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ASSESSMENT OF BIODIVERSITY ACCOUNTING APPROACHES FOR BUSINESSES

Discussion paper for EU Business @ Biodiversity Platform

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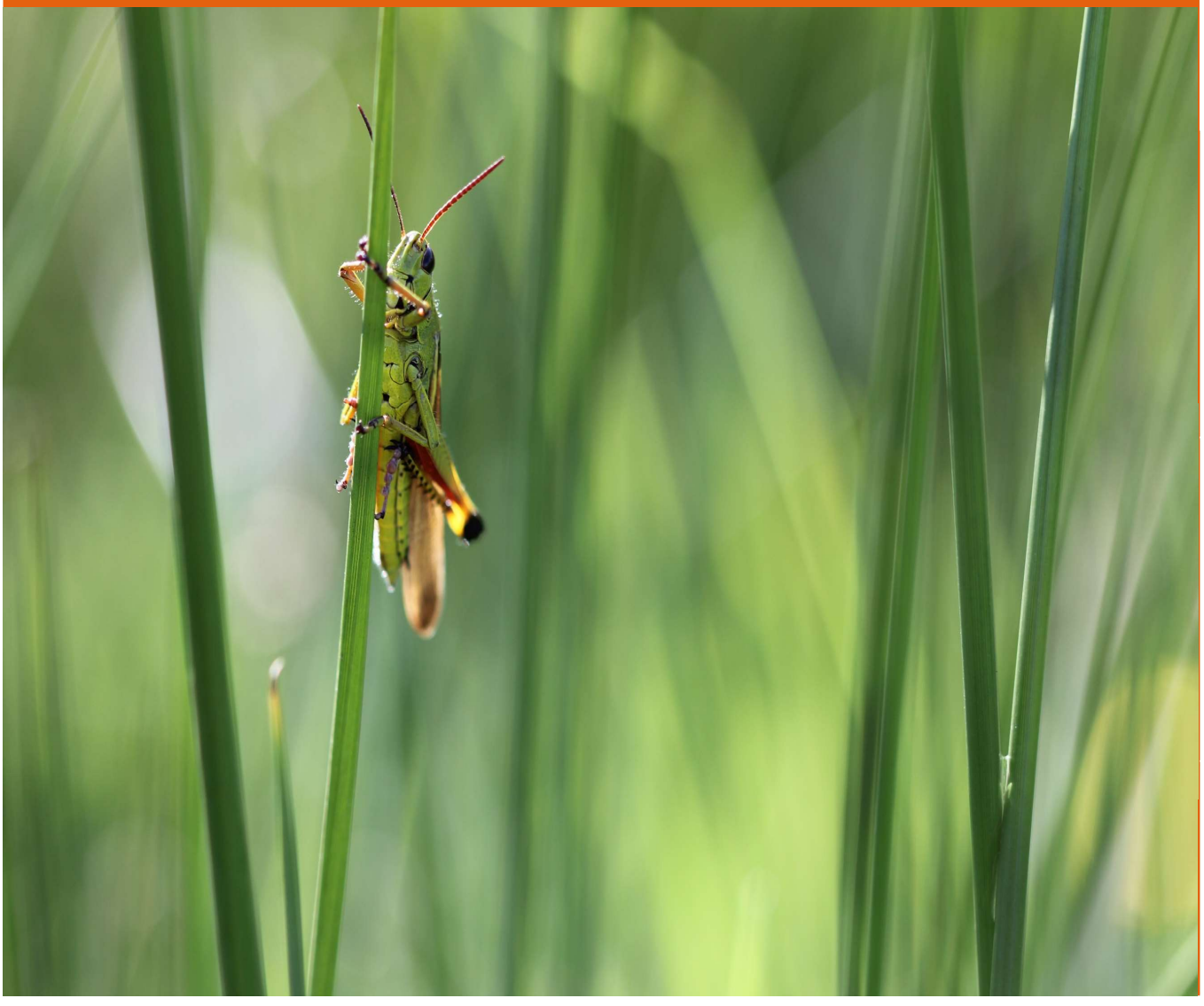

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1 OBJECTIVE

Natural capital accounting is rapidly gaining interest, not only at the level of countries or regions, but in particular also at the level of business. The traditional unidimensional perspective of financial performance (GDP for nations, financial reports for companies) is being replaced by a more multidimensional perspective covering also natural and social capital performance. There is growing interest amongst public authorities, financial institutions and amongst the business community. Non-financial is becoming the new financial.

The consequence of this tendency is the need for natural capital metrics and robust methodologies. For some environmental issues, such as GHG-emissions and water consumption, these metrics are relatively straightforward and businesses are quite familiar with measuring their performance in these areas. However, the situation is different for biodiversity as key component of comprehensive natural capital assessments. Generally accepted and applied methodologies on how businesses can measure and value their impacts and dependencies on ecosystem services and biodiversity are lacking yet.

Businesses are struggling to find ways for measuring their biodiversity performance that are on the one hand practical and pragmatic and on the other meaningful and relevant for biodiversity impacts and dependencies. This also applies to the community of financial institutions who is looking for simple ways to assess biodiversity performance of their investments.

Why is it so hard to develop a generally accepted approach to measure and value biodiversity performance of a company? There are several reasons for it, such as the complexity of biodiversity itself (multitude of species and habitats, each with their specific sensitivity to different pressure categories) and the often complicated cause – impact relationships between company activities and biodiversity receptors, to only name a few.

In the light of the growing attention for natural capital accounting and a clear demand for methodologies for such accounting that include ecosystems and biodiversity, several attempts are taking place to develop pragmatic biodiversity metrics for business. The EU Business & Biodiversity Platform (EU B@B) and in particular the Workstreams on Natural Capital Accounting and Financial Institutions have taken the initiative to conduct a critical and constructive assessment of these attempts. As a first step the aim is a synopsis of the key features and overview of various methodological approaches. A second aim is revealing the obstacles which are faced and also identifying remaining gaps. In light of the business demand for such methodologies findings are likely feeding future action by the EU Business & Biodiversity network and potential partners as developers and users of these metrics. This work shalll also feed into the initiative to prepare a Biodiversity Supplement to the Natural Capital Protocol.

This discussion paper is a first step and is not exhaustive. It will be updated on a regular basis. We therefore invite further constructive contributions by others in the EU B@B community and beyond with a view to continuously improve insights and solutions in the field of biodiversity metrics for the private sector .

2 METHODOLOGY

2.1 Scope

Given the wealth of biodiversity assessment approaches, we need clear boundaries for scoping this assessment. **The focus of this assessment is on biodiversity accounting approaches for businesses and FIs which rely on quantitative indicators that provide information on the significance of impacts on biodiversity, and which are not case-specific**. The latter is important, as we need approaches that can by applied by several companies and preferably for different types of business applications, different levels of application (e.g. project, site, ..) and in different locations.

For this reason and without any prejudice to their value and usefulness, certain types of biodiversity assessment approaches are not included in this assessment, such as:

- Checklist-based approaches which rely on 'yes/no' questions and only provide qualitative insights on the level of actions undertaken by a company in the field of biodiversity. They rely on 'implementation indicators' (e.g. 'Do you have a biodiversity action plan?') rather than 'impact indicators'. Although they certainly have their merits, this is not the type of tools we are looking for. Examples are the European Biodiversity Standard[1], its sister standard for the UK, the Biodiversity Benchmark[2], and the Biodiversity Check[3]
- Approaches applied in Environmental Impact Assessment and similar types of specialized studies, which focus on a specific development in a specific area.

Other approaches that are not included at this moment are biodiversity metrics approaches which can be used for calculating biodiversity offsets. Examples are the BBOP biodiversity metrics, the UK DEFRA biodiversity metrics, the Dutch 'Natuurpunten' method, etc. We are aware that these latter approaches also could fit under the given scope, but due to time and budget constraints these are not covered in the current version.

2.2 Assessment principles

A key principle of this assessment is the applicability of the biodiversity metrics and related tools by businesses and financial institutions (FIs). This depends on the **type of applications** businesses and FIs are interested in (see Box 1) as well as **the level of detail** of the required information. Example for the business application 'comparing options':

- A financial institution looking for ways to make its investment portfolio more sustainable, might be interested in the biodiversity performance of different sectors or companies (corporate level)
- A multinational company might be interested in the biodiversity performance of each site, or in the biodiversity performance of its products
- A company site manager might be interested in comparing 2 different projects (locations, technologies, …)

[1] http://www.europeanbiodiversitystandard.eu/en
[2] https://www.wildlifetrusts.org/sites/default/files/2018-06/BBOM4%20Biodiversity%20Benchmark%20Requirements.pdf
[3] https://www.business-biodiversity.eu/docs/ebbc_index01.aspx?id=36799&basehrefrequ=true&isalias=true

Table 1: Business applications where 'biodiversity performance' is an important indicator (Source: NCP, CoP Finance workstream of EU B&B Platform[4])

Business application	Product level	Project level	Site level	Corporate level	Supply chain level	Investment portfolio
Assessing biodiversity risks and/or opportunities *Assessing nature and magnitude of biodiversity impacts and dependencies, and their associated business risks and opportunities*	X	X	X	X	X	
Comparing options *Compare, contrast and select from a range of alternative options, while considering their relative biodiversity performance*	X	X	X		X	X
Going for No Net Loss or Biodiversity Net Gain *Assessing net biodiversity impact; this requires a sound understanding of the baseline situation*	X	X	X	X	X	X
Communicating internally or externally *Communication on biodiversity performance, and if relevant evolution over time*	X	X	X	X	X	X
Other?						

Furthermore, the assessment approach is underpinned by the same principles as applied in the NCP:

1. Relevance
2. Rigor
3. Replicability
4. Consistency

Relevance means that the most relevant biodiversity issues are covered, i.e. those that are most material for the business and its stakeholders. This requires:

- A clear insight in the cause/impact relationships, i.e. which pressures are causing which impacts on which biodiversity groups? Materiality and level of detail need to be adequate to the specific situation, and this is often determined by stakeholder expectations.
- A correct set of indicators, which provide relevant information to inform business decisions; in particular indicators need to be responsive to changes (pressure indicators need to reflect changes in pressures, while species or habitat indicators should be able to reflect changes in the state of biodiversity as a result of company actions).

A key challenge in this respect is the quest for a simple and comprehensive biodiversity indicator. Does it really exist? Is such indicator compatible with the abovementioned criterion of relevance? A complicating factor is

[4] During the workshop of 21 March 2018, the CoP Finance (Workstream 3 of EU B&B Platform) proposed the following specific types of business applications for financial institutions:

- portfolio level assessments (FIs need KPIs on biodiversity impacts/performance by sector)
- company level assessments (FIs often apply 'best in class' approaches for benchmark purposes, so there is a need for reference benchmarks)
- project level assessments
- internal purposes vs reporting purposes

the duality of the term 'biodiversity', as it comprises both intrinsic biodiversity values (species, habitats, and their functional relationships) and ecosystem services (ES). Business can have impacts on ES and might also be dependent on ES. So, the assessment will consider both elements of biodiversity.

Several approaches rely on one overall proxy indicator for biodiversity. In such case, the type of applications will be limited.

Rigor refers to the use of technically robust (from a scientific and economic perspective) information, data and methods that are also fit for purpose. This requires:

- The use of up-to-date information on presence and sensitivity of species and habitats within the influence area of company activities. Level of detail is often determined by stakeholder expectations.
- Correct information on the baseline situation, in case of project appraisal

Replicability means that all assumptions, data, caveats, and methods used are transparent, traceable, fully documented, and repeatable. This requires:

- No black boxes
- ….

Consistency is the principle that all data and methods used for an assessment are compatible with each other and within the scope of the analysis, which depend on the overall objective and expected application (e.g. option appraisal, assessing biodiversity risks and opportunities, aiming for no net loss or biodiversity net gain).

Additional assessment parameters, which are relevant in the context of this assessment exercise, are[5]:

- **sector coverage:** Is it sector specific or can it be used by several sectors?
- **user friendliness:**
  - Is it easy to use by non-experts or does it require specialist knowledge?
  - What are the required time efforts?
  - Does it require a similar approach as other environmental issues or is it very specific?
- **outcomes informed by real data or modelling?**
  - For model-based outcomes, it is very useful to know if real data (on pressures, on state of biodiversity) can be plugged in, in order to refine these outcomes;

[5] Apart from 'sector coverage', the other additional criteria were suggested during the CoP Finance (WS 3) workshop of 21 March 2018 in Brussels

2.3 Uniform assessment template

In order to look at the various initiatives in an equal way and obtain the same set of information and parameters the identified and here included initiatives (see Chap. 2.4) have been invited to fill[6] a uniform template and provide answers to the following questions and elements:

- Title/Name of initiative
- Date of assessment, including updates
- Description of involved actors, and type of process
- Description of state-of-the-art of current developments (starting development of methodology, pilot phase, already (widely) applied in sector, etc.)
- Description of the metric(s) and methodology behind it
- Outcomes informed by real data or by modelling?
- Description of types of business application (see Box 1), i.e. what kind of decisions could be based on it? The following applications are considered:
    - At which levels of the value chain can the approach be used: site level, corporate level, supply chain level, product level?
    - Can the approach be applied to compare different investment options?
    - Can the approach be used to assess progress of a biodiversity action plan?
    - Can the approach be used to proceed towards no net loss or biodiversity net gain?
    - Does the approach only apply to new developments or does it also cover existing activities?
    - Etc…
- Which sectors are covered by current initiatives?
- Which drivers of biodiversity loss are covered e.g. land use, ….
- Level of detail of data, data sources, flexibility in granularity, etc.
- User friendliness
- Strengths and weaknesses, according to initiators

Based on these parameters we provide in this paper a more detailed overview or synopsis in Chapter 3 as well, as initial elements of a comparative analysis of certain key features in the tables of Chapter 4, which we consider vital for understanding the methodological approach.

Important: We would like to stress that this discussion and assessment paper is a first step and is neither meant to be definitive nor exhaustive. We rather hope to facilitate a discussion based on enhanced transparency with a view to facilitate that the much-needed methodological initiatives further improve and complement. Notably we intent to update and amend this initial analysis on a regular basis based in light of further input received.

[6] exceptionally the information has been inserted / completed by the author of this paper

2.4 Current initiatives

Within the scope of this assessment, several initiatives have been identified on the basis of own research and bilateral consultations with developers of assessed approaches (who often started the development of their approach with an inventory of existing approaches). Most of these approaches are still under development. Table 2 provides an overview.

Table 2: Overview of biodiversity accounting approaches included in this assessment report

	Developer	Name of tool	Assessment
1	CDC Biodiversité	Global Biodiversity Score	Completed and assessed by EU B&B Final update on 22 August
2	Cambridge Institute for Sustainable Leadership (CISL)	Biodiversity Impact Metric	Completed on 15 March Reviewed by EU B&B Update on 20 August
3	UNEP-WCMC	Biodiversity Indicators for Extractive Companies	Completed on 19 April. Reviewed by EU B&B Update on 15 July and 21 August
4	I CARE	Product Biodiversity Footprint	Completed on 20 June Reviewed by EU B&B. Update on 23 August
5	ASN Bank	Biodiversity Footprint approach	Completed on 28 June Reviewed by EU B&B Update on 24 August
6	Bioversity International	Agrobiodiversity Index (ABD)	Completed on 1 August Reviewed by EU B&B
7	Plans Up	Biodiversity Footprint Calculator	Information from website
8	LIFE Institute	Biodiversity Estimated Impact Value (BEIV)	Completed on 21 August. Reviewed by EU B&B
9	Platform BEE (Dutch Ministry)	Bioscope	Information from website
10	IUCN	Biodiversity Return on Investment Metric (BRIM)	Completed on 29 August

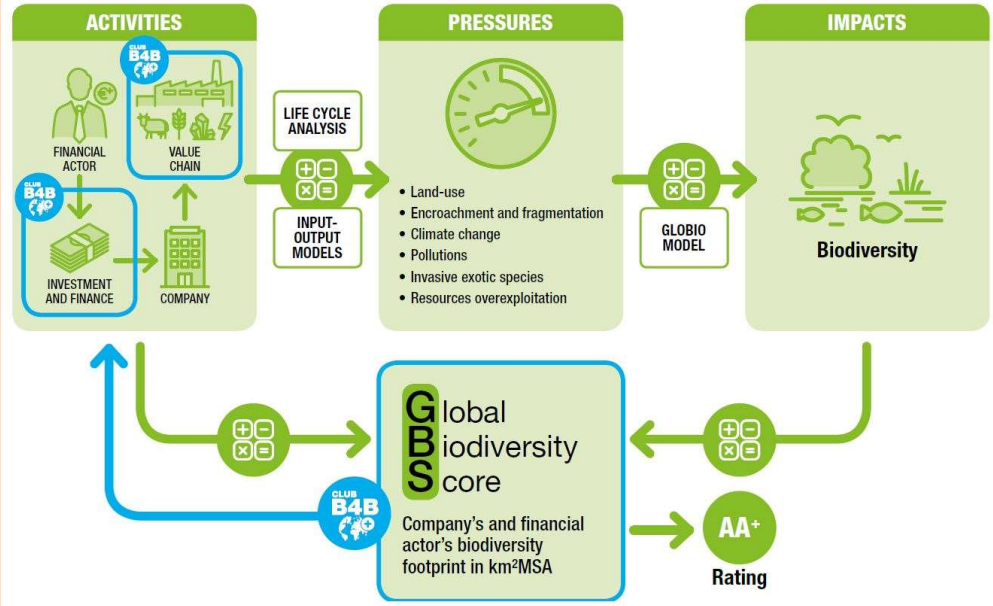
From this list, 8 assessment forms / templates were completed by the developers themselves, 6 of them being adapted or completed based on a critical review by the NCA Workstream Leader of the EU B&B Platform. Due to late inclusion of approaches nr. 8 and 10, such a review was not (yet) possible. Approaches nr 7 and 9 have been described on the basis of information available on internet, as time was lacking to get in touch with the developers. For these approaches we apologize if information is not presented in the way developers would have preferred.

We are very grateful for the very constructive cooperation with all contacted developers.

3 ASSESSMENT OF BIODIVERSITY ACCOUNTING APPROACHES FOR BUSINESS

3.1 The Global Biodiversity Score (CDC Biodiversité)

NAME:	GLOBAL BIODIVERSITY SCORE (GBS)
Date of assessment	• First assessment submitted to CDC Biodiversité on 12 January 2018 • Replies by CDC Biodiversité on 24 January 2018, which were all integrated in the text below • Update by CDC Biodiversité on 22 August 2018
Actors	**Lead**: CDC Biodiversité (France) **Other**: Club of Businesses for Positive Biodiversity (B4B+ Club) acts as a platform for the GBS development (a group of +30 businesses representing different sectors, including finance sector)
Process and current position	CDC Biodiversité launched the biodiversity equivalent of the Teq CO_2 for climate change in partnership with businesses and financial institutions. It is based on internationally recognised scientific research. An excellent description of the GBS approach and state of the art can be found under http://www.mission-economie-biodiversite.com/wp-content/uploads/2017/11/N11-TRAVAUX-DU-CLUB-B4B-INDICATEUR-GBS-UK-BD.pdf. The GBS will remain under development until early 2020: the first biodiversity footprint audits will be conducted in 2020. • Technical developments are ongoing: aquatic drivers impacting biodiversity are being included, the scope of raw materials analysed is expanded and the link between company's activities and raw materials is refined. • The **operational relevance of the footprint is being tested thanks to the involvement of future users, i.e. businesses**. This happens both through meetings of the B4B+ Club and through several ongoing (and future) case studies, including on sourcing comparison for agricultural commodities and on (investment and loan) portfolio impact assessment
Key features of methodology	GBS™ is designed to provide an overall and synthetic vision of the **biodiversity footprint of economic activities**. It is **not intended to replace local indicators** which are best suited to local or on-site biodiversity assessments. This idea of reconciling different scales is key and it is essential that the GBS™ results are consistent with analyses conducted on a local scale, making it possible to summarize the data while losing as little information as possible. The GBS business biodiversity footprint can be estimated in a two-step process (see figure below). First, pressures caused by specific economic activities on biodiversity have to be quantitatively assessed. To analyse the value chain, the GBS™ methodology mainly uses the Exiobase matrix-based input-output model and direct data on pressures when available. Then, the impacts of these pressures on ecosystems have to be estimated. This last step relies on the GLOBIO model which is based on pressure-impact relationships. The GLOBIO model, developed by a consortium formed in 2003 consisting of PBL, UNEP GRID-Arendal and UNEP-WCMC, calculates the impact of environmental drivers on biodiversity in the past, present and future. It draws on driver-impact links found in scientific research (pressure – impact relationships are derived from peer-reviewed literature (nearly 300 articles) using meta-analyses). GLOBIO provides both pressure-impact relationships and global estimates of the abundance of biodiversity, based on spatialized data on various **environmental drivers** (see below) – and not field data on species – as input data. These drivers are taken mainly from the Integrated Model to Assess the Global Environment (IMAGE). GLOBIO produces spatialized results for land and aquatic (freshwater) biodiversity at a resolution of 0.5° by 0.5°, i.e., 50 km by 50 km at the Equator. These are expressed in terms of average abundance of a species (i.e. MSA).

NAME:	GLOBAL BIODIVERSITY SCORE (GBS)
	
Metrics	**High level proxy indicator** (at macro-economic level) Principles: • Quantitative ('a number') • Entire value chain coverage • Concise ('which is good for communication purposes') • Measures intrinsic biodiversity value (not ecosystem services, but is assumed that ecosystem services flourish when intrinsic values are OK) • Consensual (developed with and accepted by scientists, NGOs, businesses) • Complement and be compatible with local indicators GBS uses mean species abundance (**MSA)** and its surface area equivalent, i.e., **km² MSA**. The latter is the product of MSA multiplied by the area to which it applies (expressed in km²). MSA measures biodiversity intactness relative to its abundance in undisturbed ecosystems. A 100% ratio indicates an intact ecosystem while damages caused by an increase of pressures bring the MSA progressively to 0% when all originally occurring species are extinct in the ecosystem.
Outcomes based on modelling or real data?	Hybrid. Modelled results of GLOBIO are used to estimate average industry pressures (and impacts) when real data are not available (= 'default assessment'). When real data on pressures are available, they are instead combined to the pressure-impact relationships provided by GLOBIO to conduct a 'refined assessment'. At each stage, the best available data are used, with a preference for real data over modelled average values.
Drivers of biodiversity loss	Drivers (GLOBIO) include: land conversion, fragmentation, encroachment, atmospheric N deposition (eutrophication) and climate change for terrestrial biodiversity, and wetlands conversion, local and network land-use in catchment of wetlands, hydrological disturbance of wetlands and rivers, land-use in catchment of rivers and eutrophication of lakes for aquatic biodiversity. Missing drivers will be added to GLOBIO through future developments.

Application	• The GBS is suitable for the following applications:
	  ○ **Calculating the footprint of a financial asset portfolio** as a basis for portfolio investment decisions by finance sector, as long as it remains at the level of sectors or companies (when enough company-specific data is available)
	  ○ **Corporate level assessments**, including estimation of biodiversity performance along the whole value chain of a company. The GBS can also be used by non-financial companies themselves to assess a refined footprint if detailed information are available.

NAME:	GLOBAL BIODIVERSITY SCORE (GBS)
	○ **Country level assessments** (out of interest for business biodiversity performance assessments) • The GBS is not the most suitable for the following applications: ○ Assessments at site level and project level Due to: ○ The uncertainties associated to the pressure-impact statistical relationships, especially at small scales (under 1000 ha). Project level assessments are robust only for very large scale projects (impacting thousands of hectares) and should generally be limited to internal purposes ○ Not species or habitat specific ○ The GBS metrics can only be used for high level indications but at this moment cannot be disaggregated to e.g. site or project level. • The GBS could be used for No Net Loss approaches at the corporate or financial institution-level: ○ As any assessment tool, it would require as an input a baseline scenario to compare against the biodiversity losses and gains. ○ Since the GBS is not the most suitable at site or project level and since it focuses on intactness and not on individual species or habitats, it is not appropriate to conduct regulatory No Net Loss project assessments (which usually require particular attention for endangered and protected species). ○ It could however provide balance expressed as net gains or losses of km^2 MSA if fed with appropriate data. • **applies both to new and existing operations** • assessments can be used for **reporting** purposes
Required data	The GBS can work with different datasets listed below, by increasing order of usefulness in terms of the precision that can be expected from assessments: • **Economic activity** data: turnover by country and industry (of the company assessed or of the company a financial institution invested in); • **Pressure** data: - Carbon emissions on scope 1, 2 and 3 - Land use changes (ideally using a 13 habitat types nomenclature including different use intensity for forests, grasslands, agriculture, etc.) • Comprehensive **biodiversity** direct data: when very detailed ecological monitoring data are available, the mean species abundance might be directly calculated.
Granularity level	For reporting purposes: - Portfolio - Corporate entity or business unit - Country For internal purposes: - Project or site (indicative values with uncertainties) The pressure-impact relationships become imprecise below areas of about 1000 ha.
User friendliness	• Is it easy to use by non-experts or does it require specialist knowledge? Using the results of the GBS does not require specialist knowledge and the metrics of km^2 MSA is relatively easy to understand and visualize (the total land area of the Earth is 130 million km^2 and about 40 million km^2 MSA have been lost, i.e. the combined area of Africa and Europe, which is something anyone can easily understand). Conducting GBS audits to assess the impact of FI does require specialist knowledge. • What are the required time efforts? The level of efforts depends on the desired level of details, as the GBS can be flexible: quick approximations can be obtained with industry and country-level averages, and more refined assessments can be obtained if more precise data are collected. A quick assessment takes a couple of weeks and uses easily accessible (and existing) data. A typical detailed assessment should require a couple of months and might require the aggregation (or creation) of additional data, e.g. on habitat maps.

NAME:	GLOBAL BIODIVERSITY SCORE (GBS)
	• Does it require a similar approach as other environmental issues or is it very specific? Carbon footprinting data and results can be re-used as direct inputs of the GBS and the approach is very similar, both in terms of data collection and of concepts (e.g. scopes 1, 2 and 3, attribution of responsibilities across the value chain).
Strenghts recognised by initiators	• Scientifically well underpinned (best available knowledge and tools e.g. GLOBIO, Exiobase) • Quantitative (and scientifically robust) link between pressures and impacts • Covers all types of biodiversity and thus adequately captures the trends and risks faced by biodiversity and associated ecological functionality • Spatially explicit • Covers most drivers for biodiversity loss • Covers all industry sectors and all countries • Compatible with site-level data (micro) and international objectives (macro) • Biodiversity input data (MSA, pressure – impact relationships) based on extensive meta-analysis which continuously allows for adding new studies • Allows for introducing weight factors differentiating ecosystem condition based on protection regime, protected species, etc.
Weaknesses recognised by initiators	• Pressure-impact relationships in the GLOBIO model are biased towards the most studied species and ecosystems. • Marine biodiversity is not factored in • Overexploitation, invasive species, chemical pollution and soil degradation are not factored in yet • Remaining shortcomings in reallocation rules (i.e. linking pressures to economic activities)

3.2 Biodiversity Impact Metric (CISL)

NAME:	Biodiversity Impact Metric
Date of assessment	• First assessment by CISL on 15th March • Update on 20th August
Actors	**Lead**: Cambridge Institute for Sustainability Leadership (CISL) Members of the Natural Capital Impact Group: Kering, ASDA, Mondi, Volac; Mars; The Crown Estate; Anglian Water; Yorkshire water; Primark **Other**: The Biodiversity Consultancy; UNEP World Conservation Monitoring Centre; various Cambridge academics; Imperial College London
Process and current position	The Natural Capital Impact Group is a global network of companies, working collaboratively, to determine how business can sustain the natural world and its resources through its strategies and operating practices. Companies in the group are already making progress trying to reduce their impact on biodiversity. Companies are supporting the adoption of good farming and conservation practices to protect and restore ecosystems. For many of them, the business case for protecting biodiversity is quite simple. Without biodiversity, there is no business. However, leading companies still struggle to showcase their achievements in a manner that is consistent, academically robust, easy to understand and comparable. Companies want the opportunity to demonstrate positive impacts and show they are reversing the trend of environmental degradation. The Group seek to increase and improve the integration of biodiversity into corporate decision making by identifying what to measure and how. The Group has developed a concept for a biodiversity metric, recognizing that the largest impacts on biodiversity tend to occur in their upstream value chains, particularly on farms where raw materials are produced. Development of the Biodiversity Impact Metric commenced two years ago. The development process has included a range of stakeholders at different points in time. There has been extensive consultation with stakeholders in the biodiversity conservation community including Birdlife International, UNEP WCMC, The Biodiversity Consultancy, Cambridge University academics and the Imperial College London. Whilst all members of the Natural Capital Impact Group have supported the development of the metric, the global luxury group Kering have championed this effort and provided significant input to ensure that it will inform decision making. The Beta version of the methodology was launched in July 2018.The methodology is currently being piloted with members of the Natural Capital Impact Group. CISL is also developing metrics for soil and water. The long term goal is to produce a metric that can be used to assess and track the impact of a company's land use activities on biodiversity, soil and water in a given area. Collectively these three elements make up what we refer to as the '**Healthy Ecosystem Metric**'.
Key features of methodology	Biodiversity is inherently multidimensional encompassing taxonomic, functional phylogenetic, genetic, landscape and many other elements of variability of life on Earth. It is not practical for a company to measure impacts on biodiversity at all levels in all places, so biodiversity assessment methods must be optimized to the specific level of organization and spatial scale of interest. Given the multiple variables, the challenge is to narrow the scope and identify which variables or proxies can be used for assessing patterns and processes of biodiversity.

NAME:	Biodiversity Impact Metric

The central idea was to develop a robust methodology that is practical, easy to use, and that will help companies to measure their impacts on biodiversity in different parts of the world and provide them with an indication of where these impacts can be reduced. This new measure has the potential to convey impacts on biodiversity in a manner that hasn't been achieved previously and will provide actionable information on how a business can reduce their impact.

The methodology has been co-developed by a number of different companies representing different industries. There is no shortage of targets and indicators that measure biodiversity. However, many of these are difficult for companies to aggregate over all of their operations and value chains.

The methodology was developed with the view that whilst biodiversity is complex, business need to report on their biodiversity impacts in a simple way if progress is going to be made incorporating biodiversity into decision making. The methodology for the metric was co designed in line with the following principles:

Metric Principles:

Principle	Description
Meaningful	Meaningful to business and investor communities so it can be used to drive decision making. Methodology is clearly understood.
Measurable and comparable	Allows for comparison across geographies and time.
Possible to aggregate	Can be aggregated from site-level to regional and global scales.
Practical	Data is accessible, measurable by company or using free, globally available data. Ability to substitute better information where available.
Replicable and credible	Based on a reputable scientific method.
Context based	Considers local conditions/levels to reflect 'impact' (beyond 'usage').
Responsive	Responds to changes in company activities, both short and long term.

Earlier working papers providing useful background information are:

- Working Paper on Biodiversity and Ecosystem Services in E P&L (https://www.cisl.cam.ac.uk/publications/publication-pdfs/BESinEPLWorkingPaper.pdf) (Oct 2016). This work was undertaken to support Kering in developing its thinking on biodiversity and ecosystem services in the context of Environmental Profit & Loss (EP&L) accounts.
- Working Paper 'How businesses measure their impacts on nature' (https://www.cisl.cam.ac.uk/publications/publication-pdfs/how-businesses-measure-their-impact-on-nature.pdf) (2016)
- Working Paper 'Healthy ecosystem metric framework: biodiversity impact' (https://www.cisl.cam.ac.uk/publications/publication-pdfs/healthy-ecosystem-metric-framework.pdf) (May, 2017)

Metric

Whilst there is never likely to be agreement on an approach that can represent the full spectrum of impacts on biodiversity, there is an urgency to develop indicators that, at a minimum, allow business to see if their decisions are conserving biodiversity or leading to its

NAME:	Biodiversity Impact Metric

degradation and loss. Without this knowledge it is not possible to know if the actions being taken are working and should continue or if different approaches need to be tried. The biodiversity metric demonstrates that it is possible to show which way some of the key components of biodiversity are heading and what a company can do to change this.

Complex, time-consuming field based biodiversity impact assessments fail to deliver information quickly enough to aid decision-making, particularly for multinational businesses that source hundreds of different raw materials from across the planet.

The Biodiversity Impact Metric is *quantifiable* measure that can be used to *assess* and *track* the impact of a company's *land use* activities on biodiversity in a *given area*.

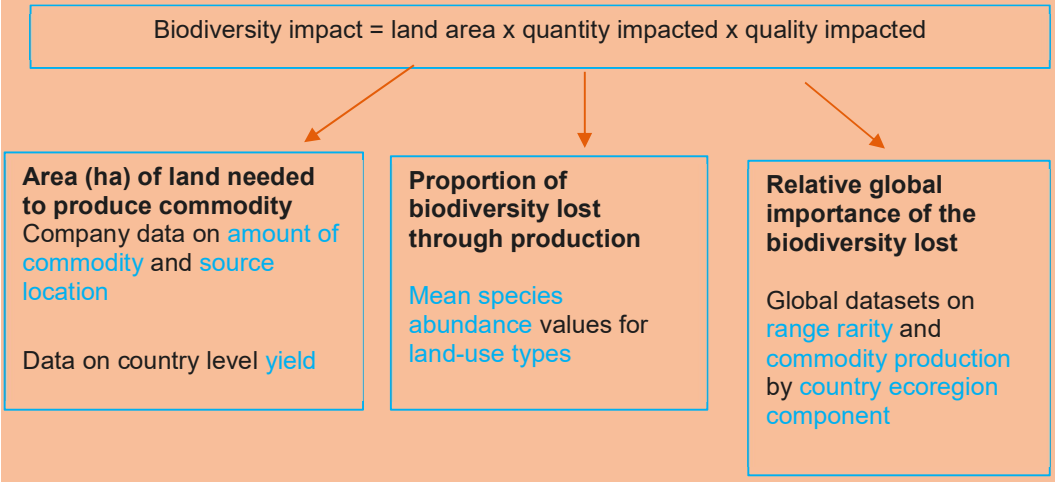
In essence the metric has been designed to provide information on the following:

- What is the ***state*** of biodiversity in an area? How has it ***changed*** relative to a baseline?
- How ***important*** is the biodiversity in an area relative to other areas?
- And how much of the change in biodiversity (both negative and positive) can we ***attribute*** to the land use of a particular company?

The biodiversity impact measured by the metric relates to the impact of using land that was once natural habitat for commodity production.

The metric combines' data on the land area required to supply a particular raw material with a series of coefficients that quantify the impact on biodiversity.

The basic framework for the metric is as follows:



The metric aims to characterize the impact of businesses on biodiversity by weighting a company's land area according to its effect on the proportion of biodiversity lost through production (quantity) and the relative importance of the biodiversity lost (quality.) The methodology provides a basis for comparing different sourcing options and as such may help a company to compare different investment options.

Land use impact coefficients are derived using the best available global data to provide a measure of the status of biodiversity stocks and the relative importance of those stocks in a given region. These components are assessed at the eco region level and aggregated to produce a score for different raw materials. The Biodiversity Impact Metric has focused initially on the biodiversity impacts of land-use in relation to raw material supply chains but may have wider application in future.

NAME:	Biodiversity Impact Metric
Drivers of biodiversity loss	The Natural Capital Impact Group has developed a concept for a biodiversity metric, recognizing that the largest impacts on biodiversity tend to occur in their upstream value chains, particularly on farms where raw materials are produced. The methodology is focused on measuring the impacts of raw material production, or land use, in global supply chains. The biodiversity metric can in principle be used to provide a measure of impact beyond agricultural land use and include extractives and land use in the built environment. The metric will gradually be expanded over time to provide a measure of all impacts on natural capital across a supply chain (i.e. manufacturing/processing/distribution, retail etc.)
Application types	In its current form, the metric has particular value for companies involved in bringing a product or service from raw material to market in global supply chains. It supports decision making at a corporate level, providing a commodity-level assessment of biodiversity impacts and giving an indication of where and how a company can reduce their impact in specific places. Raw materials could include raw latex, cotton, rice, coffee, cattle, soybeans, palm oil and other major agricultural commodities. This includes companies from the following commercial sectors: - Food, beverage and apparel - Cosmetics and pharmaceuticals - Forest based industries - Other major consumer goods companies sourcing raw materials The Biodiversity Impact Metric has a number of potential uses, including: • Establishing an *overall potential impact* score from commodity sourcing • Flagging *geographic sources* of potential elevated impacts in a commodity supply chain • Comparing potential impacts of *different commodities* – within a company's supply chains or more generally • Comparing potential impacts of *different companies* sourcing the same commodity(ies) The metric is designed to provide robust information on the impact of raw materials that are sourced from different locations across the world. It supports decision making at a corporate level, providing a commodity-level assessment of biodiversity impacts and giving an indication of where and how a company can reduce their impact in specific places. Currently the methodology is focused on measuring the largest impacts on biodiversity that occur upstream in most company's value chains. The methodology provides a basis for comparing different sourcing options and as such may help a company to compare different investment options. Anglian Water, a water utility company based in the UK, have successfully adapted the methodology to provide an understanding of the current state of biodiversity across all of their operational sites and to prioritize areas where the need to enhance protective measures is more crucial. The methodology will gradually be expanded over time to include different forms of land use and widening the range of companies for whom the metric will be useful.
Required data	*Company land area*

NAME:	Biodiversity Impact Metric

Land area is the first data input in the metric. A company provides data on how much land they, or their suppliers, are using to produce a raw material in a particular sourcing location. There are likely to be many cases where a company has limited knowledge of how much land is being used in specific region to produce a specific crop. If this proves to be the case, estimates of land area can be generated using freely available data.

The proportion of biodiversity lost

Biodiversity is inherently multidimensional encompassing taxonomic, functional phylogenetic, genetic, landscape and many other elements of variability of life on the Earth. Measuring change in biodiversity is multi-faceted and can include loss of quantity (abundance, distribution), quality (ecosystem degradation) or variability (diversity of species or genes) within all levels and aspects. It is not practical for a company to measure impacts on biodiversity at all levels in all places, so biodiversity assessment methods must be optimized to the specific level of organization and spatial scale of interest.

Given the multiple variables, the challenge is to narrow this down and identify which variables can be used for assessing patterns and processes of biodiversity. Species diversity is one of the most widely adopted metrics for assessing patterns and processes of biodiversity. Species diversity is strongly correlated with diversity at other levels or organization, such as genetic diversity and ecosystem functioning. The number of different species that are present in a given area is an important measure of ecosystem health and this is often dependent on what type of land use is being employed (e.g. forestry, cropping, pastoral) and how intensively the land is being managed (e.g. monoculture, agro forestry, agro-pastoral)

A series of global coefficients have been derived for different land use types and intensities, representing the amount of biodiversity (in undisturbed natural habitat) that is lost through transformation to a different land-use and land-use intensity. These coefficients that quantify the loss of biodiversity are based on leading empirical studies and provide a basis for differentiating the impacts of land-use types and associated land-use intensities. The values provide an indication of changes in Mean Species Abundance (MSA). MSA is defined as “the mean abundance of original species in disturbed conditions relative to their abundance in undisturbed habitat, as an indicator of the degree to which an ecosystem is intact” (Schipper et al. 2016). These values are based mainly on the latest MSA coefficients (Schipper et al. 2016) with some limited interpolation and expert judgement. Types of land use and management practices carried out by a company across different sourcing locations are categorized according to six broad land cover classifications under minimal, light or intense management.

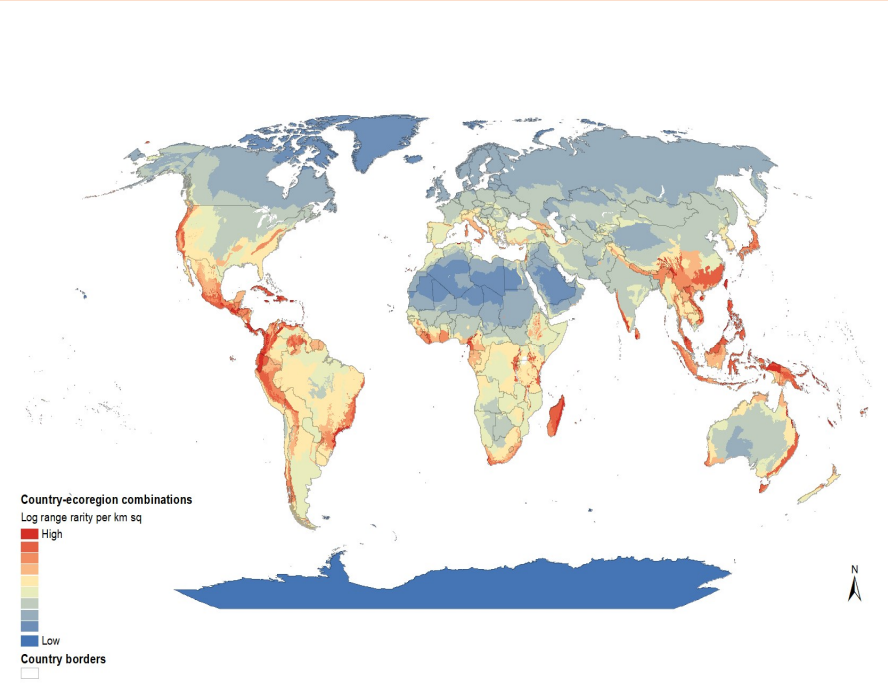
The importance of a location for biodiversity

All biodiversity is important however in some parts of the world biodiversity is more vulnerable or at risk than in others. Some species are unique to a defined geographic location or have seen their habitat shrink to a point where they are now a great risk of becoming extinct. These species often find themselves marooned in only one, small geographic area and as such are priorities for global conservation. To determine ‘biodiversity importance’ a new range rarity approach has been developed and incorporated into the metric, drawing on IUCN RED list data. Range data from the IUCN Red List (2017) was used to create a range rarity layer to be used as a proxy of biodiversity importance.

Range rarity values provide an indication of the relative importance of a place for biodiversity compared to other areas. Range rarity scores combine measures of range-restriction (endemism) and richness, considered to be key factors that relate to biodiversity importance. Range rarity is crucial for considering species with very small ranges that are often of greatest conservation concern and is a close proxy for the irreplaceability of a location when the goal is to conserve as many species as possible. Range rarity is determined using Extent

NAME:	Biodiversity Impact Metric

of Occurrence range maps for four taxonomic groups that are completely assessed on the IUCN Red List of Threatened Species, i.e. amphibians, mammals, birds and conifers. Range rarity has been calculated across ~1 km grid cells. Each ~1km grid cell was scored for range rarity for each species (the proportion of the species' global range the cell represents; i.e. area of grid cell/range size) and given a total score by summing scores across all the species potentially occurring in it.



Visualization of range rarity by Country Ecoregion Component (analysis and mapping: UNEP-WCMC)

Areas that hold a large number of species (richness) and/or species with small ranges sizes are given a higher score. The species in these areas are more vulnerable to land conversion. The taxonomic groups used to represent biodiversity are limited to amphibians, birds, mammals and conifers. Other taxonomic groups were not considered for this analysis as they are still incomplete, at least for the terrestrial realm, and the available spatial data will typically have been collated with a number of geographic biases. As the IUCN Red List assessment and mapping process is ongoing, further groups could be included in future leading to provide a more representative index of biodiversity importance. The global pattern of importance based on aggregation to the country-ecoregion combination (CEC) level shows expected patterns of high importance in the tropics and especially on small islands and in mountain ranges.

Calculating an impact score

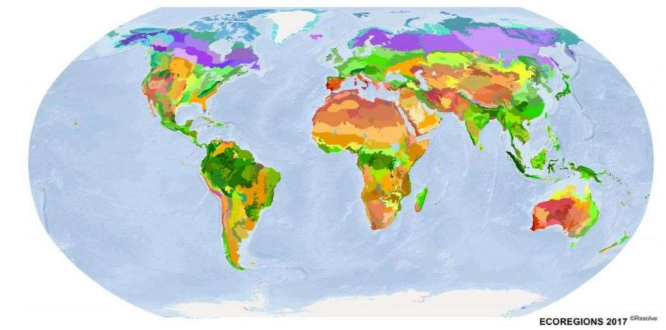
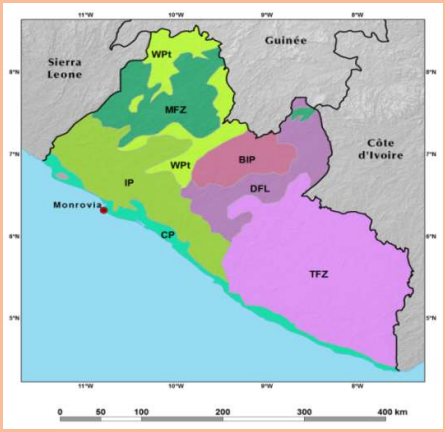
The metric can be applied in different ways to calculate an impact score, depending on the amount of information a company is able to provide on its sourcing activities:

1. Tier 1: Calculating a 'base' score (with limited company sourcing information)
2. Tier 2: Calculating an 'improved' impact score (with information on a commodities source location, production management and local yields)

Tier 1: Calculating a 'base' score (with limited company sourcing information)

NAME:	Biodiversity Impact Metric
	At this level the metric can be used to identify potential hotspots or risks in a supply chain associated with the production of particular commodities. It can provide an indication of the magnitude of the impact they are having and where there are opportunities to reduce their impact through their operational decision making. The metric can be used to: • Flag *geographic sources* of potential elevated impacts in a commodity supply chain • Compare potential impacts of *different commodities* – within a company's supply chains or more generally • Comparing potential impacts of *different companies* sourcing the same commodity(ies) The metric can be applied at this level using information on the amount of production sourced from a particular country, or region. To calculate the metric in its simplest form, the input data required is the weight of the commodity sourced (in tonnes) from each producing country. The metric calculates the biodiversity impact of a company's commodity sourcing in weighted hectares (wehas.) A weighted hectare combines land area (hectares) with weightings for biodiversity importance, based on species range rarity, and quantity of biodiversity impacted, based on global averages for Mean Species Abundance. In essence, what this means is that each hectare of land under production is given a weighting, providing an indication of how much biodiversity has been lost as a result of land conversion and how important the loss of that biodiversity is relative to other areas. This impact can be expressed as a total (i.e. 320 weighted hectares) or as an averaged impact/tonne. Impact scores can be compared across different locations or against a global average to provide an indication of whether the sourcing of a particular commodity is having a *below* or *above* average impact on biodiversity in a particular area, compared to other sourcing locations. At this level, the metric distinguishes between quantity of biodiversity impacted by different land-use types, but not by different land-use intensities. **Tier 2: Calculating a more refined impact score accounting for different land-use intensities in a specific geographic location** The relationship between biodiversity and how intensely land is managed is complex, however low intensity production systems tend to harbour more biodiversity than intensive systems. For focusing and tracking improvements in land management and production practices, the 'detailed' version of the metric is required. At this level the metric can be used to start distinguishing between the impacts of different land-use intensities. If more detail is available on source location, production management, and local yields, then the metric may be applied at a 'detailed' level, with land-use intensity also be factored into the metric. At this level a company can start to identify the links between different supply chain interventions (internal standards, third party certification schemes) and reducing impacts on biodiversity in different location.
Granularity level	The various components in the metric are assessed at the eco region level. Terrestrial Ecoregions of the World are a biogeographic regionalization of the Earth's terrestrial biodiversity. Ecoregions are defined as relatively large units of land containing a distinct assemblage of natural communities sharing a large majority of species, dynamics and environmental conditions. The new terrestrial ecoregion dataset[7] , updated in 2017, proposes

[7] (Dinerstein *et al.* 2017)

NAME:	Biodiversity Impact Metric
	867 terrestrial ecoregions, which size ranges from 3 km^2 (Central Polynesian tropical moist forests) to 3.9 million km^2 (East Siberian taiga), with an average size of ecoregions of 155,748 km^2. They are classified into 14 different biomes such as forests, grasslands or deserts.  Ecoregions are a convenient size, small enough that ecosystem type and biodiversity 'quality' are largely consistent within them, but large enough that precise source information for commodities is not needed. Most ecoregions tend to stretch across national boundaries. A 'Country Ecoregion Component', or CEC, (see map below) is the portion of a particular ecoregion that falls within a particular country. The map below provides an example of different Country Ecoregion Components in Liberia.  Metric results are calculated at the scale of Country Ecoregion Component and then aggregated to produce a national score for different commodities. The metric can work at any scale in principle, but the underlying information base has been developed at the scale of Country Ecoregion Component.
Strengths recognised by initiators	• The metric is academically robust and draws on a number of globally recognized data sets. It does not involve primary, field based data collection in different sites • It is simple to use and doesn't require a company to provide large amounts of data • It provides a comparable methodology to showcase progress across different industries

NAME:	Biodiversity Impact Metric
	• There are a number of steps or stages in Natural Capital protocol, starting with a framing and scoping phase and then progressing into measurement, valuation and application. The Metric can help companies during the Scoping and Measuring stages of applying the protocol
Weaknesses recognised by initiators	• It will help shed light on high-risk locations where the company is most likely to experience biodiversity risks but won't provide enough information about a specific site to support completion of a biodiversity action plan. This would require more detailed information at a finer scale. • At present, it is focused on the impacts of land use associated with raw material production. It does not provide a measure of all impacts on natural capital across a supply chain (i.e. manufacturing/processing/distribution, retail etc.) • The metric does not assess the broader landscape context, nor the indirect effects (outside the land-use footprint) of commodity production. • The metric does not assess conservation status of commodity-producing ecoregions. Supplementary metrics can be calculated (from ecoregion-scale data) to assess the conservation context of commodity sourcing from a particular country, in relation to the area of ecoregion protected and the extent of unprotected natural habitat remaining.

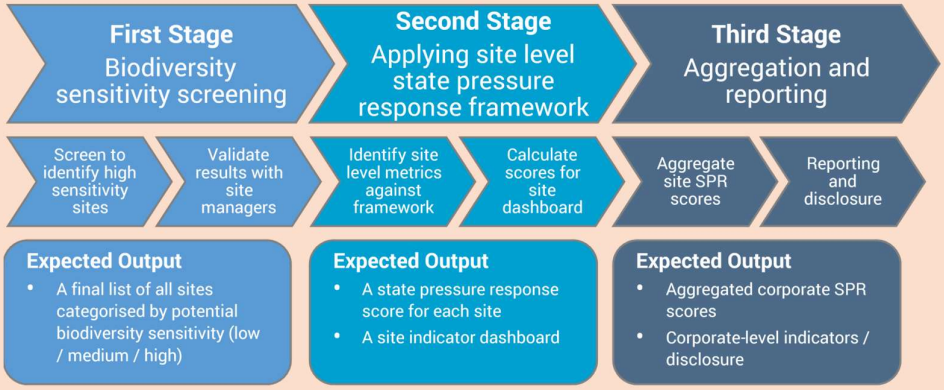
3.3 Biodiversity Indicator for Extractive Companies (UNEP-WCMC)

NAME:	UN Environment World Conservation Monitoring Centre (UNEP-WCMC) Biodiversity Indicator for Extractive Companies
Date of assessment	• First assessment by UNEP-WCMC on 2nd April 2018 • Updates on 15th July 2018 and….
Actors	**Lead**: UNEP-WCMC **Other**: IPIECA Biodiversity and Ecosystem Services working group (http://www.ipieca.org/our-work/environment/bes-issue-management/) and Proteus Partners (https://www.unep-wcmc.org/featured-projects/proteus-partnership) engaged as a platform to provide industry specific insights for the development of an indicator. An advisory group comprising: ConocoPhillips, Conservation International, ENI, IUCN, Oxford University, Rijksdienst voor Ondernemend Nederland (RVO.nl), Shell, Fauna & Flora International and The Biodiversity Consultancy provide an independent sounding board to the project.
Process and current position	UNEP-WCMC initiated the Biodiversity Indicator for Extractive Companies project in March 2017. Phase 1 determined the needs and current practices used by the sector, through desk review and interviews with industry representatives. The key findings of Phase 1 highlighted two potential models to take forward for further methodological development and piloting: • A single composite indicator • A framework approach For a detailed description of the findings of phase 1, please find the report here. Phase 2 of the project commenced in January of 2018 (currently ongoing). A shortlist of suitable methodologies, that fit the models described above, was created and explored with industry representatives at a half day workshop. Participants highlighted that a single metric may not provide the necessary resolution, flexibility or information to meet the indicator needs of the extractive sector. Current data gaps and lack of comparability may in the short-term render a single indicator challenging. Learning from Greenhouse Gas reporting, a tiered approach, incorporating high-level screening of all sites within a portfolio followed by the development of indicators for identified high-risk sites, using a Pressure-State-Response model were identified as a potential first step in the development of improved biodiversity indicators for the extractive sector and would draw from existing methodologies and data. A draft methodology was discussed at the Proteus Annual Member's. It was positively received by IPIECA and Proteus members. The methodology is now being finalized following this feedback and Phase 3 of the project is being developed to pilot the methodology.
Key features of methodology	A three stage process is suggested for indicator development (Figure 1): • First stage: **screening of the company's portfolio of operations to identify sites with potentially high biodiversity sensitivity**, based on globally and locally available data sets combined with site validation to identify sensitive sites for prioritisation of reporting effort; • Second stage: **development of site level biodiversity indicators using the state-pressure-response (SPR) framework** (a widely accepted organising framework for biodiversity management and monitoring), informed by the stage above and based on site level data and documentation for high sensitivity sites collected as part of the environmental impact assessment; and

NAME:	UN Environment World Conservation Monitoring Centre (UNEP-WCMC) Biodiversity Indicator for Extractive Companies

- Third stage: **aggregation of scores for SPR** at site level up to business unit, division, and corporate level to provide insight into performance on the ground.

Figure 1: Process for site prioritization and biodiversity indicator development



Metrics

In order to comply with the user needs of consulted companies, the following criteria apply to the envisaged indicator(s).

Criteria	Description
1.Business relevant	Indicator can be used directly for company's business decisions at multiple levels.
2.Spatial extent	The ability to use an indicator at site level and aggregate it up to business unit or corporate level.
3.Sensitivity to change	Indicator responds to change in the issue of interest with minimal lag, enabling monitoring over time.
4.Data availability /accessibility	Extent to which data is available and inexpensive/ feasible to access.
5.Scientifically valid*	Accepted theory of relationship between the indicator and its purpose, with agreement that change in the indicator indicates change in the issue of concern.
6.Communication	Ease of understanding of indicator to non-technical people.
7.Production	Data collection, analysis and calculation is straightforward and non-specialists can use the indicator.
8. Policy relevance*	Links to SDG/Aichi Targets.

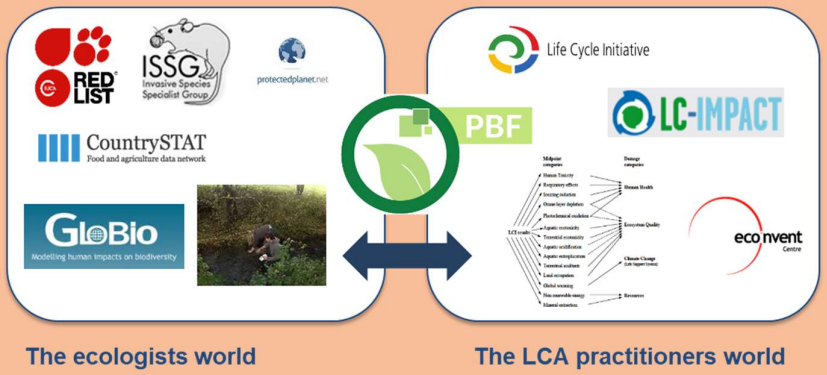
The below table provides an overview of screening criteria, and recommended data source for global-scale screening (First Stage in Figure 1 above).

Criterion	Description	Data source

NAME:	UN Environment World Conservation Monitoring Centre (UNEP-WCMC) Biodiversity Indicator for Extractive Companies		
	Criterion 1: Globally threatened species	Criterion evaluating the number of threatened species ranges overlapping an operating site, taking into account the size of the ranges. Operating sites are scored based on overlap with a range rarity layer for threatened species, derived from the IUCN Red List species ranges. Threatened species are species listed on the Red List as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU). Range rarity measures species richness weighted by the inverse of range size, giving high values to locations that support more species that are found in few other locations. For the purposes of this criterion, range rarity is further weighted by relative extinction risk, giving higher scores for locations support species that are more threatened.	Red List species range rarity layer - 1x1km resolution (IUCN). Available through IBAT as of January 2019.
	Criterion 2: Critical habitat	Criterion evaluating the overlap of operating sites with areas which likely or potentially classify as Critical Habitat, as defined by the IFC Performance Standard 6 (PS6) (IFC 2012). IFC PS6 defines critical habitat as areas of high biodiversity value, based on a set of five criteria: • Habitats of significant important to Critically Endangered and/or Endangered species • Habitat of significant important to endemic and/or restricted-range species • Habitat supporting globally significant concentrations of migratory species and/or congregatory species • Highly threatened and/or unique ecosystems • Areas associated with key evolutionary processes As detailed in the IFC performance standard guidance note 6, Critical Habitat may also be triggered by other recognized areas of high biodiversity values, including Protected Areas (Ia-II and sometimes III-IV), World Heritage Sites and the majority of Key Biodiversity Areas, which encompass Important Bird and Biodiversity Areas and Alliance for Zero Extinction sites.	Global Critical Habitat screening layer (UNEP-WCMC). Available through IBAT as of January 2019.
	Criterion 3: Protected areas	Criterion evaluating the overlap of operating sites with national-level protected areas and protected areas designated under regional or international conventions or agreements. Protected areas aim to conserve biodiversity by protecting species, habitats and other biodiversity features within their boundaries. Protected areas are one of the cornerstones of biodiversity conservation as outlined by the Convention on Biological Diversity (CBD). The authoritative definition of protected areas has been formulated by the IUCN (Dudley 2008).	Polygon-based - World Database on Protected Areas (IUCN and UNEP-WCMC). Available through IBAT.
Outcomes based on modelling or real data?	It is intended that the approach uses real data, but modelled/ estimated data may also be used. This will be explored within the piloting process.		
Drivers of biodiversity loss	Pressures are considered as a part of the application of the state, pressure, response model.		
Application types	The UN Environment World Conservation Monitoring Centre (UNEP-WCMC) Biodiversity Indicator for Extractive Companies can support the following types of business applications: • Assessing and monitoring progress of biodiversity risks at project, site and corporate level • Comparing options at project and site level • Applying a NNL approach at project, site and corporate level (establishing baseline and monitoring progress)		

NAME:	UN Environment World Conservation Monitoring Centre (UNEP-WCMC) Biodiversity Indicator for Extractive Companies
	• Communication and reporting (e.g. compliance with GRI reporting) • Both new and existing operations • FIs can compare biodiversity performance of companies within the extractives sector
Required data	For Stage 1: Data on critical habitat, IUCN red list species range rarity information and location of protected areas, derived from the Integrated biodiversity assessment tool (IBAT). The initial screen looks at globally threatened species as a quick and easy set of data to access, this creates a short list of potentially sensitive sites. For Stage 2: Those priorities are then checked through site discussion and with time all sites will be reviewed. IBAT is not the source of information for the site level indicator production, EIAs, BAPs (biodiversity action plans) and local data sets will be.
Granularity level	It will cover scales at both the site level and corporate level.
User friendliness	To be determined through piloting. Initial feedback on the concept has been positive.
Strengths recognised by initiators	• Builds from existing environmental management systems • Stage 1 formalises and documents existing industry practice enabling a more transparent communication of identification and management of risks • Designed in consultation with industry and driven by industry needs • Builds from a model well used in the conservation and policy arena • Theoretically sensitive to management interventions
Weaknesses recognised by initiators	• Assessment looks at current status of biodiversity rather than future predictors of decline • Incompleteness of data sets may lead to understatement or overstatement of sensitivity • Isolating pressures attributable to corporate action is challenging, as is defining area of influence • The resultant indicator set may be complex to communicate and may not meet needs for external disclosure • Lags in responsiveness of indicators may obscure performance

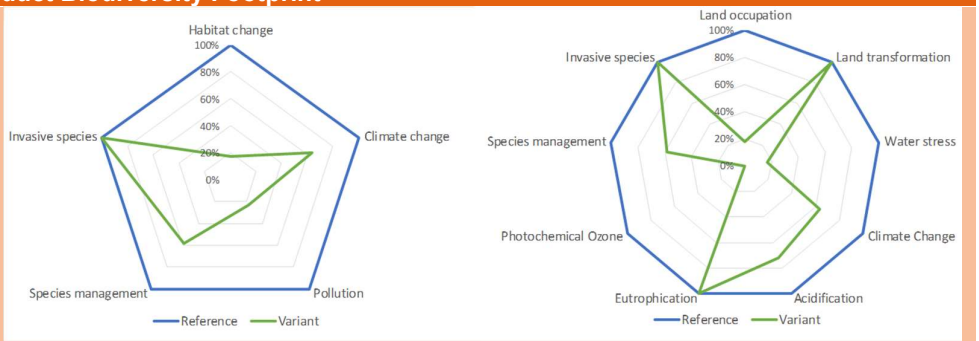
3.4 Product Biodiversity Footprint (I Care & Consult, Sayari)

NAME:	Product Biodiversity Footprint
Date of assessment	First version by I Care & Consult on 20 June 2018 First review EU B&B Platform on 6 August 2018 Update by I Care & Consult on 23 August 2018
Actors	**Lead**: I Care & Consult, Sayari **Other**: Steering committee: French ministry of environment, ADEME, Kering, Avril, L'Oréal Scientific committee: members of the following organizations: MNHN, UN Environment, IUCN, Irstea, Solinnen.
Process and current position	The PBF project aims to answer the lack of specific tools **to assess the impact of different products and services on biodiversity.** In order to do this, baseline principle of the PBF project is to co-develop a method and a tool relying both on sectoral/local biodiversity studies and on company data to quantify the impacts of a product on biodiversity **all along the product's life cycle stages** in order to provide recommendations for changes. PBF project brings together all existing available data and provides **quantitative results for decision making** processes regarding product strategy (risks analysis, purchasing strategy, eco-design…). The approach for development of the first version is presented in a method document, available on the project website: http://www.productbiodiversityfootprint.com/. It has intrinsically combined scientific knowledge (embodied by the scientific committee, gathering experts from both LCA and ecological field) and business requirements and case studies. *Product Biodiversity Footprint is about bridging a gap between 2 worlds : field analysis on one side, lifecycle analysis based on data on the other side*  First assessments took place in 2017, and 3 case studies provided results in February 2018 for three agricultural sectors: goat wool, rapeseed oil, palm oil (phase 1). Further testing for other sectors will take place in 2018- 2019 (phase 2)
Key features of methodology	• **Discriminating capacity** The main objective of the project is to improve the biodiversity performance of a product by identifying bioidversity hotspots that can be improved and support eco-design approaches. In order to have such a capacity the PBF has a strong **discriminating capacity**: the method aims to identify between the variants of a product the one with lowest impacts on biodiversity. The LCA framework is used to calculate **the relative differences between the variants of a product**. In the long term, it will also allow to compare different products or different sectors at larger scales. • **Integrating biodiversity in LCA ecosystem** To be easily adopted by companies for product assessment, the method is integrated in the LCA ecosystem, meaning it is **connected to LCA database** and compatible with **LCA**

NAME:	Product Biodiversity Footprint
	assessment framework (Chaudhary et al. 2015, Verones et al. 2017)[8]., so that this additional biodiversity assessment can be seen as an **add-on to LCA global assessment**. Therefore, the choice made for PBF method is to include biodiversity knowledge in the LCA framework. • **Covering a large scope of impacts** The method covers the 5 pressures on biodiversity identified in the Millennium Ecosystem Assessment (2005). Biodiversity knowledge included in the LCA framework is based on **ecological publications** specific for each pressure and on **available global biodiversity database** to assess the state of biodiversity. • Taking into consideration **vulnerability and irreplaceability** of species
Metrics	PBF allows the comparison of different product scenarios: one "reference" and one or more "variants". The comparison is made on an indicator reporting the **potential loss of species**. The indicator is expressed in the so called "potential disappeared fraction of species within a year" or PDF*yr. This indicator is developed by LCA researchers, and frequently used in LCA methodologies. It can be applied both as a regional and global indicator, as recommended by the UNEP SETAC 2016 guidance: - Regional indicator (PDF_{reg}*yr) quantifies the potential for disappearance of species at regional level; region is understood as an ecologically homogeneous area, practically identifies as ecoregions for terrestrial ecosystems, and the water basins for freshwater ecosystems). - Global indicator (PDF_{glo}*yr) quantifies the potential for global extinction of species, accounting for their vulnerability at global level. Results are presented in different layers (see figure below): (a) A first level displays a relative comparison of the biodiversity impacts on the 5 axes of MEA pressures,; the 100% value will be assigned to the Reference scenario; (b) The second level provides details for each MEA pressure: relative comparison and absolute quantification. ▪ **Change of habitat** is detailed in • land occupation impact on biodiversity • land transformation impact on biodiversity • water stress impact on biodiversity ▪ **Pollution** is detailed in: • terrestrial acidification impact on biodiversity, • freshwater eutrophication impact on biodiversity • photochemical oxidation impact on biodiversity ▪ **Climate change** impact on biodiversity is displayed in biodiversity loss. Impacts will also be supplied in the usual unit of kgCO2eq, according to IPCC 2013 100 year factors (In Module 1, the relationship between pressure and impact on biodiversity is modelized following LC methodology (2016), as precised in the footnote. Module 2 helps refining these impacts through local data and details on company practices).

[8] Verones et al. 2017. LCIA framework and cross-cutting issues guidance within the UNEP-SETAC Life Cycle Initiative, *Journal of Cleaner Production,* vol. 161.
Chaudhary et al. 2015. Quantifying Land Use Impacts on Biodiversity: Combining Species− Area Models and Vulnerability Indicators*, Environ. Sci. Technol*. 2015, 49, 9987−9995.

NAME:	Product Biodiversity Footprint

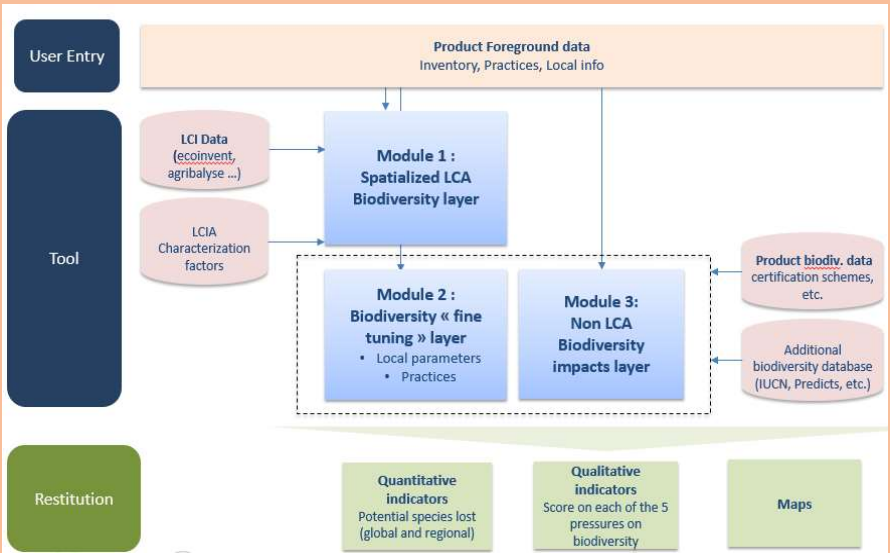


PBF two main outputs: two different levels of results aggregation, to assess the biodiversity impact of two variants of one product (fictive product).

To calculate these metrics, the methodology is based on 3 modules, as described in figure bellow:

Module 1 computes lifecycle impact assessment, with spatial differentiation for the main impact categories evaluated. Characterization factors used for computation are the ones currently available in published LCA methodologies (LC Impact[9]). This first module enables the user to visualize the hotspots of the product footprint both geographically and along the whole value chain.

- **Module 2** treats specific information regarding the practices and the local context, that would enable to adjust impact computations based on information entered by the users. The development of criteria and rules to quantify the changes in impact computations are defined per type of land use (e.g. arable crops, perennial crops, grassland, mining, forest, urban….) and/or per sector (livestock, transport, electricity, construction….). Results of modules 2, additionally to the results of the Module 1, enable the user to visualize and quantify the benefits of a chosen practice/location, and compare various scenarios for a given product.
- **Module 3** assesses qualitatively 2 aspects that are not part of any LCA model, namely 'invasive species' and 'species management', this last one encompassing 'overexploitation' aspects of the Millennium Ecosystem Assessment, such as hunting, poaching or overfishing, but going beyond as it also includes positive actions (e.g. installation of pollinators, use of various breeds, follow up of endangered species…).



NAME:	Product Biodiversity Footprint
Outcomes based on modelling or real data?	Outcomes are based on a mixed approach, with modelling and real data.
Drivers of biodiversity loss	Biodiversity impacts are assessed independently **for the 5 MEA pressures: habitat change, climate change, pollution, species management and invasive species**. At this stage, we did not combine the 5 pressure scores into a single biodiversity score, to avoid issues of scales and weighting between indicators.

Application	• **Product evaluation**: PBF evaluates the impact of products or services created as a result of a fabrication, manufacturing, or production process. This approach is mainly based on life-cycle assessment (LCA), a technique to assess environmental impacts associated with all the stages of a product's life g.. PBF can help avoid a narrow outlook on environmental concerns and be a tool for decision-making or product communication (see below).
	• **Decision making**
	  ○ Sourcing of material
	  ○ Change of production practices (e.g. farming)
	  ○ Ecodesign
	• **Product communication** : the result of the comparison between reference and variant can help the company in producing convincing and scientific-based points for enhancing and valorizing the biodiversity benefits of the product

Required data	• Company data: the company needs to transfer following data to PBF team
	  ○ Standard Data on the production process of the product: raw materials, transport, yield, …
	  ○ Localization data for the main processes: localization of sourcing, …
	  ○ Existing local biodiversity studies (inventories, impact studies, …)
	  ○ List of actions undertaken/ practices put in place to mitigate the impact on biodiversity
	• Method data
	  ○ LCI Data (Ecoinvent (https://simapro.com/databases/ecoinvent/), Agribalyse (https://simapro.com/products/agribalyse-agricultural-database/), …)
	  ○ Biodiversity database (IUCN, IBAT, Predicts, …)

Granularity level	• General level: **ecoregion and countries**. although spatial resolution is specific to each impact category, LC-Impact proposes aggregated characterization factors at country level for each environmental category. • Detailed level: **land use occupation practices and biodiversity local context** (depending on the level of data available on the product)
User friendliness	• **Required expertise**: There is a need for both a LCA expert and a biodiversity expert, in order to gather the necessary input data for PBF tool, • **Time effort** Time effort is limited, quite similar to a normal LCA (provided that underlying biodiversity data are already existing): 10% ETP during 4 months for LCA specialist and 10% ETP during 4 months for biodiversity specialist • **Specificity of the approach** The approach is actually a mix of other environmental approaches already existing in the company: LCA approach and impact study approach • **Communication of results** Thanks to the spider graphic, it is very easy for a non-expert to understand the results of PBF

[9] *Verones F et al., 2016, LC-Impact Version 0.5, A spatially differentiated life cycle impact assessment approach, retrieved from http://www.lc-impact.eu/downloads/documents/LC-Impact_report_SEPT2016_20160927.pdf, 2016*

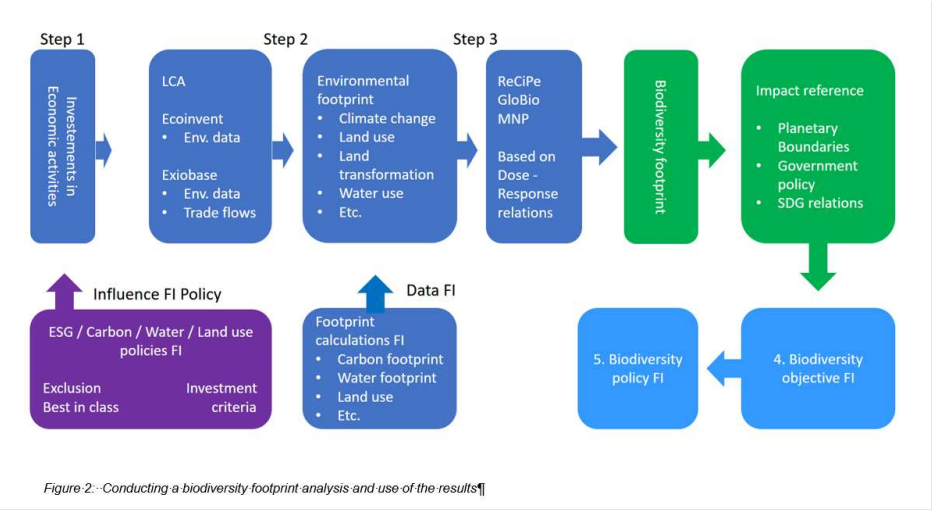
NAME:	Product Biodiversity Footprint
Strenghts recognised by initiators	The testing of the PBF methodology has revealed 4 main strengths • A full "**product**" approach, encompassing all the lifecycle of the product and not only one specific phase (eg.: agriculture production) • Ability to **reveal the impact of the positive biodiversity actions of a company** along the product lifecycle (sourcing, production practices, …) • Capacity to **combine** both "database modelized information" and real company data, so that it reduces the need for input data from the company but also positions the specific product performance vs. average product performance • The **coverage of all pressures** on biodiversity (and not only impact of land use)
Weaknesses recognised by initiators	This methodology is a significant step towards pragmatically assessing the biodiversity impact at product level. Application to case studies has proven the feasibility of the method. Still some weaknesses have been identified and some improvements will be performed in 2018/2019 • **Methodology needs to be tested and adapted to other sectors:** Energy production, Mining, Transport Infrastructures in particular. • **Methodology needs to include or complete some cause-effect pathways,** by example adding ecotoxicity in pollution; vulnerability in further LCA categories, … • **Graphic interface (maps)** needs to be improved to facilitate vision of impacts geographically

3.5 Biodiversity Footprint approach ASN bank (ASN Bank)

NAME:	Biodiversity Footprinting approach ASN bank
Date of assessment	21 June 2018
Actors	**Lead**: ASN Bank (The Netherlands) **Other**: The methodology is co-developed with CREM and PRé Consultants.
Process and current position	ASN Bank launched the methodology in 2016. The first footprint and report was made and published in August 2016. In 2017 a second report[10] was published in which a footprint of the whole balance sheet was made over the years 2014, 2015 & 2016. The methodology was also adjusted with this second footprint, based on external and internal methodological and data updates. The method entails both a quantitative and qualitative assessment. At this moment ASN is working together with CDC Biodiversité, ACTIAM and Finance in Motion to establish a common ground for biodiversity footprinting by financial institutions. They will publish a joint paper on this in November 2018.
Key features of methodology	ASN's Biodiversity Footprinting approach is designed to provide an overall biodiversity footprint of the economic activities a financial institution (FI) invests in. The quantitative methodology consists of 3 steps: The first step is to create an overview of the economic activities the FI invests in. This step includes: • A 'definition' of the activities of a company: what is the company producing (in what sectors is the company active?) and where does production take place? • Decisions on the scope of the assessment, like the inclusion of supply chains of companies the FI invests in (included in the ASN Bank approach); • A selection of the investments included in the assessment (all major investments) In the second step the environmental impact of the economic activities of the companies invested in is assessed. The environmental data in the 'Exiobase' input-output database[11] is used to assess what land use, water use, emissions, etc. is linked to the economic activities of the companies. Exiobase takes into account world-wide trade flows between countries and between sectors. In the third step, the ReCiPe methodology is used to calculate the environmental footprint on a midpoint level (e.g. climate change resulting from CO2 emissions) and to calculate the resulting impact on ecosystem quality or biodiversity (endpoint level). This latter step is based on science based 'dose-response' relations (e.g. the effect of a 1 degree temperature rise on biodiversity). This results in an impact on terrestrial biodiversity and an impact on aquatic biodiversity. The unit used to express the impact on biodiversity is PDF.ha.yr, the Potentially Disappeared Fraction of species per hectare (per cubic meter for aquatic biodiversity) per year. The result is then used to calculate the biodiversity footprint in m2 per Euro invested (for each investment category) and the total footprint in m2 for all investments. A qualitative analysis is used to guide the interpretation and the use of the footprint results, looking at (among others) the limitations of the footprinting methodology and the potential influence of the footprint results on investment decisions.

10

11 https://www.exiobase.eu/

NAME:	Biodiversity Footprinting approach ASN bank
	 *Figure 2: Conducting a biodiversity footprint analysis and use of the results*
Metrics	The methodology uses Exiobase for the environmental data and uses ReCiPe to calculate the midpoint and endpoint footprint. The following endpoints / results are used. PDF.m2.yr (for land) and PDF.m3.yr (for water). PDF stands for Potentially Disappeared Fraction of species. This shows the percentage of species lost on 1 m2 or in 1 m3 in one year time. The PDF.m2.yr and PDF.m3.yr can be added up to a PDF.yr or species/yr score (using the average species density on land and in water).
Outcomes based on modelling or real data?	The methodology uses real data from Exiobase to calculate the environmental footprint on a midpoint level and uses dose-response modelling (based on real data) to calculate the biodiversity footprint of economic activities / companies. No primary data (actual data from the companies invested in) are used in this step, only secondary data (sector averages from Exiobase).
Drivers of biodiversity loss	Most important drivers for biodiversity loss are taken into account, including: climate change, terrestrial ecotoxicity, terrestrial acidification, land occupation, land transformation, water use/scarcity, marine ecotoxicity, fresh water eutrophication and fresh water ecotoxicity. Impact drivers not included in the quantitative assessment include the introduction of invasive species and disturbance. A qualitative analysis is used to assess how these drivers might influence the footprint score (this depends on the sectors invested in and the investment criteria used).

Application	• The methodology is suitable for the following applications:
	  ○ Calculating the footprint of a financial asset portfolio, and subsequent portfolio investment decisions by finance sector, as long as it remains at the level of sectors or companies.
	  ○ Development of investment criteria based on insights in the main impact drivers of different asset classes and sectors.
	  ○ Use as a scoping step: to identify biodiversity impact hot spots on a portfolio level, enabling follow-up steps for a selection of investments.
	  ○ Use this footprint of the portfolio /balance sheet to identify hotspots and create a strategy to reach a No Net Loss
	
	• The methodology is less suitable for the following applications:
	  ○ Assessments at site level and project level

Required data	• Data on economic activities of companies invested in. • Exiobase data; the use of other data-sources (like Trucost data) is being explored.

NAME:	Biodiversity Footprinting approach ASN bank
	• Information on biodiversity impact drivers in different sectors to allow for a qualitative analysis guiding interpretation and use of the footprint results.
Granularity level	Method is best suited to get a broad overview and footprint and to determine the hot spots of biodiversity impact in the portfolio /balance sheet.
User friendliness	The methodology is user friendly, but requires the use of impact calculation software fit to deal with the (high number of) input data and the calculation of impacts based on the ReCiPe methodology. Depending on the level of knowledge within the FI using the methodology, expert input may be needed to stay informed of data and methodology updates and to enable a correct interpretation of the footprint results.
Strenghts recognised by initiators	• Scientifically well underpinned • Use of open source and free database (no black box calculations) • The Exiobase input/output model shows trade flows between countries and sectors and therefore allows for a geographical identification of impact hot spots on a country level. • Supported by range of stakeholders (including government, knowledge institutes and NGOs) after stakeholder consultations • Covers most drivers for biodiversity loss. • Location/region specific data can be used when they are/become available. • Scalable to be used by other banks • The ReCiPe methodology takes into account pollution (besides nutrient load and other impact drivers) • The complementary qualitative analysis guides correct interpretation and use
Weaknesses recognised by initiators	• Exiobase limitation (use of sector average data). This weakness is expected to improve and change in time when better data will become available. • Land-use related impacts are biased to temperate regions which means that land-use related impacts will be less accurate for tropical regions. . • Inclusion of location specific characteristics is limited, limiting the methodology's fitness for use on a project level. On a portfolio level, with the aim of identifying biodiversity impact hot spots, this limitation is fine. • Not all drivers of the loss of biodiversity are covered by the ReCipe methodology. For example, the introduction of invasive species and overexploitation are not covered. This limitation is addressed by means of a complementary qualitative analysis, analysing the significance of this limitation and what this means for the interpretation of results.

3.6 THE AGROBIODIVERSITY INDEX (ABD) by Bioversity International

NAME:	THE AGROBIODIVERSITY INDEX (ABD index)
Date of assessment	• First version by Bioversity Int. on August 1, 2018 • First review by EU B&B Platform on 7 August
Actors	**Lead**: Bioversity International **Other**: Clarmondial AG, a Swiss investment advisory company focused on sustainable natural resources investments is a partner for business and finance applications. Bioversity International is a member of the World Benchmarking Alliance platform, which aims to provide information that indicates how companies are contributing to the SDGs and is helping to leverage and harmonize SDG-related monitoring initiatives under development. Several knowledge and data partners contribute to the development of the ABD index including, among others: FAO, the PREDICTS group of the Natural History Museum and the Commonwealth Scientific and Industrial Research Organization (CSIRO). EU DEVCO and Italian Cooperation are pioneering funders.
Process and current position	**Process:** • A feasibility study mapped the demand and specific needs for an Agrobiodiversity Index among food and agriculture companies, institutional investors, governments as well as other index groups. • A review of the scientific literature was published and provides the scientific foundations of the Agrobiodiversity Index, in particular the importance of agrobiodiversity for food system sustainability, healthy and diverse diets, production systems resilience to abiotic and biotic stresses, and for seed systems, agroecological intensification, ecosystem services and conservation. • A first prototype was developed and an online portal created (completed June 28, 2018) (https://www.bioversityinternational.org/abd-index/) • The prototype has been populated with data from existing global databases and from case studies from pioneering companies and countries. This brings, for the first time, several datasets together from an agrobiodiversity perspective. • A sensitivity analysis was performed to assess different ways of aggregating data. • An advisory panel to guide the use and scaling of the ABD index has been established, including relevant experts from business alliances, multi-lateral government bodies, civil society and academics. • Continuous interactions with private and public sector users feed into the design and applications of the ABD index. **Current position:** • The ABD index prototype Version 1 and the related online portal are ready and will be officially launched in November 2018. • A process to continuously strengthen the ABD index, integrate new data and fill specific data gaps, is being set up. • Food and agriculture company and country case studies and applications are being elaborated. The companies represent different actors along the value chain – input suppliers, processors, retailers. The countries represent different continents and agroecological systems. Continuous interactions with private and public sector users feed into the fine-tuning and applications of the ABD index.
Key features of methodology	The ABD Index fills a specific niche – on agricultural biodiversity the foundation of agroecological intensification and food system sustainability, which is fundamental for both food and agricultural companies and countries, to reduce material risks, seize new market opportunities, and make global food systems sustainable. • The focus is on **agricultural biodiversity** at the genetic, species and landscape levels, i.e. the variety and variability of animals, plants and micro-organisms that are **used directly or indirectly for food and agriculture** (FAO definition). This makes the ABD index very **complementary to other metrics or indices that focus primarily on wild**

NAME:	THE AGROBIODIVERSITY INDEX (ABD index)

biodiversity. Research shows many interdependencies and linkages between agrobiodiversity and wild biodiversity. Both wild biodiversity and agrobiodiversity provide multiple ecosystem services that support food production, underpin food security and human well-being. A review for the UN Convention on Biological Diversity of 119 National Biodiversity Strategies and Action Plans shows only 30 percent included actions to conserve and use agrobiodiversity. Considering 38% of land is now farmed and the importance of agrobiodiversity for wild biodiversity and vice versa, the absence of actions to increase and mainstream agrobiodiversity should be a big concern not only for the sustainability of food systems but also for the conservation of wild biodiversity.

- A central premise of the ABD Index is that loss of agrobiodiversity creates material risks for food and agricultural supply chains, for example shocks and long term sustainability of sources of supply in the face of climate change and changing pest and disease loads and reputational risks with investors and consumers prioritizing healthy food from sustainable food systems. By detecting material agrobiodiversity-related risks and opportunities, the ABD Index is intended to motivate food and agriculture companies and public and private investors to mainstream agrobiodiversity in supply chains (e.g. diversified sourcing strategies) and financial instruments (e.g. positive or negative screening).
- The basic structure includes three pillars: **1) diets and markets** seeks to capture to what extent and how food and agriculture companies, countries and projects contribute to ensure food biodiversity for healthy diets. **2) production systems** seeks to capture to what extent and how food and agriculture companies, countries and projects contribute to agricultural diversity for sustainable production. **3) genetic resources** seeks to capture to what extent and how food and agriculture companies, countries and projects contribute to diverse genetic resources for current and future/equal options towards adaptation and innovation.
- The ABD Index relies on three levels of measurement: 1) **commitment:** scores the level of commitment to agrobiodiversity as expressed in publicly available documents; 2) **actions:** scores the performance for a list of agrobiodiversity supporting practices; 3) **status:** the actual measurement of agrobiodiversity in terms of species, varieties, functions and specific landscapes features. To support this, we are building up a spatial layer of georeferenced data points. The evidence base and datasets that feed into this are large and growing.

Metrics

33 indicators feed into the ABD index – each calculated based on a number of actual measurements, of which there are 76 in total at the moment. Some are more accessible for the current version. The colour coding indicates current availability of data.

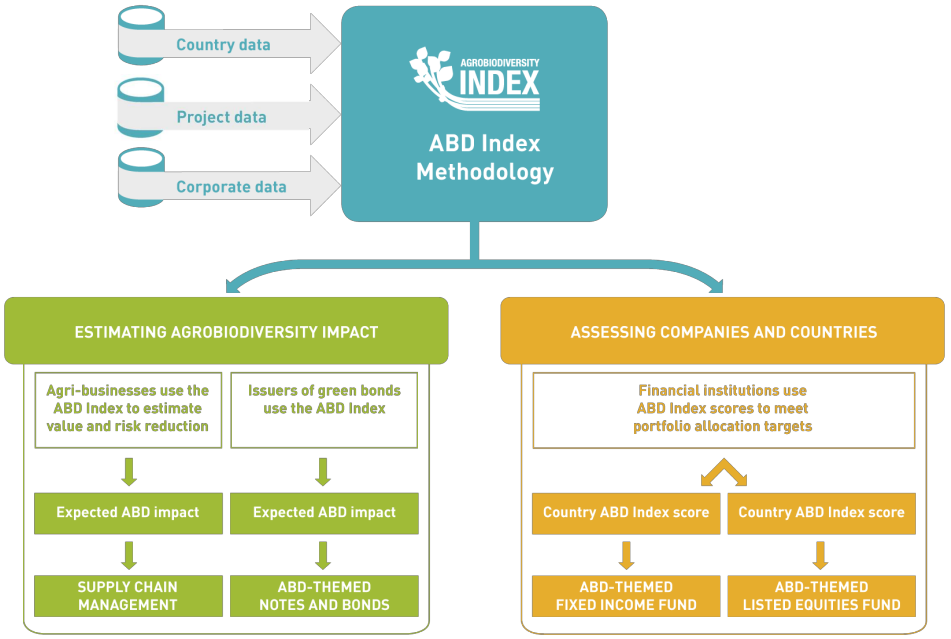
Category	Indicators	Markets & Consumption	Production	Genetic resources	Source
Status 7 indicators	Species diversity	✓	✓	✓	Public and private datasets, evidence-base modelling, remote sensing, crowdsourcing
	Varietal diversity*	✓	✓	✓	
	Functional diversity	✓	✓	✓	
	Underutilized/local species	✓	✓	✓	
	Soil biodiversity		✓		
	Pollinator biodiversity		✓		
	Landscape complexity		✓		
Actions 5 indicators	Consumption practices supporting ABD	✓	✓	✓	Reports, Global datasets
	Avoided negative impacts	✓	✓	✓	
	Favor the maintenance of ABD	✓	✓	✓	
	Enhance use of ABD	✓	✓	✓	
	Supporting GR conservation	✓	✓	✓	
Commitment 21 indicators	Level of commitment based on 21 indicators	✓	✓	✓	Policies, strategies, declarations, etc.

Largely available and feasible | Partially available and needs work | *Not available from secondary sources/prototype stage

Outcomes based on

Primarily based on real data. Soil and pollinator diversity are based on extrapolation through meta-analysis using the PREDICTS model.

NAME:	THE AGROBIODIVERSITY INDEX (ABD index)
modelling or real data?	
Drivers of biodiversity loss	Negative actions and low commitment – see also above.
Application	This diagram shows **various financial applications of the ABD Index**



Impact investing refers to **investments** "made into food and agriculture companies, organizations, and funds with the intention to generate a measurable, beneficial **social** or environmental **impact** alongside a financial return.

We would like to use the ABD Index in conjunction with an impact investment vehicle – not only does the ABD Index provide a measure that addresses about half of the SDGs, both social and environmental, the Index also works in the realms of business risk and opportunity.

Imagine 3 categories of data feed in the methodology: country level, project or brand level and corporate data.

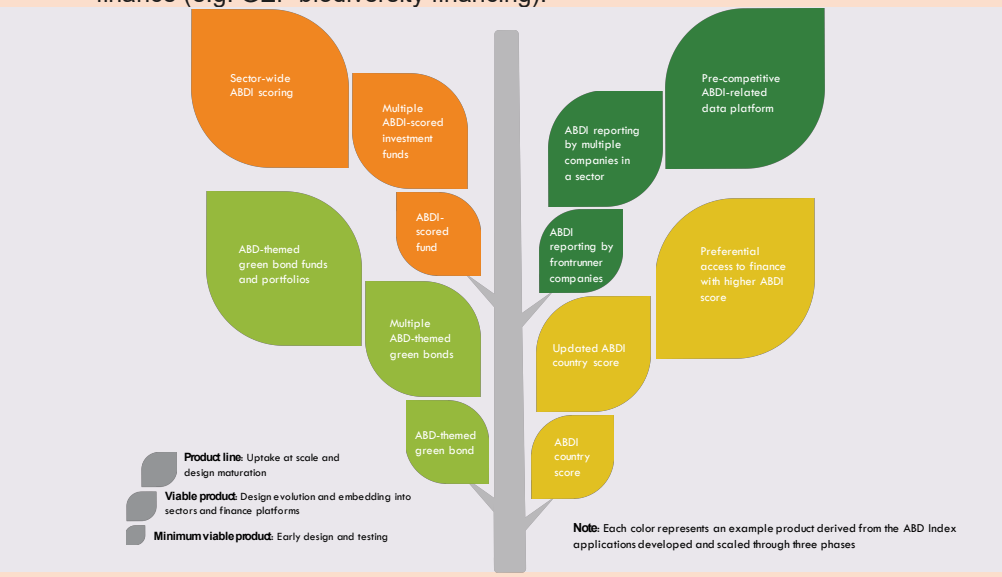
These are treated in 2 buckets: one bucket is for brands and projects (GREEN in above diagram, the left hand column) and concerns ABD performance compared to business as usual. This provides powerful information for supply chain management and the issuance of public or private notes and bonds.

The other bucket (ORANGE in above diagram, the right hand column) is for regularly updated scoring or assessment of countries and corporations, which allows portfolio allocations in fixed income funds and listed equities funds.

The intent of both buckets is to drive financing into projects, brands, country and corporate actions and commitments that improve the STATUS of agrobiodiversity.

Longer term applications

Trillions of euros and dollars are invested in food and agriculture every year. The ABD Index aims to empower public and private decision-makers to sustainably transform what we grow, eat, and conserve. To achieve this vision, the top global 100 food and agriculture companies and 25 representative countries will be rated. Near-term pioneer projects will scale up to a commercially viable product in broad use across the global food system through a series of interim accomplishments. Some examples include:

NAME:	THE AGROBIODIVERSITY INDEX (ABD index)
	• Partnering with a commercial agricultural lender to develop an ABD Index score for their loan portfolio could stimulate ABD Index scoring and reporting by multiple agricultural lenders, eventually enabling sector-wide ABD Index reporting. • Advising a company on its internal ABD Index monitoring system and agrobiodiversity enhancement in its value chain strategy could, if successful, encourage similar endeavours by multiple companies in a sector or region. If material benefits are observed, this could lead to development of an ABD Index-related data platform by several frontrunner companies in a sector or region. • Successful issuance of an ABD Index-scored green bond (e.g. in partnership with a development finance institution) could lead to additional ABDI-scored green bonds within a region or sector and further to development of an investment fund of ABDI-scored bonds. • Development of an ABD Index country score (e.g. in partnership with the Global Environment Facility) could provide the foundation for developing ABD Index scores for multiple countries (e.g. GEF clients) in a region, eventually enabling countries with higher or improved ABDI score to gain preferential access to sustainability finance (e.g. GEF biodiversity financing). 
Required data	Three types of data feed into the ABD Index: • Publicly available reports, strategies, policies, product information • Privately shared information on geospatial location of activities • Global geospatial datasets and other global datasets.
Granularity level	• Granularity varies for specific indicators that feed into the Index; but the Index as a whole is calculated at project, company or country level.
User friendliness	• The ABD Index brings a wide variety of data together in order to make the information that those data provide, more actionable and usable by companies, countries and investors. • The online portal presents the data in simple graphics and also allows deeper dives into details where of interest.
Strengths recognised by initiators	• The focus on **agro**biodiversity, being very complementary to indices that focus on wild biodiversity and contributing also directly to better identify and manage **operational risks** – related to low agrobiodiversity, alongside reputational risk. • The food system approach of the ABD Index, i.e. including three connected pillars: diversity in markets and consumption for healthy diets, diversity in production systems for sustainable agriculture, and diversity in genetic resources for current and future options.

NAME:	THE AGROBIODIVERSITY INDEX (ABD index)
	• The architecture that includes commitments, actions and status, allowing identification of where change is needed/ possible. • The relatively low need for data input since most information is coming from publicly available documents and datasets.
Weaknesses recognised by initiators	• Specific data gaps, particularly varietal diversity – identified as a critical aspect to make progress on. • The limited quality or resolution of some secondary databases – identified as a critical aspect to make progress on. • The aggregated ABD Index can be presented and communicated in a relatively simple way but the underlying measurements and indicators are quite complex.

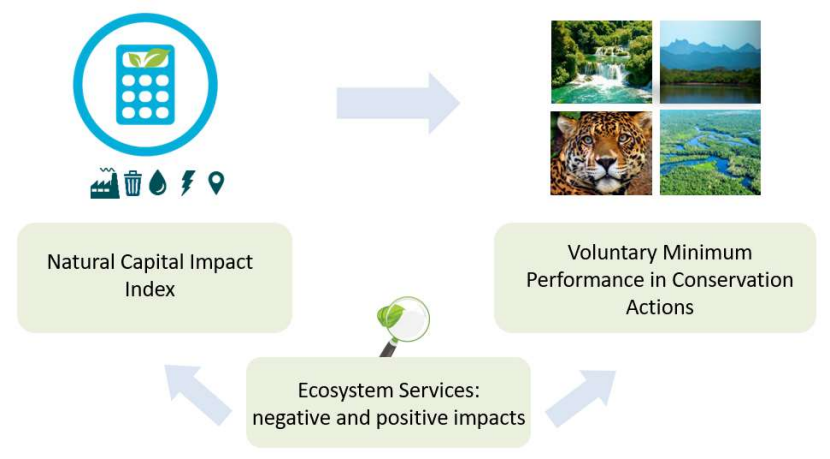
3.7 BIODIVERSITY FOOTPRINT CALCULATOR (PLANSUP)

NAME:	
Date of assessment	30 August 2018 (description by EU B&B Platform, based on information available on internet)
Actors	**Lead**: This calculator was made by Plansup in collaboration with Saxion. **Other**:
Process and current position	Operational. The research of the underlying methodology and the development of the calculator was carried out with public money and therefore the calculator is fully accessible and free of charge. It is expected that the tool will be improved in the future on the basis of additional research.
Key features of methodology	***A free calculation tool to assess both current and future biodiversity footprint of a company's product at the landscape level. With the tool companies can test the effectiveness of presumed biodiversity friendly measures.*** With the help of this tool, companies have an opportunity to calculate their biodiversity footprint online. The tool is based on dose response relationships of two pressure factors from the GLOBIO methodology and therefore it gives only an indication of the generic impact on biodiversity. This tool calculates the biodiversity impact of a company's supply chain, production process and transport that can be related to one or more products. With the calculator it is possible to calculate the biodiversity footprint for multiple scenarios. It is recommended to use the first scenario to describe the current situation and to use subsequent scenarios to describe all kinds of biodiversity friendly measures that are expected to change the footprint in the near future. More information can be found on http://www.plansup.nl/biodiversity-footprint-calculator/ The methodology used in this calculator is based on the Biodiversity Footprint methodology (see http://www.plansup.nl/expertise/biodiversity-footprint/), developed by Plansup in collaboration with Wageningen Environmental Research (Alterra). The calculator is a limited version of the full Biodiversity Footprint method and focuses on the impact of the two most important pressure types on biodiversity: Land use and Green House Gas emissions. The impact is calculated for three parts of the value chain: Raw materials (/suppliers), Production process, and Transport. The Biodiversity Footprint methodology has a broader application. It calculates the biodiversity footprint of a company or product, both for a current and alternative or future situation, to assess changes in impact and effectiveness of mitigation and pro-biodiversity actions, and takes into account 4 pressure factors: Land use, Greenhouse gas emissions, Water use, and Nitrogen and Phosphorus emissions to water.
Metrics	The indicator combines the area of impact with the impact on the quality of biodiversity ('naturalness') in the impacted area, expressed in MSA.ha.
Outcomes based on modelling or real data?	Modeling
Drivers of biodiversity loss	Land use and Green House Gas emissions
Application	Calculation of biodiversity impact of a company's supply chain, production process and transport that can be related to one or more products. Multiple scenarios can be calculated (application of measures).
Required data	Company data (pressures, location) and GLOBIO data
Granularity level	No information yet

NAME:	
User friendliness	No information yet
Strengths recognised by initiators	No information yet
Weaknesses recognised by initiators	No information yet

3.8 BIODIVERSITY ESTIMATED IMPACT VALUE (BEIV) (by LIFE INSTITUTE)

NAME:	LIFE METHODOLOGY / LIFE CERTIFICATION
Date of assessment	• 20/08/2018
Actors	**Lead**: LIFE Institute LIFE Institute is a non-profit organization headquartered in Brazil who operates internationally to the development and implementation of LIFE Methodology and its environmental managements tools. LIFE Institute is also responsible for the operationalization of LIFE Certification System and the accreditation of independent Certifying Bodies. **Other**: LIFE Permanent Technical Committee Committee composed by representatives of various organizations from different sectors: business, civil society and academia, as well as environmental government agencies. Technical Committee members voluntarily contribute to the development and promotion of LIFE initiative.
Process and current position	LIFE Methodology is an international tool developed by LIFE Institute, which guides and recognizes businesses organizations that promote effective Natural Capital conservation actions contributing to the maintenance of Biodiversity and Ecosystem Services. LIFE Methodology helps organizations in identifying their impacts and designing a strategic plan to reduce, mitigate and compensate them, including a specific approach to reduce impacts in the supply chain. LIFE's main objective is to disseminate and scale-up Natural Capital conservation and to contribute to make production practices more sustainable. LIFE Methodology was designed as a practical and pragmatic tool to be applied in companies of any size and sector, adaptable to every country. LIFE Methodology can be used both as an **Environmental Management System** (LIFE Key Software) and as a **third-party Certification Scheme**. The initiative is currently operational in Brazil and Paraguay, with an expansion plan in execution in Latin America and Europe. Some 28 companies/ organizations are LIFE users and/ or have carried out technical projects to improve their environmental performance based on LIFE Methodology. In Brazil, 5 companies are already LIFE Certified, as well as 1 company in Paraguay. LIFE is aligned with the Convention on Biological Diversity (CBD) and its Aichi targets as well as other international organizations and initiatives. More information about LIFE initiative and all technical documents can be found under https://institutolife.org/en
Key features of methodology	The Methodology is composed of **complementary quantitative and qualitative approaches** for a more comprehensive and complete impact/performance analysis; together with a more effective design of an action plan focused on concrete results. A LIFE company is mainly committed to: • Identify, measure, monitor and reduce impacts on Natural Capital and implement a voluntary action plan for the conservation of Biodiversity and Ecosystem Services consistent with the identified impacts;

NAME:	LIFE METHODOLOGY / LIFE CERTIFICATION
	• Improve its environmental management (based on LIFE management indicators) and implement a purchasing policy to avoid/ reduce impacts on biodiversity in the supply chain. LIFE guidelines and main points of intervention are: • **Environmental Management:** LIFE policies and reference documents, LIFE management indicators • **Impacts analysis:** calculation of LIFE Impact Index on Natural Capital, performance of an impact assessment on Biodiversity and Ecosystem Services • **Conservation actions:** Scoring of all conservation actions already implemented and/ or development of an action plan focused on Biodiversity and Ecosystem services
Metrics	The quantitative approach is based on the calculation of an **Impact Index on Natural Capital** and consequent definition of a **Minimum Score in positive Conservation Actions**. consistent with the calculated impact. These **calculations are automatically performed by LIFE Software (LIFE Key)** once the requested data are provided. This analysis is complemented with the use of LIFE Matrix of Impacts on Biodiversity and Ecosystem Services, resulting from the company's operations. This module helps the identification/ analysis of business impacts as well as the dependencies, risks and opportunities related to them.  **<u>Natural Capital Impact Index</u>** The calculation of LIFE Natural Capital Impact Index is based on selected environmental aspects that can be measured (or estimated) by any type of company: **Waste generation, GHG emission, Water consumption, Energy use** and the **Area occupied** by the operations. The impact of each one of these aspects is calculated in terms of **quantity and severity** (see picture below). A company fulfills the requested data and the system calculates **the resulting impact index for each aspect, as well as a final average impact index**. To this end, LIFE software must be customized by country and fed with all national Natural Capital information required to the calculations. Data is obtained from national official documents and national bodies/ agencies (or internationally recognized organizations). Some examples of required information are:

NAME:	LIFE METHODOLOGY / LIFE CERTIFICATION

total GHG country emissions, total waste generated, energy and water consumed in the country per year, water availability per region, hierarchy of fragile and threatened ecoregions.

Index calculations are adjusted considering the maximum values known (per company) in the country, and are presented in a customized scale.

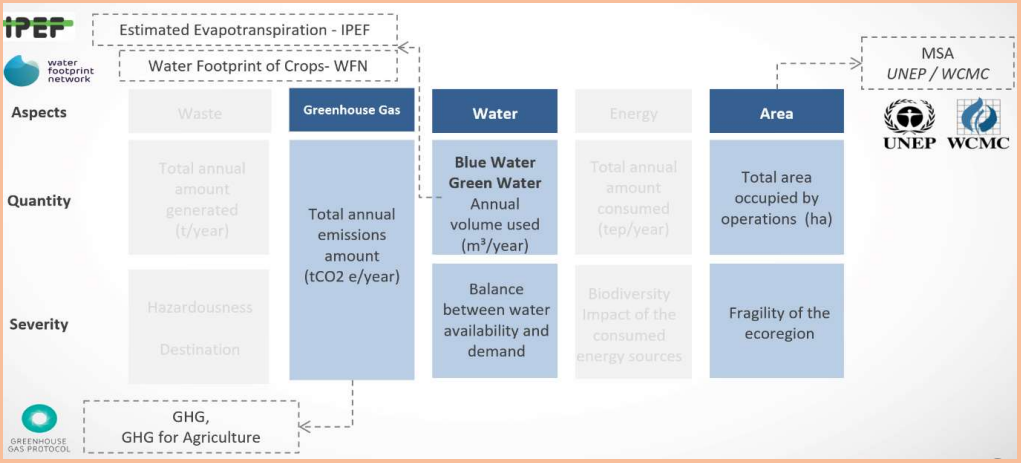
Aspects	Waste	Greenhouse Gas	Water	Energy	Area
Quantity	Total annual amount generated (t/year)	Total annual emissions amount (tCO_2 e/year)	Annual volume used (m^3/year)	Total annual amount consumed (tep/year)	Total area occupied by operations (ha)
Severity	Hazardousness Destination		Balance between water availability and demand	Impact of the consumed energy sources	Fragility of the ecoregion

Specificities of the Impact Index calculation

Some recognized tools are used for the estimation of few aspects that companies cannot directly measure (specific scientific studies on estimations can also be used):

- Water Footprint Network
- GHG Protocol and GHG Protocol Agricultural Guidance
- Regional evapotranspiration of forest plantations estimation (water withdrawn from the natural system)

In addition, the MSA (Mean Species Abundance) GLOBIO index is applied to better analyse biodiversity in the area occupied by the company.



Minimum Performance in Conservation Actions

NAME:	LIFE METHODOLOGY / LIFE CERTIFICATION
	LIFE tool calculates a **Minimum Performance in Conservation Actions** for the voluntary compensation of residual impacts. Calculation of the minimum performance scoring considers the above-mentioned Impact Index. Scoring points obtained by means of conservation actions are defined according to an established list of **actions/ projects, hierarchically ranked according to national priorities for conservation**. The scoring hierarchy system focuses on projects providing more concrete and effective results, considering technical qualifiers, indicators and the duration of the action. The results indicators define minimal monitoring priorities that capture changes in Biodiversity and Ecosystems *Composition, Structure and Function.* The calculation of a minimum positive performance in conservation is a parameter for: • Analysing the adequacy of positive actions already implemented by the company and/ or • Establishing an Action Plan for the Conservation of Biodiversity and Ecosystem Services and /or • Meet a LIFE Certification requirement
Outcomes based on modelling or real data?	Hybrid. In most cases data are real and updated annually. Exceptionally, when real data are not available, estimations can be used and should be replaced over time by actual monitoring data.
Drivers of biodiversity loss	Drivers of biodiversity loss include: land conversion, fragmentation, climate change, pollution, large environmental disturbances. Drivers have been added to the methodology as a result of LIFE continuous improvement.
Application	LIFE Methodology can be used both as an **Environmental Management System** and/ or as a **Certification Scheme**. It applies to companies and organizations of all sizes and sectors, considering a **site assessment approach** taking into consideration the scope of the company's management responsibility as well as the place(s) where conservation actions are implemented. The methodology also contains specific guidelines for reducing supply chain impacts. The site to be analysed is defined by the company. LIFE can be used to assess an entire group/ holding, a specific brand/ company department or a business unit. LIFE Methodology/Software must be fed with national data prior to its use. • **LIFE Management System** Using LIFE Key software, the company can access the complete methodology or specific modules that it deems relevant. In this case, the company is considered as a *LIFE user.* • **LIFE Certification** A company that complies with LIFE indicators and achieves the Minimum Performance in Conservation Actions may request a third-party audit to obtain LIFE Certification. Certification Bodies must be accredited by LIFE Institute. All documents are available on LIFE website. Main technical documents are: LIFE Standards (Qualitative assessment: environmental management indicators) LIFE Technical Guide 01 (Calculation of the impact index) LIFE Technical Guide 02 (Scoring system for conservation actions) **Note: The evaluation of impacts on biodiversity and ecosystem services module is not yet available online**

NAME:	LIFE METHODOLOGY / LIFE CERTIFICATION
Required data	**Company data:** • Sector of activity, business structure, unit (site) selected for the methodology application, identification/ location information, annual income **Environmental Information:** • Waste - type of waste, destination and annual quantity generated • Gas - gases emitted, GHG Protocol scope (1,2,3), annual quantity emitted • Water – type of water source, annual amount consumed • Energy - energy source, annual quantity consumed • Area - ecoregion, type of land occupation (agriculture, built area, etc.), area size **Environmental projects and conservation actions** carried on • Type of action (according to LIFE Methodology) • Ecoregion • Purpose of the action • Description of the action • Initial and final date • LIFE qualifiers and indicators attended **Impacts analysis – Biodiversity and Ecosystem Services** • Processes, activities and their resulting impacts, affected ecosystem services, dependencies, risks and opportunities (the completion of the matrix is guided by options lists and orientations provided by the tool)
Granularity level	Business unit scaled to the country
User friendliness	• Is it easy to use by non-experts or does it require specialist knowledge? LIFE Key software Is easy to use by non-experts and does not require specialist knowledge. A quick training is recommended for a better understanding of the tool. However, a specialist can help to refine and detail the analysis and the elaboration of the action plan. Software accessible via the Internet. Navigation based on Windows and Office templates. • What are the required time efforts? Efforts depend on the level of detail sought, especially in relation to conservation projects and action plan. The first full and detailed assessment should take a few months and annual updates are much quicker. The different modules of the methodology can be used separately for specific evaluations. • Does it require a similar approach as other environmental issues or is it very specific? LIFE is not a sectoral specific methodology. Some tools and scientific studies are used as part of LIFE calculations: Water Footprint Network; GHG Protocol and GHG Protocol Agricultural Guidance; regional evapotranspiration of forest plantations studies. MSA (Mean Species Abundance) GLOBIO index is applied to better analyse biodiversity in the area occupied by the company.
Strenghts recognised by initiators	• Focused on Biodiversity and Ecosystem Services conservation • Pragmatic tool applicable to organizations of any size and sector • Complementarity between qualitative and quantitative approaches • Designing of strategic conservation plan scenarios • Measures, evaluates, monitors and compares business positive and negative impacts • Enables comparability between companies, business units and sectors

NAME:	LIFE METHODOLOGY / LIFE CERTIFICATION
	• Issues executive and detailed reports for clear and transparent results communication to different stakeholders • Possibility of recognition by third-party Certification • Strategic orientation to assure investment return in conservation by focusing on concrete actions proven to contribute to Biodiversity and Ecosystem Services conservation
Weaknesses recognised by initiators	• Need for prior adaptation by country • Visibility of returns on investment (business as usual perspective) • Scaling-up pace • Still to be developed a financial valuation module (negative/ positive impacts and dependencies on ES)

3.9 BIOSCOPE (by Platform BEE, Dutch Ministry)

NAME:	BIOSCOPE
Date of assessment	30 August 2018 (assessment by EU B&B Platform, based on information on internet)
Actors	**Lead**: BioScope has been developed by PRé Sustainability, Arcadis and CODE, commissioned by Platform BEE (Biodiversity, Ecosystems and Economy); a collaboration between IUCN NL and VNO-NCW financed by the Dutch ministry of economic affairs.
Process and current position	Operational
Key features of methodology	BioScope provides businesses with a simple and fast indication of the most important impacts on biodiversity arising from their **supply chain**. The results brought by BioScope are aimed at helping you to formulate meaningful actions to further assess and reduce the impact of your business on biodiversity. It not only indicates the **potential impact of the commodity you purchase, but also of the upstream supply chain of these commodities**. BioScope makes use of Exiobase v2.2 enabling you to select commodities and resources purchased from 170 sectors in 43 countries (27 EU countries and all large economies outside the EU), covering the largest part of global economic activities. The resulting impacts on biodiversity are calculated with the ReCiPe method, which was specially adapted for BioScope. More info can be found in the Methodological Guidance, see https://www.bioscope.info/uploads/bioscope.info/bee_downloads/9/file/Methodology_Report_v1.compressed.pdf
Metrics	PDF.m2.yr (for land) and PDF.m3.yr (for water). PDF stands for Potentially Disappeared Fraction of species.
Outcomes based on modelling or real data?	Modeling
Drivers of biodiversity loss	Most important drivers for biodiversity loss are taken into account, including: climate change, terrestrial ecotoxicity, terrestrial acidification, land occupation, land transformation, water use/scarcity, marine ecotoxicity, fresh water eutrophication and fresh water ecotoxicity. Impact drivers not included in the quantitative assessment include the introduction of invasive species and disturbance.
Application	Supply chain decisions. Examples of questions which can be answered are: • Which of the commodities purchased by my business could be the largest cause of impact on biodiversity? • What could the new purchasing strategy of my business mean for our impact on biodiversity? • What commodity purchased by my business do we need to focus on if we want to make a meaningful contribution to conservation of biodiversity? In which regions are these impacts localized?
Required data	An inventory of commodities used in a given supply chain; this is done by specifying the expenditure per commodity for each stage. A biodiversity impact mode (ReCiPe), which will translate these regionalized economical activities to meaningful indicators that describe their influence with regard to each of the impact drivers
Granularity level	Parcel level

NAME:	BIOSCOPE
User friendliness	Very user friendly (see Quick Start Guide https://www.bioscope.info/uploads/bioscope.info/bee_downloads/8/file/User's_quick_start_v1.pdf
Strenghts recognised by initiators	Strenghts and limitations of underlying Exiobase and ReCiPe models.
Weaknesses recognised by initiators	

3.10 BIODIVERSITY RETURN ON INVESTMENT METRIC (by IUCN)

NAME:	Biodiversity Return on Investment Metric (BRIM)
Date of assessment	• 29 August 2018
Actors	**Lead**: IUCN **Other**: Vulcan Inc; The Biodiversity Consultancy; BirdLife International
Process and current position	Technical approach and methodology developed during 2017 through a series of consultative workshops and a research program. Methodology under road test in two field situations- Sumatra and Nicaragua. Process underway to submit manuscript of methodology and lessons learned from road-test in peer-reviewed journal by end 2018.
Key features of methodology	• **BRIM measures the change in risk of species extinction attributable to investment** • Investment can change the scale and impact of the processes that cause species to be at risk of extinction- deforestation, over-exploitation • Based on the IUCN Red List of Threatened Species – the global standard for documenting species' conservation status • Based on quantitative categories and criteria – not expert opinion • Incorporates compilation of data on range, habitats, threats, etc – not just a list
Metrics	• A fully additive and scaleable metric, from pixel to global, or across sites in a portfolio • BRIM allows comparison across investment targets – a change in value in one place is directly comparable to a change somewhere else on the planet • Responsive at the pace of investors; changes in management can quickly cause changes in pressures affecting species

Outcomes based on modelling or real data?	• Based on the IUCN Red List of Threatened Species – the global standard for documenting species' conservation status
	  • Based on quantitative categories and criteria – not expert opinion
	  • Incorporates compilation of data on range, habitats, threats, etc – not just a list

Drivers of biodiversity loss	Based on the IUCN/Conservation Measures Partnership (CMP) Unified Classification of Direct Threats.
Application	• **Bank**: Screening of potential biodiversity ROI across a portfolio (for instance, investments in a particular company value chain, for a site-based commodity) • **National Government**: National baseline of potential for species extinction reduction, establishment of SDG 14 target and progress measures towards target (contribution to change in Red List Index) • **Conservation project investor**: ex-ante evaluation of project potential to reduce risk of species extinction; identification of priority management actions; ex-post progress towards target • **Company**: assessment of potential for species extinction risk reduction across corporate footprint (mine sites, plantations, landscape restoration) •
Required data	• Species range maps or maps of Extent of Suitable Habitat from the IUCN Red List of Species • Threat status and threats applying to species from the IUCN Red List of Species (complemented by information from the Key Biodiversity Areas dataset) • Polygon of investment intervention is needed (site, protected area, country, landscape, land-use unit) • Site- or country-based measures require bespoke assessments using GIS applications and integration of threat and landuse layers •
Granularity level	Measurable at any scale from pixel to global. Additive and scalable, and comparable globally, so that changes in BRIM in two sites in different parts of the world are directly comparable

NAME:	Biodiversity Return on Investment Metric (BRIM)
User friendliness	• Is it easy to use by non-experts or does it require specialist knowledge? The methodology can be interpreted by non-experts and recommendations made to managers based on results of assessments Site- or country-based assessments require bespoke assessments using GIS applications and integration of threat and landuse layers, by technicians familiar with the IUCN Red List of Species • What are the required time efforts? Under assessment • Does it require a similar approach as other environmental issues or is it very specific? Species are the best known component of biodiversity Their status has been evaluated in a scientifically consistent, multi-stakeholder, global process (the IUCN Red List of Species) The presence of threatened species in a site or habitat is an indication that the ecosystem is under pressure Habitats or ecosystems with many threatened species are likely to be at a greater risk of collapse Ecosystem collapse will cause significant harm to people and economies **investing in reducing the risk of species extinctions is an efficient way to maintain ecosystem benefits to people**
Strenghts recognised by initiators	• It can help the finance industry and investors target their investments to achieve conservation outcomes • BRIM can enable investors and governments to track conservation gains • BRIM can measure the contributions these investments make to global targets such as the Sustainable Development Goals, as it can be used to track progress towards changes in the Red List Index • Based on the IUCN Red List of Threatened Species – the global standard for documenting species' conservation status • Based on quantitative categories and criteria – not expert opinion • Incorporates compilation of data on range, habitats, threats, etc – not just a list • BRIM allows comparison across investment targets – a change in value in one place is directly comparable to a change somewhere else on the planet • A fully additive and scaleable metric, from pixel to global, or across sites in a portfolio • Responsive at the pace of investors- changes in management can quickly cause changes in pressures affecting species • The BRIM can measure ex-ante (potential) and ex-post (achieved) impacts of investments at a range of scales and over a range of timeframes. • It can complement conventional measures of financial ROI
Weaknesses recognised by initiators	• Not all species are adequately scored for extent and intensity of threat- full calculation of BRIM will require assessment for some or many species • Not all taxa are comprehensively assessed (some species have not been evaluated at all, coverage in some ecosystems, such as marine and freshwater, is incomplete) • Application at site scale requires some data gathering and complementary information • Measurement of ex-post BRIM requires identification of linkages between investment and changes in correlates of population (for instance changes in Extent of Suitable Habitat)

4 ANALYSIS OF ASSESSMENTS

The following tables list the elements of certain key features in a concise form that we consider vital for enhancing the transparency, understanding the approaches and for an initial comparative analysis. They may be the basis for a more thorough analysis later on.

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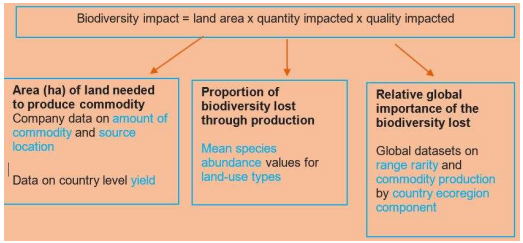
Table 3: Key features of assessed initiatives on biodiversity metrics for business

	State of art	Sectors	Metric	Key elements of methodology	Real data or modeling	Which data
1. Global Biodiversity Score	Full development by 2020. Operational relevance being tested.	All sectors, including FI	Mean species abundance (**MSA**) and its surface area equivalent, i.e., **km² MSA**	Two-step process: 1. Quantitative assessment of pressures caused by specific economic activities on biodiversity; value chain analysis based on Exiobase matrix-based input-output model and direct data on pressures when available. 2. Estimation of impacts of these pressures on ecosystems; this relies on the GLOBIO model which is based on pressure-impact relationships. GLOBIO includes land conversion, fragmentation, encroachment, atmospheric N deposition (eutrophication) and climate change for terrestrial biodiversity, and wetlands conversion, local and network land-use in catchment of wetlands, hydrological disturbance of wetlands and rivers, land-use in catchment of rivers and eutrophication of lakes for aquatic biodiversity. Missing drivers will be added to GLOBIO through future developments	Hybrid. Real data on pressures can be included. When very detailed ecological monitoring data are available, the mean species abundance might be directly calculated.	• **Economic activity** data: turnover by country and industry (of the company assessed or of the company a financial institution invested in); • **Pressure** data: - Carbon emissions on scope 1, 2 and 3 - Land use changes (ideally using a 13 habitat types nomenclature including different use intensity for forests, grasslands, agriculture, etc.) • Comprehensive **biodiversity** direct data
2. Biodiversity Impact Metric	Pilot testing of beta version.	Particularly for MNCs that source	The Biodiversity Impact Metric	The methodology is focused on measuring the impacts of raw material production, or land	Hybrid.	Company land area Proportion of biodiversity lost

	State of art	Sectors	Metric	Key elements of methodology	Real data or modeling	Which data
	Extending the possibilities in the future.	hundreds of different raw materials from across the planet	is *quantifiable* measure that can be used to *assess* and *track* the impact of a company's *land use* activities on biodiversity in a *given area*.	use, in global supply chains. The basic framework for the metric is as follows:  The various components in the metric are assessed at the eco region level. Metric results are calculated at the scale of Country Ecoregion Component and then aggregated to produce a national score for different commodities.		(MSA coefficients for different land uses and management intensities) The importance of a location for biodiversity, based on range rarity scores (underpinned by IUCN Red List data)
3. Biodiversity Indicators for Extractive Companies	Under development	Extractive industries (O&G, mining)	Set of site level indicators, allowing aggregation at corporate level (to be developed). It was decided that a single metric may not provide the necessary resolution, flexibility or information to meet the indicator needs of the	A three stage process is suggested for indicator development: 1. First stage: **screening of the company's portfolio of operations to identify sites with potentially high biodiversity sensitivity**, based on globally and locally available data sets combined with site validation to identify sensitive sites for prioritisation of reporting effort; 2. Second stage: **development of site level biodiversity indicators using the state-pressure-response (SPR) framework** (a widely accepted organising framework for biodiversity management and monitoring), informed by the stage above and based on site level data and documentation for high	It is intended that the approach uses real data, but modelled/ estimated data may also be used. This will be explored within the piloting process	Red List species range rarity layer - 1x1km resolution (IUCN). Available through IBAT as of January 2019 Global Critical Habitat screening layer (UNEP-WCMC). Available through IBAT as of January 2019 Polygon-based - World Database on Protected Areas (IUCN and UNEP-WCMC). Available through IBAT

	State of art	Sectors	Metric	Key elements of methodology	Real data or modeling	Which data
			extractive sector.	sensitivity sites collected as part of the environmental impact assessment; and 3. Third stage: **aggregation of scores for SPR** at site level up to business unit, division, and corporate level to provide insight into performance on the ground.		
4. **Product Biodiversity Footprint**	Pilot phase. Further improvements in 2018/2019	All industries	Potential disappeared fraction of species within a year, or PDF*yr (frequently used in LCA methodologies)	The main objective of the project is to improve the biodiversity performance of a product by identifying biodiversity hotspots that can be improved and support eco-design approaches. The LCA framework is used to calculate **the relative differences between the variants of a product**. In the long term, it will also allow to compare different products or different sectors at larger scales. The methodology is based on 3 modules - **Module 1** computes **lifecycle impact assessment**, with spatial differentiation for the main impact categories evaluated. Characterization factors used for computation are the ones currently available in published LCA methodologies (LC Impact). This first module enables the user to visualize the hotspots of the product footprint both geographically and along the whole value chain. - **Module 2** treats specific information regarding the practices and the local context, that would enable to adjust impact computations based on information entered by the users. The development of	Hybrid approach, based on modelling and real data	LCI Data (EcoInvent, Agribalyse, …) Biodiversity database (IUCN, IBAT, Predicts, …) Data provided by company on biodiversity measures

	State of art	Sectors	Metric	Key elements of methodology	Real data or modeling	Which data
				criteria and rules to quantify the changes in impact computations are defined per type of land use (e.g. arable crops, perennial crops, grassland, mining, forest, urban….) and/or per sector (livestock, transport, electricity, construction….). Results of module 2, additionally to the results of the Module 1, enable the user to visualize and quantify the benefits of a chosen practice/location, and compare various scenarios for a given product. - **Module 3** assesses qualitatively 2 aspects that are not part of any LCA model, namely 'invasive species' and 'species management', this last one encompassing 'overexploitation', but going beyond as it also includes positive actions (e.g. installation of pollinators, use of various breeds, follow up of endangered species…).		
5. **ASN Biodiversity Footprint approach**	Developed and being applied for 2 years now	FI, covering investments in all sectors	PDF.m2.yr (for land) and PDF.m3.yr (for water). PDF stands for Potentially Disappeared Fraction of species. The PDF.m2.yr and PDF.m3.yr	The **quantitative** methodology consists of 3 steps: The first step is to create an overview of the economic activities the FI invests in. This step includes: • A 'definition' of the activities of a company: what is the company producing (in what sectors is the company active?) and where does production take place? • Decisions on the scope of the assessment (supply chains included or not);	Real data from Exiobase to calculate the environmental footprint on a midpoint level and dose-response modelling to calculate the	Data on economic activities of companies invested in. Exiobase data; the use of other data-sources (like Trucost data) is being explored. Information on biodiversity impact

State of art	Sectors	Metric	Key elements of methodology	Real data or modeling	Which data
		can be added up to a PDF.yr or species/yr score (using the average species density on land and in water).	• A selection of the investments included in the assessment (all major investments) In the second step the environmental impact of the economic activities of the companies invested in is assessed. The environmental data in the 'Exiobase' input-output database[12] is used to assess what land use, water use, emissions, etc. is linked to the economic activities of the companies. Exiobase takes into account world-wide trade flows between countries and between sectors. In the third step, the ReCiPe methodology is used to calculate the environmental footprint on a midpoint level (e.g. climate change resulting from CO2 emissions) and to calculate the resulting impact on ecosystem quality or biodiversity (endpoint level). This latter step is based on science based 'dose-response' relations (e.g. the effect of a 1 degree temperature rise on biodiversity). This results in an impact on terrestrial biodiversity and an impact on aquatic biodiversity. The result is then used to calculate the biodiversity footprint in m2 per Euro invested (for each investment category) and the total footprint in m2 for all investments. A **qualitative** analysis is used to guide the interpretation and the use of the footprint results, looking at (among others) the limitations of the footprinting methodology and	biodiversity footprint of economic activities / companies. No primary data (actual data from the companies invested in) are used in this step, only secondary data (sector averages from Exiobase).	drivers in different sectors to allow for a qualitative analysis guiding interpretation and use of the footprint results

[12] https://www.exiobase.eu/

	State of art	Sectors	Metric	Key elements of methodology	Real data or modeling	Which data
				the potential influence of the footprint results on investment decisions.		
6. **Agrobiodiversity Index (ABD)**	prototype Version 1. Elaboration of case studies and continuous fine-tuning	Agro-industry	ABD Index based on 33 indicators. Although only a few indicators relate to wild biodiversity, the index could be considered as a proxy-indicator for wild biodiversity.	The focus is on **agricultural biodiversity** at the genetic, species and landscape levels, i.e. the variety and variability of animals, plants and micro-organisms that are **used directly or indirectly for food and agriculture** (FAO definition). This makes the ABD index very **complementary to other metrics or indices that focus primarily on wild biodiversity**. The basic structure includes three pillars: **1) diets and markets** seeks to capture to what extent and how food and agriculture companies, countries and projects contribute to ensure food biodiversity for healthy diets. **2) production systems** seeks to capture to what extent and how food and agriculture companies, countries and projects contribute to agricultural diversity for sustainable production. **3) genetic resources** seeks to capture to what extent and how food and agriculture companies, countries and projects contribute to diverse genetic resources for current and future/equal options towards adaptation and innovation. The ABD Index relies on three levels of measurement: 1) **commitment:** scores the level of commitment to agrobiodiversity as expressed in publicly available documents; 2) **actions:** scores the performance for a list of agrobiodiversity supporting practices; 3) **status:** the actual measurement of agrobiodiversity in terms of species, varieties, functions and specific landscapes features.	Primarily based on real data. Soil and pollinator diversity are based on extrapolation through meta-analysis using the PREDICTS model.	Three types of data feed into the ABD Index: - Publicly available reports, strategies, policies, product information - Privately shared information on geospatial location of activities - Global geospatial datasets and other global datasets

	State of art	Sectors	Metric	Key elements of methodology	Real data or modeling	Which data
7. **Biodiversity Footprint Calculator**	Operational	All sectors	MSA.ha (Mean Species Abundance)	**A free calculation tool to assess both current and future biodiversity footprint of a company's product at the landscape level. With the tool companies can test the effectiveness of presumed biodiversity friendly measures.** With the help of this tool, companies have an opportunity to calculate their biodiversity footprint online. The tool is based on dose response relationships of two pressure factors from the GLOBIO methodology and therefore it gives only an indication of the generic impact on biodiversity. This tool calculates the biodiversity impact of a company's supply chain, production process and transport that can be related to one or more products. With the calculator it is possible to calculate the biodiversity footprint for multiple scenarios. It is recommended to use the first scenario to describe the current situation and to use subsequent scenarios to describe all kinds of biodiversity friendly measures that are expected to change the footprint in the near future.	Modeling	Company data (location, pressures GHG and land use) GLOBIO data
8. **Biodiversity Estimated Impact Value (BEIV)**	Operational	All sectors	MSA (Mean Species Abundance), as part of a wider NC Impact Index	LIFE Methodology helps organizations in identifying their NC impacts and designing a strategic plan to reduce, mitigate and compensate them, including a specific approach to reduce impacts in the supply chain. LIFE Methodology can be used both as an **Environmental Management System** (LIFE Key Software) and as a **third-party Certification Scheme**.	Hybrid. In most cases data are real and updated annually. Exceptionally, when real data are not available, estimations can be used	**Company data Environmental information:** Data on pressures and area (ecoregion, type of land occupation (e.g. agriculture, built area, etc.), area size

State of art	Sectors	Metric	Key elements of methodology	Real data or modeling	Which data
			Quantitative approach is based on the calculation of an **Impact Index on Natural Capital** and consequent definition of a **Minimum Score in positive Conservation Actions**. consistent with the calculated impact. **Calculations are automatically performed by LIFE Software (LIFE Key)** once the requested data are provided. This analysis is complemented with the use of LIFE Matrix of Impacts on Biodiversity and Ecosystem Services, resulting from the company's operations (based on GLOBIO pressure – impact relationships). LIFE tool calculates a **Minimum Performance in Conservation Actions** for the voluntary compensation of residual impacts. Calculation of the minimum performance scoring considers the outcomes of the NC Impact Index. Scoring points obtained by means of conservation actions are defined according to an established list of **actions/ projects, hierarchically ranked according to national priorities for conservation**. The scoring hierarchy system focuses on projects providing more concrete and effective results, considering technical qualifiers, indicators and the duration of the action. The results indicators define minimal monitoring priorities that capture changes in Biodiversity and Ecosystems *Composition, Structure and Function.* LIFE Methodology/Software must be fed with national data prior to its use	and should be replaced over time by actual monitoring data	**Environmental projects and conservation actions** **Impacts analysis – Biodiversity and Ecosystem Services:** Processes, activities and their resulting impacts, affected ecosystem services, dependencies, risks and opportunities (the completion of the matrix is guided by options lists and orientations provided by the tool)

	State of art	Sectors	Metric	Key elements of methodology	Real data or modeling	Which data
9. **Bioscope**	Operational	All sectors	PDF.m2.yr (for land) and PDF.m3.yr (for water). PDF stands for Potentially Disappeared Fraction of species.	BioScope provides businesses with a simple and fast indication of the most important impacts on biodiversity arising from their **supply chain**. The results brought by BioScope are aimed at helping you to formulate meaningful actions to further assess and reduce the impact of your business on biodiversity. It not only indicates the **potential impact of the commodity you purchase, but also of the upstream supply chain of these commodities**. BioScope makes use of Exiobase v2.2 enabling you to select commodities and resources purchased from 170 sectors in 43 countries (27 EU countries and all large economies outside the EU), covering the largest part of global economic activities. The resulting impacts on biodiversity are calculated with the ReCiPe method, which was specially adapted for BioScope.	Modeling	An inventory of commodities used in a given supply chain; this is done by specifying the expenditure per commodity for each stage. A biodiversity impact mode (ReCiPe), which will translate these regionalized economical activities to meaningful indicators that describe their influence with regard to each of the impact drivers
10. **Biodiversity Return on Investment Metric (BRIM)**	Under development. First road-testing.	FI + All sectors	BRIM Ex-ante ROI for a species, and/or for a site Composed of 1/ % of total population at site, 2/ Red List category weighting, 3/ relative contribution of each pressure (P x w x R)	**BRIM measures the change in risk of species extinction attributable to investment** Investment can change the scale and impact of the processes that cause species to be at risk of extinction- deforestation, over-exploitation Based on the IUCN Red List of Threatened Species Based on quantitative categories and criteria – not expert opinion Incorporates compilation of data on range, habitats, threats, etc – not just a list	Real data and coefficients	Species range maps or maps of Extent of Suitable Habitat from the IUCN Red List of Species Threat status and threats applying to species from the IUCN Red List of Species (complemented by information from the

	State of art	Sectors	Metric	Key elements of methodology	Real data or modeling	Which data
						Key Biodiversity Areas dataset) Polygon of investment intervention is needed (site, protected area, country, landscape, land-use unit) Site- or country-based measures require bespoke assessments using GIS applications and integration of threat and land-use layers

Table 4: Type of business applications for each biodiversity metrics tool

	Product	Project	Site	Supply chain	Corporate	Finance
1. **Global Biodiversity Score**		Project level assessments are robust only for very large scale projects (impacting thousands of hectares) and should generally be limited to internal purposes			**Corporate level assessments**, including estimation of biodiversity performance along the whole value chain of a company. The GBS can also be used by non-financial	**Calculating the footprint of a financial asset portfolio** as a basis for portfolio investment decisions by finance sector, as long as it remains at the level of sectors or companies (when enough company-specific data is available). The GBS could be used for **No Net Loss** approaches at the financial institution-level.

	Product	Project	Site	Supply chain	Corporate	Finance
					companies themselves to assess a refined footprint if detailed information is available. The GBS could be used for **No Net Loss** approaches at the corporate level.	
2. **Biodiversity Impact Metric**	Establishing an *overall potential impact* score from commodity sourcing, and comparing potential impacts of *different commodities* – within a company's supply chains or more			Flagging *geographic sources* of potential elevated impacts in a commodity supply chain		Comparing potential impacts of *different companies* sourcing the same commodity(ies) generally
3. **Biodiversity Indicators for Extractive Companies**		Assessing and monitoring progress of biodiversity risks. Comparing options.	Assessing and monitoring progress of biodiversity risks Comparing options.		Assessing and monitoring progress of biodiversity risks Applying a NNL approach	Comparing biodiversity performance of companies within the extractives sector

	Product	Project	Site	Supply chain	Corporate	Finance
		Applying a NNL approach	Applying a NNL approach Communication and reporting		Communication and reporting	
4. **Product Biodiversity Footprint**	**Product evaluation (**PBF evaluates the impact of products or services) and subsequent **decision making** on sourcing of material, change of production practices (e.g. farming) or ecodesign. **Product communication**					
5. **ASN Biodiversity Footprint approach**						**Calculating the footprint of a financial asset portfolio**, and subsequent portfolio investment decisions by finance sector, as long as it remains at the level of sectors or companies. **Development of investment criteria** based on insights in the main impact drivers of different asset classes and sectors. Use as a scoping step: to **identify biodiversity impact hot spots on a portfolio level**, enabling follow-up steps for a selection of investments. Use this footprint of the portfolio /balance sheet to identify

	Product	Project	Site	Supply chain	Corporate	Finance
						hotspots and **create a strategy to reach a No Net Loss**
6. **Agrobiodiversity Index (ABD)**				**Measuring supply chain performance**	**Measuring corporate performance**.	**Impact investing, i.e. investments** "made into food and agriculture companies, organizations, and funds with the intention to generate a measurable, beneficial **social** or environmental **impact** alongside a financial return. issuance of an **ABD Index-scored green bond**
7. **Biodiversity Footprint Calculator**	Calculation of biodiversity impact of a company's supply chain, production process and transport that can be related to one or more products. Multiple scenarios can be calculated (application of measures).					
8. **Biodiversity Estimated Impact Value (BEIV)**			**Measuring biodiversity performance**. It applies to companies and organizations of all sizes and sectors, considering a **site assessment approach** taking into consideration the scope of the company's management responsibility as well as the place(s) where conservation actions are implemented. The methodology also contains specific guidelines for reducing supply chain impacts. The site to be analysed is defined by the company. LIFE can be used to assess an entire group/ holding, a specific brand/ company department or a business unit.			**Investment decisions** could be guided by certifications, such as LIFE

	Product	Project	Site	Supply chain	Corporate	Finance
9. **Bioscope**	Assessment of biodiversity performance of specific commodities in the supply chain			**Supply chain decisions by corporates**. Examples of questions which can be answered are: • Which of the commodities purchased by my business could be the largest cause of impact on biodiversity? • What could the new purchasing strategy of my business mean for our impact on biodiversity? • What commodity purchased by my business do we need to focus on if we want to make a meaningful contribution to conservation of biodiversity? In which regions are these impacts localized?		
10. **Biodiversity Return on Investment Metric (BRIM)**			Application at site scale requires some data gathering and complementary information		Assessment of potential for species extinction risk reduction across corporate footprint (mine sites, plantations, landscape restoration)	Screening of potential biodiversity ROI across a portfolio (for instance, investments in a particular company value chain, for a site-based commodity)

5 FIRST FINDINGS

Disclaimer:

The assessment of biodiversity metrics approaches is work in progress. This report reflects only a number of first findings, which are all subject to further discussion. Findings so far are mainly based on the descriptions of the approaches by the developers. Time was lacking to interact with all developers and to investigate background documents or technical guidance in detail. Applications of approaches by businesses or FIs have not been explored yet. This will need to be done in the next phase.

A comparative analysis of selected initiatives on biodiversity metrics for business and FI, reveals the following findings:

- Most approaches are under development and make use of a road-testing phase.
- Results from road-testing are scarce at this moment. Some approaches are operational but also for these approaches no case studies have been explored. As the 'proof of the pudding is in the eating' **it will be crucial to integrate case study findings in the next phase of this assessment exercise**.
- Approaches are not only being developed for the business community but also for the finance community, which is a very positive development and reflects the growing awareness that financial institutions can play a key role in pushing company performance on biodiversity upward
- Most approaches are applicable sector wide. The UNEP-WCMC approach only addresses the extractives sector, while the ABD Index is only applicable to the agri-food sector (and FIs investing in it). The CISL approach focuses on land use in the supply chain.
- Some developers have clearly articulated the key principles for suitable biodiversity metrics for business. As an example, the key principles developed by CISL are listed below, but also CDC Biodiversité and UNEP-WCMC have developed a set of principles. Despite some differences they are largely overlapping.

  Metric Principles:

Principle	Description
Meaningful	Meaningful to business and investor communities so it can be used to drive decision making. Methodology is clearly understood.
Measurable and comparable	Allows for comparison across geographies and time.
Possible to aggregate	Can be aggregated from site-level to regional and global scales.
Practical	Data is accessible, measurable by company or using free, globally available data. Ability to substitute better information where available.
Replicable and credible	Based on a reputable scientific method.
Context based	Considers local conditions/levels to reflect 'impact' (beyond 'usage').
Responsive	Responds to changes in company activities, both short and long term.

- Approaches generally follow the same logic for identifying impacts:
  - Step 1: scoping (economic activities, products)
  - Step 2: linking economic activities to pressures
  - Step 3: linking pressures to biodiversity impacts; this requires coefficients for linking pressures to impacts, as well as data on biodiversity in the affected area

  Steps 2 and 3 often **rely on the same underpinning models or data sources**:

  - For Step 2: Exiobase matrix-based input-output model (economic activities → pressures);
  - For Step 3: GLOBIO and ReCiPe (LCA) for linking pressures to impacts; GLOBIO (global estimates of biodiversity abundance), IUCN Red Lists and IBAT for assessing biodiversity values

  As a result, **strengths and weaknesses of developed approaches are to a large extent defined by the intrinsic strengths and weaknesses of these models/data sources**.

  Some examples of remaining weaknesses related to GLOBIO are the following (ReCiPe has similar weaknesses):

  - Pressure-impact relationships in the GLOBIO model are biased towards the most studied species and ecosystems.
  - Marine biodiversity is not factored in
  - Overexploitation, invasive species, chemical pollution and soil degradation are not factored in yet
  - GLOBIO is not species and habitats specific

  Similar shortcomings were flagged with regard to linking pressures to economic activities. A potential shortcoming with regard to a correct impact assessment on species and habitats is:

  - The overemphasis on IUCN Red List species, Critical Habitats and 'protected areas' might mask the ongoing degradation of more common biodiversity. Therefore, wherever available additional data should be applied (e.g. local Red Lists, indicator species representing common biodiversity)

- Some approaches acknowledge the need for introducing **real data**, either by replacing modelled data or by adding real data (hybrid approaches). A **critical attitude at the side of the developers is key**. The last thing we want to have are metrics that show nice biodiversity performance, but that rely on assumptions which don't reflect reality or which are based on inaccurate descriptions of measures (e.g. moving from minimal to light and intensive land use management)

- Most approaches foresee the possibility to **compare scores/performance between action and non-action**. In those cases, one should be careful to align the type of business decisions with the granularity level of the input data (economic activities, pressures, biodiversity values). Strategic decisions might only require indicative information which is sufficient to show which way some of the key components of biodiversity are heading and what the company can do to change this (e.g. selection of new areas for commodity production). Other decisions might require more detailed information even at species level, for instance in case of reputational risks.

- All approaches are OK in terms of rigor, replicability and consistency but the **main challenge might be 'relevance'**…. Relevance means that the most relevant biodiversity issues are covered, i.e. those that are most material for the business and its stakeholders (Source: NCP). This requires:
  - A clear insight in the cause/impact relationships, i.e. which pressures are causing which impacts on which biodiversity groups? Materiality and level of detail need to be adequate to the specific situation, and this is often determined by stakeholder expectations.
  - A correct set of indicators, which provide relevant information to inform business decisions; in particular indicators need to be responsive to changes (pressure indicators need to reflect changes

in pressures, while species or habitat indicators should be able to reflect changes in the state of biodiversity as a result of company actions).

- Most approaches rely on **one comprehensive metric**. MSA and PDF are prevailing. I Care's PBF approach uses PDF but for each impact driver separately (spider diagram). The BRIM RoI is a specific one. The UNEP-WCMC approach for Extractive Industries aims for a '**set of site level indicators, allowing aggregation at corporate level** (to be developed). It's interesting to note that the working group decided that a single metric may not provide the necessary resolution, flexibility or information to meet the indicator needs of the extractive sector. The ABD Index is based on 33 indicators.

- **Ecosystem services** are generally not in the picture (GBS assumes high ES values when intrinsic biodiversity values are high), apart from LIFE

- In terms of **coverage of business applications throughout the value chain**, all parts of the value chain are covered by one or more of the assessed set of approaches, which is a positive observation:
  - 4 approaches cover a product level assessment
  - Only 2 approaches cover project level assessments, one of them limited to large scale projects
  - 3 approaches cover site level assessments
  - 4 approaches cover the supply chain
  - 6 approaches cover corporate level
  - 7 approaches might be applicable by FIs

  Some approaches (Global Biodiversity Score, ABD Index) are also suitable for country level assessments, which is out of scope for this study, but these offer promising potential in the light of increased demand for better alignment between business and national level NCA.

  None of the approaches covers all types of business applications.

- As presented in Most methods are not particularly **aligned with other NCA approaches**. The Global Biodiversity Score of CDC Biodiversité does (well aligned with GHG Protocol metrics) as it acknowledges the importance of more convergence between NCA approaches. Carbon footprinting data and results can be re-used as direct inputs for the GBS and the approach is very similar, both in terms of data collection and of concepts (e.g. scopes 1, 2 and 3, attribution of responsibilities across the value chain. The Healthy Ecosystem Metric of CISL aims to integrate biodiversity, soil and water performance of land use into one overall metric. The Natural Capital Impact Matrix of Life Institute includes waste generation, GHG emission, water consumption, energy use and the area occupied.

- Table 5, **5 different types of business applications are covered by one or more approaches**. 'Assessing biodiversity performance' always allows 'comparing options', so the numbers for these applications are equal. This also applies to 'communication'. 'No Net Loss' applications and 'offering financial products based on high biodiversity performance' are interesting additional business applications, which are only covered by a minority of approaches.

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Table 5:Number of approaches covering different types of business applications:

Business application	Product level	Project level	Site level	Corporate level	Supply chain level	Investment portfolio
Assessing biodiversity performance (risks and/or opportunities) *Assessing nature and magnitude of biodiversity impacts and dependencies, and their associated business risks and opportunities*	4	2	3	6	4	6
Comparing options *Compare, contrast and select from a range of alternative options, while considering their relative biodiversity performance*	4	2	3	6	4	6
Going for No Net Loss or Biodiversity Net Gain *Assessing net biodiversity impact; this requires a sound understanding of the baseline situation*	1?	1	1	2	0	2
Communicating internally or externally *Communication on biodiversity performance, and if relevant evolution over time*	4	2	3	6	4	6
Assessing RoI of investments in biodiversity restoration	0	0	1	1	0	1
Offering financial products based on high biodiversity performance (e.g. green bonds)	0	0	0	0	0	1

COLOPHON

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