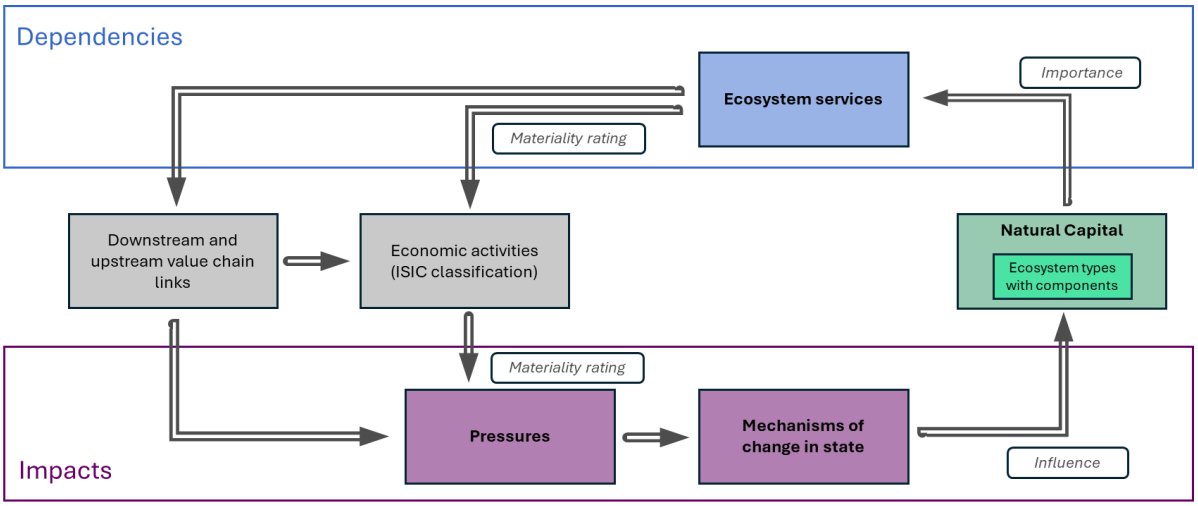

Figure 2. Structure of the updated ENCORE knowledge base (adapted from UNEP-WCMC 2024)

The main ENCORE module enables rapid scoping of potential sectoral dependencies and impacts, informing priorities for further investigation and action.

The ENCORE biodiversity module gives a more detailed, spatially-explicit assessment of biodiversity impacts for two key sectors – agriculture and livestock, and mining. It produces metrics based on (1) Mean Species Abundance (MSA, weighted by an ecoregional significance measure based on ecoregion size and proportion of natural habitat remaining) and (2) the Species Threat Abatement and Restoration metric (STAR) (UNEP-WCMC et al. 2021).

Although not framed in this way by ENCORE's documentation (UNEP-WCMC et al. 2021), these two metrics in the biodiversity module in effect provide different estimates, for ecosystems and species, of both occupancy impacts and the potential for restoration to contribute to global biodiversity goals. Note that MSA and STAR were also used (as impact and significance metrics) in case studies for BIAF.

For agriculture and livestock the biodiversity module uses averages by country, so produces a very broad-brush measure that may not be representative of the locations where activities are actually taking place. For mining, the spatial granularity is finer, based on known locations by company in S&P's asset level database.

ENCORE has a very different purpose than BIAF, and is best suited to initial exploration and scoping of impacts and dependencies. Some elements of the updated version may nonetheless provide useful inputs to BIAF assessments. In particular, the comprehensive tabulation of impact pathways, and of key value chain links, may be helpful in identifying and defining impact pathways for BIAF and checking for potential material negative impacts upstream and downstream.

6.3.7 Example approach: IBAT

The Integrated Biodiversity Assessment Tool (IBAT), is a long-established (since 2008) online portal that makes available three authoritative, regularly updated, spatial global biodiversity datasets: the IUCN Red List of Threatened Species, World Database on

Protected Areas (WDPA) and World Database of Key Biodiversity Areas. IBAT also incorporate two species datasets derived from the Red List: the Species Threat Abatement and Restoration metric (STAR) and rarity-weighted species richness.

The IBAT datasets have many applications but are particularly valuable for screening and evaluating biodiversity risks and opportunities (for example, for project planning or for the LEAP process of the TNFD framework: chapter 6.4.5).

Commercial organisations must pay to use the IBAT datasets. Once assessment location(s) are specified, IBAT can produce a suite of ready-made reports that include mapping, interpretation and contextual information. Certain subscription tiers also allow users to download the IBAT datasets for integration with their own geographic information systems.

IBAT provides detailed and spatially granular information highly relevant to understanding biodiversity impacts, risks and opportunities. While the interface is straightforward to use, interpretation of the outputs is likely to require some level of biodiversity expertise.

IBAT is not designed for directly estimating positive impacts or identifying nature-positive finance. For BIAF, the STAR and rarity-weighted species richness layers provide useful metrics for the relative biodiversity significance of locations.

6.3.8 Example approach: S&P Global Sustainable1's Nature & Biodiversity Risk Profile

This is a spatially explicit risk assessment method for the terrestrial realm, focusing on direct operations and taking a double materiality approach that considers both how nature impacts business and *vice versa*.

It goes substantially beyond other available DIRO tools through both a highly granular (1-5 km^2 scale) and quantitative approach, with a clear conceptual and mathematical framework for estimating relative exposure to risk. Measures to manage risk, although part of the conceptual framework, are not currently considered. The methodological approach is adapted from United Nations Environment Programme (2023) and detailed in S&P (2024).

Risk profiling is a paid-for service linked to S&P's proprietary database of over 2.9 million assets mapped to corporate owners (Nature & Biodiversity Risk Dataset | S&P Global Marketplace, accessed 28 March 2025).

The overall approach is shown in Figure 3. The methodology includes some elements of potential relevance to nature finance assessment and/or BIAF, including assessment of impact magnitude. As it is complex in detail, an overview and some commentary are provided in Annex chapter 10.

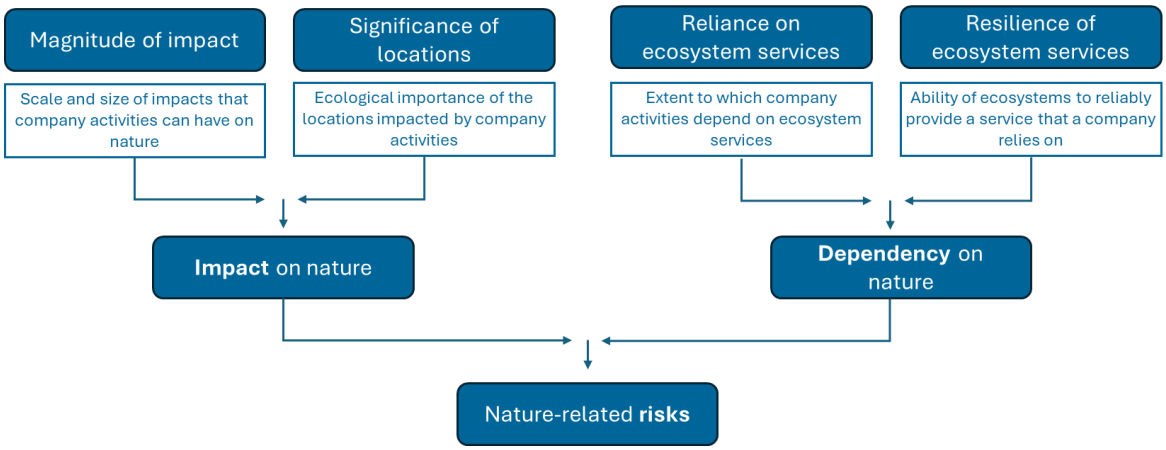

Figure 3. 'Building blocks' of the methodology for profiling nature-related risks. Adapted from S&P (2024).

The S&P Nature Risk Profile is not designed to measure positive impacts nor to identify nature-positive financing. The method could be adapted to predict positive impact by comparing impact magnitude for an intervention versus a business-as-usual scenario. How this could be done is outlined in UNEP (2023), but the approach is technically demanding and has not yet been implemented in a decision-support tool (see Annex chapter 10).

6.4 Disclosure, reporting and target-setting frameworks

6.4.1 What they are

Over the last half-decade at least seven major global or regional disclosure, reporting and target-setting frameworks have been developed and have begun to be implemented. Most of these are voluntary, but the European Sustainability Reporting Standards (ESRS) are now in regulatory force (although a streamlining process is underway).

The frameworks have some important differences, e.g. in their definitions of materiality, but very substantial similarities in their overall approach and requirements, and increasing focus on inter-operability. The steps required to evaluate, assess and report on DIRO (see 4.3 above) are perhaps most clearly outlined in TNFD's Locate, Evaluate, Assess and Plan (LEAP) approach. The Science Based Targets Network's framework for Science-based Targets for Nature provides a detailed approach to setting targets for action, at present for land and freshwater use and not directly related to (though highly relevant for) biodiversity.

6.4.2 What they can be used for

These frameworks set out the detailed elements, within a structured approach, for understanding business and finance interactions with nature, and planning and reporting responses to improve business and nature outcomes.

They are supported by substantial guidance material (availability varying by framework) and lists of suggested metrics, datasets and tools that can support implementation.

The frameworks themselves do not do the work needed for disclosure, reporting and target-setting – in effect they provide a manual for how users need to go about it.

6.4.3 Relevant characteristics

- ✓ Comprehensively identify and describe the elements needed to disclose, report and plan responses to nature-related dependencies, impacts, risks and opportunities
- ✓ Provide substantial technical guidance
- ✓ Provide a standardized structure but flexible process for assessment
- ✓ Encourage incorporation of context-specific information
- × Leave many technical decisions on implementation to users
- × Are complex and not straightforward to navigate and understand
- × Require considerable technical expertise to apply.

6.4.4 Relationship to BIAF

BIAF can help to inform business and finance responses to risk and opportunity evaluations needed for disclosure, reporting and target-setting – such as the Plan stage of TNFD's LEAP process, and the target-setting element of SBTN.

BIAF can be used to identify relevant impact pathways and scale and compare predicted impacts (or in future realised impacts, using BIAF-3) for actions to Regenerate and Restore ecosystems or Transform processes along the value chain, using the terminology of TNFD and SBTN.

6.4.5 Example approach: TNFD

The Task Force on Nature-related Financial Disclosures (TNFD) was established with the mission to "develop and deliver a risk management and disclosure framework for organisations to report and act on evolving nature-related risks, with the ultimate aim of supporting a shift in global financial flows away from nature-negative outcomes and toward nature-positive outcomes" (TNFD 2023a).

TNFD published its recommendations in 2023 (TNFD 2023a). The TNFD framework provides a standardized approach for business and finance to identify, assess, manage and disclose their material nature-related issues. Recommendations were developed through an extensive two-year consultation process and include (TNFD 2023b):

- Four disclosure pillars (governance, strategy, risk and impact management), metrics and targets. These build on Task Force for Climate-related Financial Disclosures (TCFD) recommendations and are consistent with the International Sustainability Standards Board (ISSB) IFRS Sustainability Disclosure Standards.
- 14 recommended headline disclosures, aligned with all those recommended by TCFD so as to encourage and support integrated climate and nature reporting.
- Incorporation of nature-related dependencies, impacts, risks and opportunities (DIRO: see chapter 6.3).

- Full alignment with the Global Biodiversity Framework Target 15 requirement to disclose dependencies, impacts and risks.

TNFD's Locate, Evaluate, Assess and Prepare (LEAP) process is fundamental to making the framework operational. Alongside its disclosure recommendations, TNFD published detailed guidance on LEAP (TNFD 2023c), including recommended metrics and approaches to measure changes in the state of nature.

The TNFD framework is further supported by a range of sector- and biome-specific guidance, plus materials on target-setting (following the Science-based Targets for Nature framework), scenario analysis, value chains and engagement with Indigenous Peoples, Local Communities and affected stakeholders.

TNFD's framework takes a double materiality approach and encompasses both negative and positive impacts on nature. While most business and finance assessment and reporting is likely to focus first on negative impacts and associated risks, movement towards nature-positive alignment should see greater emphasis over time on opportunities and positive impacts. The BIAF methodology is potentially useful for comparing opportunities and measuring predicted and actual positive changes in the state of nature.

6.4.6 Example approach: ESRS

The European Sustainability Reporting Standards (ESRS), developed by the European Financial Reporting Advisory Group (EFRAG), were adopted in July 2023 by the European Commission (European Union 2023), providing a framework for nature-related disclosures by businesses and financial institutions with substantial activity in the EU. The ESRS apply to companies subject to the EU's Corporate Sustainability Reporting Directive (CSRD), in addition to other related EU regulation such as the Sustainable Finance Disclosure Regulation (SFDR). Note that the scope of the CSRD and of required disclosures is expected to change, with proposals published in February 2025 (https://ec.europa.eu/commission/presscorner/detail/en/qanda_25_615) that would take most small companies out of scope, clarify and simplify ESRS requirements and substantially reduce the number of data points required in reporting.

EFRAG and TNFD worked closely together during the development of the ESRS and TNFD frameworks. Correspondence mapping of ESRS and TNFD requirements shows strong alignment across concepts and definitions, approach to materiality, disclosure pillars, use of the LEAP approach, and recommended disclosures and metrics (EFRAG and TNFD 2024).

The detailed requirements/recommendations of the two frameworks differ in places in scope, terminology or granularity. Most of these differences are relatively minor, but mean that reporting for one framework cannot simply be used unadjusted for the other.

The potential role of BIAF in supporting reporting under ESRS is similar to that for TNFD (chapter 6.4.5, above).

6.5 Impact investment or nature-finance frameworks

6.5.1 What they are

Impact investment or nature-finance frameworks include a varied set of guidance, requirements, methods and metrics, supporting the identification and description of finance that may have positive outcomes for biodiversity.

They include taxonomies of activities, sets of candidate metrics and frameworks for targeting and designing finance so as to achieve positive impacts.

Several sustainability taxonomies exist and others are in development around the world, by regulators, development banks or other organisations (Natixis Corporate and Investment Banking 2023, Finance for Biodiversity Foundation and United Nations Environment Programme 2024). An example is explored in more detail in section 6.5.5. In addition:

- The World Bank Group has developed a draft taxonomy specifically for the purpose of identifying activities eligible as nature finance (World Bank Group 2023).
- MDBs are collaborating to complete development of a taxonomy of qualifying activities to implement the Common Principles for tracking nature-positive finance (see Annex chapter 8) (IDA 2021).
- The EU Taxonomy for Sustainable Activities, developed under the EU Taxonomy Regulation, which is arguably the most comprehensive and advanced regulatory taxonomy to date. The EU taxonomy and its technical screening criteria incorporate requirements for 'substantial contribution', and 'do no significant harm', which are two key elements for identifying nature-positive finance. However, the current taxonomy has gaps in some key sectors such as agriculture, forestry and energy (though interim criteria are available). It is also designed for the EU policy context rather than general application. Thus, for example, environmental objectives do not directly align with the IPBES drivers of biodiversity loss (Jaureguiberry 2022), and 'substantive contribution' requirements are scaled to goals of the EU Green Deal.
- The Global Biodiversity Expenditure Taxonomy (GLOBE) (UNDP 2024), which is focused on public rather than private finance that could benefit biodiversity.
- The Rio Markers are a system used by OECD countries to track and monitor the flow of Official Development Assistance (ODA) related to the Rio conventions on biodiversity, climate change and desertification. OECD (2023) provides a set of broad criteria for identifying ODA targeting the objectives of the CBD, and a short indicative taxonomy of activities that may qualify. Activities can be marked as having the biodiversity objective either as 'principal' (the main focus of the activity) or 'significant' (other objectives are primary but these have been adjusted to meet biodiversity concerns). The Rio Markers for biodiversity are broad-brush and most DFIs consider them insufficiently granular to categorise nature-positive finance (WWF & The Biodiversity Consultancy 2021).

6.5.2 What they can be used for

These varied frameworks can be used to:

- Identify activities where investment is likely to have biodiversity-positive outcomes
- Screen in investments that may count as nature-positive finance
- Identify (positive) impact pathways associated with investments
- Identify state, pressure and/or response metrics to measure interventions and their outcomes
- In some cases, assign scores or make a qualitative assessment for the relative scale of predicted outcomes.

6.5.3 Relevant characteristics

- ✓ Help to identify opportunities to enhance positive impact
- ✓ Help to identify (positive) impact pathways
- × Do not provide a consistent and transparent basis for comparisons
- × Most do not incorporate negative impacts.

6.5.4 Relationship to BIAF

BIAF complements and supports these frameworks by providing a standardised and transparent approach to quantifying predicted and realised outcomes (BIAF-3).

BIAF can draw on these frameworks, especially activity taxonomies to support the definition of impact pathways, and suggested metrics to translate actions (responses) into changes in pressure (and then biodiversity state).

In BIAF-2, this could be implemented using drop-down lists, semi-automated approaches and/or AI support.

6.5.5 Example approach: IFC Biodiversity Finance Reference Guide and Metrics

The IFC taxonomy provides an indicative list of investments, activities, and project components that help protect, maintain, or enhance biodiversity and ecosystem services, as well as promote the sustainable management of natural resources. It sets out general criteria that investment activities must meet to be considered biodiversity finance:

- Consistency with Green Bond and Green Loan Principles (ICMA 2022, APLMA LMA LSTA 2025), which in addition to use of proceeds (i.e. the investment) for activities providing clear environmental benefit cover project evaluation and selection, management of proceeds and reporting
- No material risk introduced to other themes and priority environmental areas of the Sustainable Development Goals
- Internationally accepted environmental, social, and governance (ESG) safeguards and standards implemented, if there are material environmental and social risks
- Addresses one or more of the key drivers of biodiversity loss (identified by IPBES)

- Appropriate metrics applied to measure performance and determine biodiversity impacts.

The indicative list includes investments that

- Seek to generate biodiversity co-benefits (e.g. reduction of plastic use, agroforestry linked to sustainable agricultural practices)
- Have biodiversity conservation and/or restoration as the primary objective (e.g. payments for ecosystem services, rewilding)
- Support nature-based solutions that can substitute or complement man-made infrastructure (e.g. constructed wetlands, mangrove rehabilitation).

The list of indicative activities is supplemented by a set of suggested metrics (IFC 2024). These focus primarily on pressures (to demonstrate reduction in intensity of impact drivers) and responses (to demonstrate scale and effectiveness of implementation), rather than on the state of nature. In most cases additional metrics would be needed to measure (rather than infer) positive biodiversity impacts.

6.5.6 Example approach: Iris+/GIIN

The IRIS+ system is a set of tools and guidance developed and managed by the Global Impact Investment Network (GIIN). IRIS+ aims to provide a standardized framework for impact investors to measure, manage and optimize their positive impacts – whether social, environmental or financial. The system supports investors to translate their objectives into measurable results, providing tools, guidance and core metric sets tailored to specific themes or Sustainable Development Goals.

IRIS+ is essentially a database of linked guidance and resources for impact investors. After specifying the impact theme and intended approach for their proposed investment, investors can access overview guidance on different dimensions of impact (what, who, how much, contribution and risk), examples (with links) of illustrative investments, and evidence for the intended outcomes with links to relevant papers and a rating of study rigour. Biodiversity and Ecosystems is one of 18 impact themes, others of which, such as Waste or Water, may also have biodiversity co-benefits. Approaches listed under Biodiversity and Ecosystems include eight options, ranging from direct protection or restoration through to nature-based solutions, improved agricultural water-use or increasing sustainability of wood-based products.

IRIS+ metrics are a key component of the system. IRIS+ encourages users to adopt a set of generally accepted metrics relevant to clearly defined impact objectives. For the Biodiversity and Ecosystems impact theme, 'Biodiversity Footprint' is the main outcome indicator for state of nature, while a suite of other suggested indicators cover (mainly) responses and pressures relevant to the chosen intervention approach. IRIS+ does not prescribe use of specific metrics, but rather provides contextual information and links, allowing users to decide how measurement will be implemented.

IRIS+ is designed for use by impact investors, with a focus on positive impacts. For BIAF users, the information in IRIS+ may be helpful in specifying an evidence-based Theory of Change and (to a lesser extent) particular impact pathways. The IRIS+ metrics set also provides useful suggestions for supplementary pressure and response metrics. However,

IRIS+ does not directly enable quantitative assessments and comparisons across predicted impacts from different investments, nor categorisation of nature-related finance.

6.6 Nature credits frameworks

6.6.1 What they are

For this report, 'nature credit' is taken as synonymous with 'biodiversity credit', although 'nature' is a broader concept that could include, for example, water, carbon or nature's contributions to people.

A biodiversity credit has been defined as "a certificate that represents a measured and evidence-based unit of positive biodiversity outcome that is durable and additional to what would have otherwise occurred" (BCA, 2024).

Over 50 biodiversity credit schemes are now operating or in development[4]. Most include a framework for how credits will be measured and certified, including a methodology for calculating biodiversity gains relevant to the credit type.

Credit schemes are very diverse in their aims and approaches. Their crediting methodologies also vary greatly in concept, robustness and complexity. However, many credit schemes, like BIAF, apply an ecosystem extent x condition metric for assessing gains.

6.6.2 What they can be used for

- Scaling and comparing positive impacts, for the context relevant to the credit type
- Reporting and communicating on realised impacts.

6.6.3 Relevant characteristics

- ✓ Provide (sometimes) detailed methods and guidance for assessing biodiversity gains
- ✓ Provide a standardized structure and process for assessment
- ✓ Assessment scores can (sometimes) be broken down for interpretation
- ✓ Incorporate context-specific information
- × Usually require substantial biodiversity expertise
- × Usually not generalisable beyond the particular credit focus, nor for impacts that are not site-based.

6.6.4 Relationship to BIAF

BIAF is not designed as a crediting framework. BIAF predicted or realised (BIAF-3) scores could be used as inputs to scale credits, and this could be especially useful for credits that are not site-based. However, this is only one element of a credits framework, which also

[4] Listed by Bloom Labs (accessed 8 March 2025): https://airtable.com/appXHR0Nau8HqfPa8/shrt5JZqmLMrQgdfF/tblTM31mqfzbGGBtR/viwLkSPMhe3K76baF

requires a set of rules for how credits will be implemented, measured, certified and verified.

Many crediting frameworks have developed their own particular, case-specific metrics, which could not readily provide inputs to BIAF. Some take a more general approach, with guidance that could potentially inform BIAF assessments (see chapter 6.6.5).

BIAF thus sits alongside crediting frameworks, with a different objective and a more generalised (and generally applicable) measurement approach.

6.6.5 Example approach: Verra Nature Framework

The Nature Framework, which sits within Verra's Sustainable Development Impact Standard (SD VISta) Program, is a methodology to enable projects to quantify positive biodiversity outcomes and generate Nature Credits (Verra 2004).

The method assesses gains against a baseline both from avoided losses and from restoration. Like BIAF, it uses an ecosystem extent x condition measure, with units of Quality Hectares. Significance is not included in the calculation but several significance measures are flagged separately.

The Nature Framework includes many other elements and implementation requirements (including consideration of additionality and leakage) relevant to a nature credit scheme. Among these is a requirement for causal chain analysis to identify cause-and-effect relationships between a project's activities and expected outcomes, including "all identified positive, negative, direct, indirect, intended, and unintended consequences". This is a similar approach to identifying the Theory of Change and impact pathways, and potential negative impacts, in BIAF's methodology.

The methodology document includes detailed requirements and guidance on selecting, measuring and monitoring ecosystem condition indicators. A hierarchy of methods is also provided for measuring crediting baselines.

Many elements of the Verra methodology may be useful for BIAF to consider for assessment of post-investment outcomes.

6.7 Integrative tools

6.7.1 What they are

In response to the rapidly evolving needs of business and finance for nature-related assessment, new tools are emerging that integrate existing datasets, metrics and analytical methods to produce automated or semi-automated outputs. These tools typically are pay-to-use and accessed via the commercial organisations that have developed them. Their methodologies are not usually transparent or publicly documented.

These tools may incorporate datasets available in existing non-automated DIRO tools (chapter 6.2.7), and/or other public or proprietary datasets, along with pre-designed templates and analyses. Some provide Artificial Intelligence support.

6.7.2 What they can be used for

Integrative tools vary in their application but typically claim to inform evaluation and assessment of dependencies, impacts, risks and opportunities, based on user-provided information combined with a suite of (usually global) datasets. This supports business and finance alignment with disclosure and reporting frameworks, and can inform corporate biodiversity strategy and target-setting.

6.7.3 Relevant characteristics

- ✓ Scale and compare (usually) negative impacts
- ✓ Help identify opportunities to manage risks and enhance positive impact
- ✓ Provide standardized process and outputs
- ✓ Work with limited data
- ✓ Integrate key supporting datasets
- ✓ Interoperable with disclosure and reporting frameworks
- ✓ Can be used without substantial biodiversity expertise
- × Paid-for services
- × May often provide broad-brush outputs with generic interpretations
- × Variable but usually limited incorporation of contextual locality information
- × Methodologies usually not transparent
- × Not designed (and may not be sensitive enough) to identify and scale positive impacts.

6.7.4 Relationship to BIAF

There could be potential for BIAF to use the outputs from certain tools. In future, the BIAF methodology could even be integrated as a component of a particular tool.

6.7.5 Example approach: Maya Climate 1st Geospatial Copilot

The Maya platform uses Artificial Intelligence to simplify and automate geospatial analysis for a range of environmental and sustainability applications, including biodiversity assessments and TNFD reports.

From site polygons uploaded by users, Maya generates automatic outputs in pre-defined report templates. An AI-powered 'copilot' supports users to refine reports.

Maya has compiled a range of datasets, both open-source and commercial, in a single catalogue available to users. The available datasets focus primarily on land cover, forests, biomass, carbon and hydrology. Some of these datasets are relevant for biodiversity assessment, but no datasets are listed (as of March 2025) with information on species, sensitive areas or ecosystem condition. Brief methodological information is included in dataset descriptions, but is otherwise unavailable.

User testimonials suggest that Maya is being applied mainly for rapid project screening, especially for nature-based carbon and other nature-based solutions.

6.7.6 Example approach: Metabolic's Link

Metabolic's Link platform provides an integrative DIRO tool for rapid assessment of nature footprint and associated risk, prioritising supply chain elements for attention, and support to reporting under the main disclosure frameworks (chapter 6.4).

Little information on methodology or datasets is available on the platform website. TNFD's Tools catalogue states that Link:

- Provides automated data matching to fill data gaps, using artificial intelligence
- Applies a proprietary sourcing engine to estimates unknown locations
- Applies a bespoke prioritization approach "to identify key leverage points".

Reporting can be made at different granularity levels for corporate teams focused on supply chains, sustainability, finance and reporting.

6.7.7 Example approach: MSCI Nature and Biodiversity Metrics

MSCI's Nature and Biodiversity Metrics package is a DIRO methodology with added functionality, including quantitative footprinting. The package is aimed at investors. It uses a double-materiality approach, considering both portfolio impacts on nature and potential impacts of nature loss on a portfolio. Company capacity to mitigate potential impacts is also assessed.

Some limited methodological information is provided in MSCI (2024).

The package incorporates both LCA footprinting across a suite of pressures (the model used is not specified), using the PDF metric, and land-use footprinting using the MSA metric (chapter 6.2; for an explanation of MSA, please see Borner et al. 2024).

Risk screening for sensitive areas uses a layer for biodiversity intactness (based on modelled MSA mapping: Schipper et al. 2019) and a published composite map of priorities for biodiversity conservation and climate stabilization, the Global Safety Net (Dinerstein et al. 2019). Exposure to deforestation risk is also assessed, from operations or supply chains related to deforestation fronts or deforestation-prone commodities.

MSCI's databases are used to identify companies at risk of contributing to nature loss, and to find asset locations. This enables combination of asset characteristics and geographic exposure in a geospatial risk analysis. The results from this can be aggregated in various ways depending on investor requirements.

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8 Annex: Categorising nature finance and identifying nature-positive finance

The MDB Common Principles for tracking nature-positive finance define nature-positive finance as supporting or enabling actions that protect, restore or enhance sustainable use and management of nature, contributing to implementation of the Kunming-Montreal Global Biodiversity Framework (KMGBF).

The Common Principles recognise four kinds of actions that may be supported by nature-positive finance:

A. *Protection* to maintain the current status and condition of nature

B. *Restoration* to assist recovery of nature

C. *Sustainable use and management* to shift economic activity away from processes driving nature loss

D. *Enabling conditions* to enable any of the above.

The Common Principles further define three general criteria for such actions to be regarded as nature positive. Actions must:

1. Make a substantive contribution to nature
2. Have expected positive outcomes for nature that are measurable and can be assessed and monitored against a baseline, where feasible, or otherwise, a business-as-usual scenario
3. Not be expected to introduce significant adverse environmental risks or impacts, nor to undermine other environmental or development objectives.

To identify nature-positive finance, the Common Principles recommend a two-step process:

1. Screening finance for eligible activities, using an appropriate taxonomy of activities (see chapter 6.5). The taxonomy should include only activities that make a substantive contribution to environmental sustainability, so can be expected to meet Criterion 1;
2. Assessing such activities against the criteria for identification as nature positive.

Finance that does not qualify fully as nature positive could nonetheless provide nature co-benefits. The World Bank's framework for tracking nature finance (World Bank 2023) recognises such financing as 'Nature mainstreaming' finance. Financing of activities that benefit nature but are undertaken entirely to mitigate or offset impacts is classed as 'Nature impact mitigation' finance by the World Bank's framework.

BIAF can support assessment of candidate nature-positive finance against the three general criteria by:

- Defining a clear and credible causal chain (via an explicit theory of change and impact pathway(s)) to achieve improvement in the state of nature

- Quantifying predicted (or, in future, realised) gains against a 'business as usual' baseline
- Checking for potential material negative impacts on nature from the activity itself or the project/supply chains it is part of.

9 Annex: User needs assessments

9.1 Impact investment asset managers and advisors

Interviews with 11 asset managers and advisors focused on impact investment identified a set of key needs that are not adequately met by current tools and datasets, for *both pre- and post-investment* as:

- Reliable assessment of the nature and scale of impacts
- Ability to quantify and compare across investments using standardized and relevant indicators
- Ability to set, track and report on quantitative biodiversity targets
- Standardized structure and process for assessments
- Access to high-quality local data and context-specific biodiversity information and metrics.

Additional challenges identified for post-investment assessment included inadequate resources and partnerships for measurement and monitoring, and limited guidance for assessment.

Asset managers and advisors identified a range of desirable attributes for a new assessment method and/or tool aiming to meet these needs. Attributes mentioned by over one-third of respondents included:

- Interoperability with other well-known frameworks or tools
- Availability of guidance, worked examples and technical support to users
- Break-down and interpretation of assessment scores
- Ability to rank and benchmark investments
- Ability for users to customize and fine-tune the methodology
- Integrated access to underlying data sources
- Integration of other ESG aspects (e.g. stewardship, transformative potential).

9.2 Development Finance Institutions (DFIs)

Interviews with nine DFIs, together with insights from AFD (2023), identified the following key user needs:

9.2.1 Pre-investment

- Identify how projects (especially those not primarily focused on nature) can be modified to achieve nature-positive outcomes
- Identify which financing can be classed as nature-positive and estimate the scale of gains for nature

- Identify which scopes (including direct operations and value chains), project activities and associated drivers have the most significant positive or negative biodiversity impacts
- Identify key potential biodiversity risks (linked to performance standards/requirements, such as IFC's Performance Standard 6) and elements for mitigation

9.2.2 Post-investment

- Assess, monitor and communicate biodiversity impacts (both positive and negative, and achieved vs predicted), in a cost-effective and standardized way
- Support practical implementation in lower-income countries, including incorporation of local knowledge and local community participation in monitoring
- Practical approaches to make assessments with limited data, and to report uncertainty

9.2.3 Desirable attributes

DFIs also identified a range of desirable attributes for a new assessment method and/or tool aiming to meet these needs.

- Ability to assess investment portfolios and funds as well as single-projects, using a practical and simple tool requiring limited expert input
- Standardization of impact pathways, and support to identify and understand these
- Use of publicly available or cost-effective data
- Alignment with the GBF and support to implement existing frameworks such as TNFD
- Guidance on definitions, indicators, monitoring, datasets and biodiversity strategy
- Guidance at the level of sector or impact pathway
- Flexible depth of assessment
- Support with communicating impact to different audiences, including those working in finance or with limited biodiversity knowledge
- Foster collaboration among E&S and impact teams
- Enable DFIs to add value to the investee and the investment.

10 Annex: S&P Nature Risk Profile methodology

This annex provides a summary, with some brief commentary, of the S&P Nature Risk Profile methodology.

10.1 Methodological approach

The tool can be applied at asset, company or portfolio level. Where possible, assessment is carried out at the asset level – termed Tier 2. Where sufficient asset-level data are not available, a less granular (Tier 1) approach uses country- or sector- averages, appropriately adjusted where necessary according to local GDP measures and mapping of relevant land-uses. The exact methods used to calculate area scores for Tier 1 or Tier 2 application vary for different metrics.

Two headline scores (for an asset, company or portfolio) are combined from a number of component metrics:

- Aggregated **dependency risk** score across 21 ecosystem services: ranging from 0 (no dependency risk) to 1 (very high dependency risk)
- Aggregated impact risk score, the '**Ecosystem Footprint**': expressed as the equivalent of an area (in ha) where ecosystem integrity has been entirely lost, in the most globally significant ecosystems.

The overall approach to assessing impact and dependency risks is shown in 3 in chapter 6.3.8. While this general approach is well established, the detailed methodology involves a number of conceptual and mathematical innovations (and a degree of complexity) in assessing and quantifying risk, so is outlined in more detail below. Further information, including geospatial layers used and methods for Tier 1 vs Tier 2 application, can be found in S&P (2024), and the broader methodology on which the Nature Risk Profile is based is described in UNEP (2023).

10.2 Dependencies

The conceptual approach for dependency risks is similar to that applied in the WWF Biodiversity Risk Filter. It considers both business **reliance** on ecosystem services and the **resilience** of that service provision from an ecosystem.

For each of 21 defined ecosystem services, an overall dependency score (for asset, company or portfolio) is calculated as the geometric mean of the reliance and resilience scores.

An aggregated dependency score is then calculated across all 21 ecosystem services. Most risk typically derives from high dependencies on a few ecosystem services. To account for this, dependency scores are first transformed using a sigmoid function (giving greater weight to high scores) and then combined using a logarithmic function (with a diminishing marginal contribution for each additional risk).

10.2.1 Reliance

The reliance score for each ecosystem service is calculated as the geometric mean of materiality and relevance scores.

10.2.1.1 Materiality

Materiality scores are taken from ENCORE and translated to a numerical score between 0 (no dependency) and 1 (very high dependency).

For water provision, company-specific data are used. Water volumes used/million USD revenue were calculated to provide a measure of water-use intensity, and normalised to produce 0-1 scores.

Where more than one ENCORE process mapped onto the sector or asset type, maximum values are used for processes complementing each other, and average values for processes substituting each other.

10.2.1.2 Relevance

The potential benefit from an ecosystem service depends not just on the overall materiality, but on the local context: for example, water filtration may be most important where water resources are polluted.

Relevance scores are calculated only for those ecosystem services where local context is likely to be important, and only for Tier 2 application (asset level), as it is challenging to assess relevance at regional scale (Tier 1). Normalised values of particular geospatial indicators (for example, landslide susceptibility in the case of 'buffering and attenuation of mass flows') are used to assign a relevance score to each asset.

10.2.2 Resilience

The ability of an ecosystem to continue to deliver services is estimated via an appropriate measure of integrity. The measure is ecosystem service-specific, though the Ecosystem Integrity Impact Index (see below) is used in most cases. The scale of assessment for Tier 2 application also varies depending on whether the service is primarily delivered at local, landscape or catchment scale.

Average or maximum scores over the assessment area are used for Tier 1 and Tier 2 application respectively.

10.3 Impacts

For impact risk, the methodology uses a similar overall approach to BIAF, based on a biodiversity extent, condition and significance (BECS) approach (see Borner et al. 2024).

Risk scores thus incorporate the area occupied (land use), the resulting degradation in ecosystem integrity (via an Ecosystem Integrity Impact Index, EIII, below), and the significance of the locations impacted.

The synthesized risk metric, the Ecosystem Footprint, is expressed as the equivalent of an area (in ha) in the most globally significant ecosystems where ecosystem integrity has been fully lost.

10.3.1 Ecosystem Integrity Index

The Ecosystem Integrity Index (EII) is a composite index of ecosystem condition mapped at 1 km^2 scale that includes components for ecosystem structure, composition and function (Hill et al. 2023). Like other condition indices, the EII ranges from 0 (integrity fully lost) to 1 (intact). The Ecosystem Integrity Impact Index (EIII) is simply the EII value subtracted from 1, (1 – EII), amounting to a measure of the impact caused by human pressures.

Each component of the EII is treated as equally important, and the value of the EII is determined by the component with the lowest score.

10.3.1.1 Structure

Ecosystem structure ('habitat intactness': S&P 2024) uses the Human Modification Index (HMI, Kennedy 2019), further refined using the methodology of Beyer et al. (2020) to account for landscape context (e.g. habitat fragmentation). The HMI is derived from 13 global layers for pressures in five major categories: (a) human settlement, (b) agriculture, (c) transportation, (d) mining and energy production and (e) electrical infrastructure. Intensity of these pressures is estimated using the approach of Theobald (2013), which is in turn based on Landscape Development Intensity (the non-renewable energy required to maintain different land use activities: LDI: Brown & Vivas 2005). LDI is an index of human disturbance scaled logarithmically according to energy inputs, but this does not necessarily relate straightforwardly to ecosystem structure measured in other ways.

10.3.1.2 Composition

Ecosystem composition is based on the Biodiversity Intactness Index, calculated using data from the PREDICTS database (Newbold et al. 2016). Like the MSA metric, BII summarizes how ecological communities change in response to human pressures. The BII uses a different and more complex statistical approach to MSA, combining models for changes in abundance and changes in compositional similarity compared to intact sites (Newbold et al. 2016, Hill et al. 2018). The pressures used in modelling the BII overlap very extensively with those used in modelling the HMI, so while the modelling approaches are different, ecosystem structure and composition values calculated for a location in the EII are based on very similar underlying datasets.

10.3.1.3 Function

Function is measured as the ratio (maximum 1) between observed net primary productivity (NPP) derived from remote sensing, and modelled natural NPP based on environmental data.

10.3.2 Significance

Significance is assessed both for biodiversity (normalized scores for the STAR metric: see 6.3.7 and Borner et al. 2024) and contribution to global ecosystem services (normalized

scores for relative contribution: Chaplin-Kramer et al. 2023). The significance score for a location is the higher of these two scores.

10.4 Application

S&P Global envisage a range of applications for nature & biodiversity risk profiling, but the primary one is likely to be overall risk analysis, disclosure and management, aligned with TNFD or other disclosure framework requirements (chapter 6.4).

Like other DIRO tools, the nature & biodiversity risk profile measures risk exposure, through potential dependencies and impacts. It does not (at present) take into account measures to mitigate or manage risks. As always, the actual situation on the ground may also be different from that predicted by data models.

The relatively sophisticated, granular and quantified approach of this DIRO tool compared to other tools can be expected to provide clearer and more accurate differentiation when comparing and benchmarking risks across assets, companies or portfolios. However, the method (while well documented) is also relatively complex, and the implications of specific methodological decisions, such as aggregation approaches, have not yet been reviewed and tested. Regarding biodiversity impacts, the EII methodology is not yet peer-reviewed and published, and a number of its elements would benefit from testing to understand better how they affect overall integrity scores at a location. These include:

- Using non-renewable energy input as the underpinning metric for modelling ecosystem structure response to pressures
- Extensive overlap between pressures used for modelling ecosystem structure and composition values
- Pegging EII scores to the lowest value amongst ecosystem structure, composition and function components
- Use of Net Primary Productivity as the basis for assessing ecosystem function.

The 'Ecosystem Footprint' aggregated impact risk metric, as the name suggests, is in fact a biodiversity footprint based on land occupancy. It uses the 'characteristic' footprint method outlined in UNEP (2023), based on comparing average EII within the footprint area to the intact reference state. This "captures the impact of all pressures at that location, even if they are not directly associated with the business activity of interest" (UNEP 2023). Since the EII's structure component includes a landscape element, the same activity may have higher measured footprint (and impact risk) when located in a degraded landscape versus a more intact landscape.

The S&P Nature Risk Profile is not designed to measure positive impacts nor to identify nature-positive financing. UNEP (2023) also outlines a 'contributory' footprint method for the EII, which measures "the impact of a single or specific set of assets that is additional to other pressures and the existing levels of degradation at the same location and within the surrounding landscape". This methodology could be used to assess the positive impact of interventions or changes to 'business as usual'. It effectively involves assessing the EII for the with- and without-project alternatives. This requires re-calculating modelled values for the structure and composition components, and determining a baseline reference value

for the function component. It appears to be a technically demanding exercise that requires access the underlying spatial datasets and models.