Assessment of tools to mainstream biodiversity for businesses

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Acronyms and abbreviations

AWS	Alliance for Water Stewardship
BAP	Biodiversity Action Plan
BIM	Biodiversity Impact Metric
BPP	Biodiversity positive performance
BPT	Biodiversity Performance Tool
CBD	Convention on Biological Diversity
CCB	Climate, Community & Biodiversity
CFMB	Corporate Fiber & Materials Benchmark
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
ENCORE	Exploring Natural Capital Opportunities, Risks and Exposure
EP&L	Environmental Profit & Loss
EU	European Union
FPIC	Free, prior, and informed consent
FSC	Forest Stewardship Council
FWAG	Farming and Wildlife Advisory Group
GAR	Golden-Agri Resources
GBS	Global Biodiversity Score
GHG	Greenhouse gas
GIS	Geographic information system
GRI	Global Reporting Initiative
ha	Hectare
HCS	High Carbon Stock
HCV	High Conservation Value
HFCC	High Forest Cover Country
HFCL	High Forest Cover Landscape
IBAT	International Biodiversity Assessment Tool
IFC	International Finance Corporation
IFM	Integrated Farm Management
IISD	International Institute of Sustainable Development
ISCC	International Sustainability & Carbon Certification
IUCN	International Union for Conservation of Nature
km	Kilometre
KPIs	Key performance indicators
LCA	Life Cycle Assessment
LEAF	Linking Environment and Farming
LIFE	Lasting Initiative for Earth
LSFR	LEAF Sustainable Farming Review
LUCA	Land Use Change Analysis
MBP	Minimum Biodiversity Performance
MSC	Marine Stewardship Council
NCA	Natural capital accounting
P&C	Principle and Criteria
PEFC	Programme for the Endorsement of Forest Certification
PSR	Pressure-State-Response
RaCP	Remediation and Compensation Procedure

RSB	Roundtable on Sustainable Biomaterials
RSPO	Roundtable on Sustainable Palm Oil
RTE	Rare, threatened, or endangered
RTRS	Round Table on Responsible Soy
SBTN	Science-based Targets for Nature
STAR	Species Threat Abatement and Recovery
TFT	The Forest Trust
UEBT	Union for Ethical BioTrade
UKHAB	UK Habitat Classification
UNEP-WCMC	United Nations Environment Programme - World Conservation Monitoring Centre
VSS	Voluntary sustainability standards

1. Introduction

Biological diversity – or biodiversity – the complex and broad variety of living organisms on Earth is essential for the webs of processes that support life. As habitats and ecosystems are destroyed or disrupted through human behaviour, biodiversity is being lost, which in turn is impacting on climate and environmental changes. According to the Convention on Biological Diversity, "mainstreaming biodiversity is generally understood as ensuring that biodiversity, and the services it provides, are appropriately and adequately factored into policies and practices that rely and have an impact on it." While acknowledging that biodiversity can be quite complex to measure, the urgency of this task has never been greater, with a special focus on the private sector.

Increasing awareness of the scale and characteristics of biodiversity loss has led to high-level prioritisation for policymakers in, for example, the Post-2020 Global Biodiversity Framework (CBD, 2021), and also a proliferation of initiatives and platforms led by the business sector or civil society to help businesses better account for their impacts and dependencies on biodiversity and natural capital. The extension of modern supply chains and trade liberalisation means that consumers, producers, and intermediate agents serve as drivers of change, either negative or positive, to biodiversity. Crop production in biodiverse tropical regions is associated with commodities destined for export (Figs. 1 and 2), and more than 80% of biodiversity impact from crop consumption in industrialised countries is incurred abroad (Chaudhary & Kastner, 2016). Whilst trade is not the problem per se, trade augments existing problems in developing countries with poor institutional frameworks, causing biodiversity loss (Atkin & Khandelwal, 2020; Brandi et al., 2020). Growing recognition of the role of global consumption in driving environmental damage elsewhere has led to a number of private- and public-sector commitments to reduce these impacts. Increasing consumer awareness of the impact of their consumption on the environment and biodiversity also means that consumers are increasingly demanding a robust evidence base for the industry to demonstrate good practice.

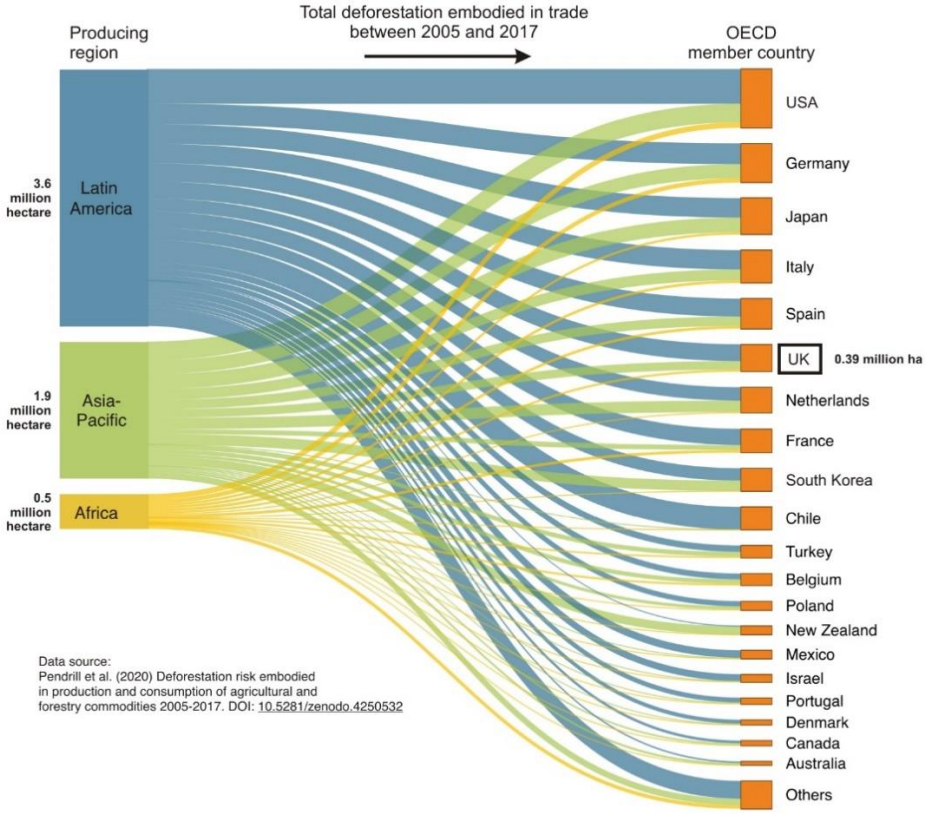

Figure 1. Total deforestation embodied in trade between 2005–2017 from producing regions of OECD countries.

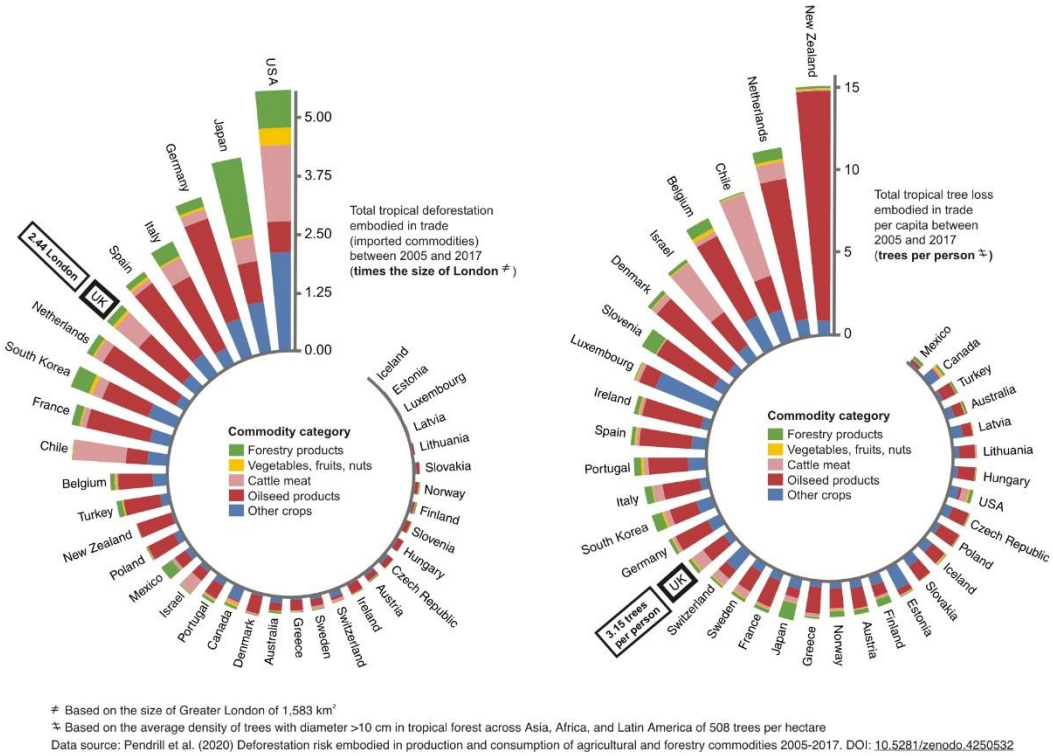

Figure 2. Total tropical deforestation embodied in commodities imported by OECD countries between 2005–2017.

Deteriorating biodiversity represents a central determinant of the sustainability of commercial activities that are considered to be particularly impactful, such as the food, infrastructural, energy and fashion sectors (Kurth et al., 2021). The complexities associated in defining the scope of such impacts (including geographic and temporal boundaries and issues of scale) means that direct measurement of biodiversity losses is rarely feasible. Therefore, companies increasingly utilise tools to mainstream biodiversity into decision making (Smith et al., 2019). These tools are increasingly being adopted in a variety of sectors as a basis for promoting sustainable business (UNEP/WCMC, 2020). By allowing producers and companies to compete on non-price factors, including social, economic, and environmental sustainability, they have the potential to create systemic and enduring economic incentives for the adoption of sustainable practices and play a major role in biodiversity conservation (Global Commons Alliance, 2020).

In the past five years, there has been a proliferation of research and practice multi-stakeholder initiatives, platforms and coalitions to advance the development, alignment and uptake of biodiversity measurement approaches and tools by businesses and financial institutions. Many of these have published structured overviews of tools and approaches, each within a specific context. Grêt-Regamey et al. (2017) reviewed decision support tools which seek to operationalise ecosystem services, finding that the majority of tools reviewed included provision for biodiversity by inclusion of the potential for and provision/connectivity of suitable habitats, and species diversity or the presence of rare species. The study highlighted the uncertainty associated with linking conservation activities with wider ecosystem services benefits. Chiavacci & Pindilli (2020) explore trends in available biodiversity and habitat quantification tools as means of informing market-based conservation efforts, emphasising the potential benefits of greater standardisation in tool development to increase consistency in how diverse habitats are assessed.

The “Aligning Biodiversity Measures for Business (ABMB) Initiative” (joint implemented by the European Business and Biodiversity Platform (EU B@B Platform) and UNEP-WCMC) highlighted the lack of knowledge and data to inform decision making and is aimed to achieve common understanding amongst users of biodiversity tools for business. In its third update report, it provided robust methodological information on the different measurement approaches and proposed a “Biodiversity Measurement Navigation Wheel”, as a pragmatic decision-making framework (considering multiple criteria at once) to select the most suitable measurement approaches for a specific business context (Lammerant, 2021). This was framed by a review of (mostly state) biodiversity indicators and reaffirmed that biodiversity as a concept is difficult to express in a single metric and different users will have different needs. This initiative is now followed by the EC-funded ALIGN project (Aligning biodiversity metrics for business and support for developing generally accepted accounting principles for natural capital) which seeks to support businesses and stakeholders (from policy and science sectors) in developing standardised approaches for quantification and measurement of biodiversity impacts and dependencies.

Other platforms or consortia have emerged to standardise measurements and support best practice. The Convention on Biological Diversity hosts the Global Partnership for Business and Biodiversity, which offers a shared platform for both national and regional initiatives working on engaging business on biodiversity. It serves as a common access point for a number of tools and guides for business including guidance on using knowledge products (Juffe-Bignoli, 2014). The Climate Disclosure Standards Board (CBSD) has developed guidance to assist companies in the disclosure of the material information about the risks and opportunities that biodiversity presents to an organisation’s strategy (CDSB, 2021). On voluntary sustainability standards (VSS) tools, the ISEAL Alliance and the International Institute of Sustainable Development (IISD) have documented a range of leading metrics

and commensurate data sources used by VSS to measure and report biodiversity performance over time (ISEAL, 2020; IISD, 2017).

As the above initiatives show, for the most part, these tools are driven by, and for, private actors and, as a result, are often developed at arm's length from public policymakers, giving rise to a high degree of variability among the tools themselves with little opportunity for alignment or comparison amongst the differing methodologies. Many tools use proxies or processes such as status of natural capital, pollution levels, or habitat loss to estimate biodiversity impacts (Wolff, 2017), but they may miss local spatial factors that influence biodiversity (Eigenbrod et al., 2010). Current use of these tools is limited by a lack of broadly accepted (biodiversity) measurement approaches to underpin them, and by a disconnect between policy objectives and the proponents of these initiatives themselves. While we work to close the valuation and decision support gap for biodiversity, extensive capacity building across the business sector is equally urgently needed if we are to fully mobilise them towards sustained biodiversity-positive outcomes (Craig, 2021). However, to date the evidence on how to assess and address these capacity gaps remains scant.

Notwithstanding their limitations, these tools establish an increasingly sophisticated infrastructure for identifying, enforcing, and measuring levels of compliance with best practices that can assist policymakers in their efforts to implement and regulate biodiversity conservation. As approaches develop and tools emerge, it is important that they are broadly consistent, scientifically robust, and pragmatic. While some reviews have identified common aims among these tools, further research is needed to explore challenges on data, metrics, boundaries baselines, and business applications, and more importantly, opportunities for these tools to support the private sector to implement the Post-2020 Global Biodiversity Framework (Addison et al., 2018; Lammerant, 2021)

This study has four main objectives:

- To compare and critically assess a selection of tools for the evaluation of biodiversity impacts by businesses based on tool context, methods, conceptualisation of biodiversity, user base and scale of assessment.
    - This seeks to understand different pathways for i) operationalisation of different concepts of biodiversity in a way that supports 'mainstreaming' biodiversity-based decisions and ii) alignment with the Post-2020 Global Biodiversity Framework 2030 action targets.
- To present specific case studies of tool application or development.
- To identify methodological limitations to the applicability of different tools in terms of characterisation of impacts, choice of indicators, spatial and temporal scales, and the knowledge base and skills required to utilise it.
- To propose recommendations for tool development to better align with both Post-2020 Global Biodiversity Framework targets as well as identify opportunities where further research can support UK policy objectives.

1.1. Scope

For this exercise, we are defining tools in a broad sense as reflecting discrete methodologies which accept information on user activities and their relevant regional context. All tools have similar broad aims of providing a score or assessment of the impact associated with an organisation's activities and/or performance. These may be translated into a biodiversity impact score based on either a

characterisation process (assuming a defined relationship between activity an impact) or performance against established threshold conditions (e.g., number of endangered species). Tools may have additional objectives, associated with determining dependence on biodiversity or impact of conservation or restoration activities.

Tools will generally utilise different indicators of impact with varying degrees of proximity to habitats themselves. These may be derived directly from species population distribution data or reflect less direct measures of biodiversity (such as area of habitat occupied) or the actions of the user (such as resource consumption) as proxies for impact. The data accepted by tools can be qualitative as well as quantitative and may reflect activities that have a less tangible relationship with biodiversity, such as the presence of organisational policies to reduce impact. Tools may integrate performance across different categories into a headline value or may present results on a less aggregated basis for individual categories. It should be mentioned that the tools themselves are not viewed in isolation of their context, this review takes into consideration the support structure around each tool, and the pathway to implementation and impact. This includes any guidance and support provided by tool developers or the presence of certification schemes. An initial list of tools was selected with a view to reflecting varied methodologies and geographical settings. The initial selection of tools was intended to capture related (but distinct) implicit objectives such as informing conservation/restoration efforts. It was considered important that the initial list of tools had an established user base and included tools that were widely available or applied within the three sectors of focus (agriculture, forests, and freshwater) and diverse regions. A diverse range of tools also offered a greater opportunity to identify distinct stakeholders willing to engage as a case study.

2. Methodology

The assessment methodology followed an iterative process. In the first instance, a total of 33 tools (see Table A1 in Appendix for the full list of the tools considered) were characterised according to six criteria: tool type, metric applied, scale of the metric, decision scope, business application and sector of interest. The initial 33 tools were sorted into five different groups, which aimed to differentiate the tools based on their main characteristics and scope. The five groups differentiate the tools in:

i) impacts metric;
ii) mitigation metric;
iii) biodiversity dependence analysis;
iv) sustainability standard (certification); and
v) management guidance.

After assigning each tool to the groups, a representative sample of each group was selected (at least two tools per group) for an in-depth review. The selection of tools was intended to facilitate comparison of both methodological depth and breadth of processes that contribute to the final results of the tools.

The selection of the tools aimed to include three sectors:

i) agriculture (which represents the greatest driver of biodiversity loss),
ii) forestry (since forests are critical habitats for biodiversity and are often considered in voluntary standards and certifications), and
iii) use of freshwater ecosystem services (because wetlands are the most endangered habitat and are experiencing high losses of biodiversity).

This is intended to capture how tools operationalise the concepts of biodiversity impacts and dependencies. Moreover, higher consideration was given to the tools which are relevant to UK biodiversity and the value chains that supply the UK agri-food system.

The in-depth review consisted of a desk review of 14 tools and relied on publicly available guidance provided by each tool developer. This step aimed to

i) identify and describe six elements of use of each tool (why, what, when, for who, how often, and how detailed),
ii) compare the tools according to how they support mainstreaming of biodiversity considerations in business decision,
iii) identify the main gaps and limitations in their use, and iv) assess their alignment to the Post-2020 Global Biodiversity Framework's 2030 Action Targets on "Tools and solutions for implementation and mainstreaming" (CBD, 2020).

To differentiate between the strength and clarity of alignment, three different levels were used (i.e., primary, indirect, unclear/not aligned).

Subsequently, key case studies were also assessed to better understand the application of three of the selected tools (LEAF Marque, LIFE Key, and LAND360), conducting semi-structured interviews with the tools' developers, and in one case with businesses associates who have used the tools. Furthermore, businesses certified by LIFE in Brazil and LEAF in the UK were mapped against biodiversity conditions. Species richness reflecting the extent of mammals, birds, and amphibians were used as an indicator of biodiversity. The species richness data with a spatial resolution of 10x10 km^2 were obtained from the BiodiversityMapping database (biodiversitymapping.org; Jenkins & Van Houtan, 2016). The data were derived by overlaying range maps of various species held in the International Union for Conservation of Nature (IUCN) database (www.iucnredlist.org) for mammals and amphibians, and BirdLife International (datazone.birdlife.org) and NatureServe (www.natureserve.org) databases for birds.

3. Results and discussion

The initial scoping exercise highlighted the high diversity of approaches currently being used by businesses and different sectors to mainstream biodiversity. Although using different frameworks, methods, and guidance, all the tools aim to support business decision making and actions that reduce negative impacts on biodiversity. There is also a wide range of scales used by the tools (from farm to corporate to value chain scale) as well as the sectors which are targeted by the tools (from agriculture to water and biofuels among others). The characterisation of the 33 initial tools is reported in Table A2 of the Appendix.

3.1. Functions of tools reviewed

The 14 tools selected for the in-depth review provide a range of functions; some only offer one of these functions, while others combine various functions (Fig. 3).

	Impact Metrics	Mitigation Metrics	Biodiversity dependence	Sustainability Standards	Management Guidance
1. Lasting Initiative for Earth (LIFE) Key	X	X	X	X	X
2. International Biodiversity Assessment Tool (IBAT)	X				X
3. Biodiversity Impact Metric (BIM)	X				X
4. Species Threat Abatement and Recovery (STAR)	X	X			X
5. Biodiversity Performance Tool and Monitoring System				X	X
6. Science Based Targets for Nature (SBTN)					X
7. Rainforest Alliance Certification				X	X
8. Roundtable on Sustainable Palm Oil (RSPO) Certification				X	X
9. Linking Environment and Farming (LEAF) Marque				X	X
10. Forest Stewardship Council (FSC) certification				X	X
11. Textile Exchange Biodiversity Benchmark Textile Exchange			X		X
12. Land360/Defra Biodiversity Metric 3.0		X			X
13. Exploring Natural Capital Opportunities, Risks and Exposure] (ENCORE)			X		X
14. Union for Ethical BioTrade (UEBT) Standard			X	X	X

Figure 3. Heatmap showing the tools' main functions (in orange).

A business activity can be a biodiversity pressure or impact driver (either through an input, such as material used, or a non-product output, such as air or water pollution). This generates changes in the state of biodiversity (impacts), which in turn can affect the organisation or society. Dependencies, often integrated along this pathway due to their interconnections with impacts, show how a particular business activity depends upon specific features of biodiversity and how changes in biodiversity affect business costs and/or benefits (CDSB, 2021).

The tools reviewed assist with the process of assessment of biodiversity-related impacts and dependencies, following different approaches to guide this process. What aspect of biodiversity is being measured, and how, depends on the intended applicability of the results of the tool for decision making. All tools reviewed enabled businesses to assess (directly or indirectly) at least one driver of biodiversity loss ('pressures'). Some tools are guided by the Driver-Pressure-State-Impact-Response (DPSIR) frameworks, which seek to capture (partially or fully) the interconnections between business activity, biodiversity impacts and impacts on business.

3.1.1. Assessment of actual or potential negative impacts on biodiversity

Most tools include some assessment of the status of or impacts on biodiversity associated with the business. However, tools vary in how this is done. Some of the tools assess the presence of actions taken towards the management of biodiversity impacts based on a mitigation hierarchy (Science-based Targets for Nature, and Textile Exchange Biodiversity Benchmark), consisting of four stages:

1. Avoid impacts on biodiversity
2. Reduce biodiversity impacts as far as possible
3. Restore/remediate impacts that are immediately reversible
4. Offset residual impacts to achieve a desired net outcome

Other tools not only acknowledge options to manage impacts, but they also assess the potential impacts of such actions.

Tools like IBAT, BIM and Defra Biodiversity Metric 3.0 assess the biodiversity status in a specific geographic location, and thus implicitly the biodiversity that may be lost if that location is developed or saved if the location is conserved. (In particular Defra Biodiversity Metric 3.0, approximates biodiversity net gain, and is intended for application in the UK planning system).

The degree of specificity of this geospatial biodiversity assessment varies considerably between tools. Those with global application, such as IBAT, provide proximity indices of the likely presence of threatened species or protected areas with a range of distances from a point location. This can generate quite long lists of threatened species and sites, that depend on the precision of the underlying databases that are drawn upon. Expert interpretation of the results is required, as the proximity reports often include a number of species that are not likely to be relevant, such as marine species for a terrestrial location if the range overlaps the coast. It appears the main intention is to inform selection of sites for development such that they avoid areas of importance for biodiversity.

BIM assesses the biodiversity value of the land occupied and the degree of biodiversity loss, according to the relative biodiversity of the natural vegetation compared to what is replacing it. This is done against a global database and depends on availability of spatial location and land area occupied. The Defra Biodiversity Metric 3.0 is UK specific but, similarly to BIM, it assesses the biodiversity value by habitat categories based on their scarcity and the condition of the habitat, and the potential biodiversity loss if the land is proposed for development. As applied under LAND360, it can also be used to simply assess the biodiversity value of current landholdings and identify areas of high biodiversity value. In all these cases, the assessments are seeking to either assess likely biodiversity loss of development or more often inform site selection where development should occur to avoid biodiversity loss. The LIFE Biodiversity Pressure Index also assesses biodiversity in terms of the biodiversity value of land occupancy but combines this with other factors related to environmental impacts such use of water, energy, and production of waste and greenhouse gases (GHGs).

3.1.2. Assessment of potential or actual mitigation of biodiversity losses

There is a similar set of tools to assess actual or potential improvements in biodiversity that may mitigate losses. The STAR (Species Threat Abatement and Restoration) tool provides geospatial estimates of the potential to reduce (abate) threats to endangered species or undertake habitat restoration. These can be used in a default mode or applied to local data on selected threatened species to assess the effects of conservation actions on threatened species populations. Thus, it could be used to select areas to invest in improving biodiversity or monitor actual effects of current actions.

The Defra Biodiversity Metric 3.0, and in particular its application under LAND360, assesses the potential to improve the biodiversity status of different habitat elements through conservation investments. These conservation improvements can then be used to offset losses due to development elsewhere, either within the same landholding, or potentially be sold to other landholders as biodiversity credits. The LIFE Biodiversity Positive Performance tool assesses the "value" of conservation investments, in terms of the importance of the habitat, species, area conserved, or influence on broader policy and practice, amongst a range of criteria. The assigned value of Biodiversity Positive Performance is compared to the Biodiversity Minimum Performance, calculated from the Biodiversity Pressure Index as a function of the turnover of the business, to assess whether negative impacts are being 'compensated' by positive actions. Where companies have a substantially greater Positive Performance compared to the Minimum, LIFE are considering the possibility of offering the balance under a 'biodiversity credit' system.

3.1.3. Assessment of dependence on biodiversity

Biodiversity dependence is a reliance on or use of biodiversity, including biological resources (e.g., materials, liquids, genetic resources) from both species and interactions with various ecosystem processes and services (e.g. pollination, water filtration, crop pest/disease control or water flow regulation).

Dependence on Biodiversity is not explicitly measured by any of the tools but is often included in the criteria for management decisions and/or assessed indirectly in the activities that may also be considered as constituting an impact pathway. This may be because generally the dependence is upon the ecosystem services provided by biodiversity rather than biodiversity per se.

The Science-Based Targets for Nature (SBTN) include criteria for business to assess their dependence on 'Nature', which we take to mean a combination of ecosystem services and natural capital including biodiversity. The ENCORE tool supports businesses in assessing their dependence on Ecosystem Services and Natural Capital; among the categories of natural capital are 'Species' and 'habitats', both of which are expressions of biodiversity. Similarly, within ecosystem services some are direct services from biodiversity such as pollination or pest control, although all the services depend on a functioning biome. The services provided by biodiversity to businesses are valued and scored in relative terms and based on expert opinion. Similar to SBTN, the LIFE Biodiversity Management Indicators include criteria whereby businesses identify their dependence on ecosystem services and put in place actions to ensure the continued provision of those services. The one sustainability standard that explicitly considers dependence on biodiversity is the Union for Ethical BioTrade (UEBT) Standard, which, in addition to the agronomic and management practice-based scoring, has criteria to ensure that populations of target species are monitored and not over-exploited, and dependence of the business upon them is recognised.

3.1.4. Sustainability standards that assess likely effects on biodiversity

A distinct approach to assessing potential effects on biodiversity is employed by the sustainability standards, such as RSPO Certification, FSC Certification, Rainforest Alliance Certification, UEBT Standard, LEAF Marque, and the LIFE Biodiversity Management Indicators which assess likely effects on biodiversity based on farming or land management practices employed. These generally include a combination of criteria about conservation of biodiversity, and natural and semi-natural habitats (especially identification of High Conservation Value areas), identification and protection of

endangered species, and a suite of good agronomic practices that should reduce impacts on biodiversity such as rational use of agrochemicals, and prioritising use of non-chemical pest control or management, where feasible. Compliance with the habitat and species protection criteria should conserve or possibly improve conditions for biodiversity, while the good agricultural practices seek to reduce negative impacts on biodiversity and potentially promote biodiversity-based ecosystem services that the production system depends upon, therefore advocating sustainable use of biodiversity. Thus, these standards include criteria that relate to the three components of negative effects, improvements, and dependence on biodiversity, although indirectly through scoring of management practices.

3.1.5. Management guidance

All the tools seek to inform management decisions at different scales with respect to biodiversity, although the guidance supporting use of the tools varies considerably in depth and detail. The frameworks used to develop and evaluate actions to mitigate biodiversity risks/impacts associated with business activities vary greatly. The approaches used to support action range from only assessing the biodiversity impacts of mitigation/conservation plans (such as STAR) to providing platforms or dashboards that fully integrate biodiversity state and pressure measurement with responses and multiple other considerations (such as LIFE), and frameworks that comprehensively cover the whole mitigation hierarchy (such as LIFE, SBTN's AR^3T framework and its adapted version by the Textile Exchange Biodiversity Benchmark).

Some tools, such as IBAT and STAR, provide a brief set of principles and examples of how the metrics provided can inform business decisions. The Defra Biodiversity Metric 3.0 is a tool to support a policy of biodiversity offsetting for land development, with LAND360 providing a service to develop a supply of biodiversity credits and to enable landowners to assess their cost versus value. The sustainability standards are intended to recognise good practice and incentivise continuous improvement through the market advantage of being certified. The scale of applicability determines the guidance provided; for example, the biodiversity performance tool provides guidance based on farm-level agricultural practices, whereas UEBT seeks to inform how value chains are organised.

Other tools have more developed management processes. The Science Based Targets Network prescribes a process for assessing biodiversity impacts and dependencies, interpreting and prioritising key issues, setting and measuring specific targets, undertaking action to avoid, reduce, regenerate, restore, and transform, and track progress towards the targets. Assessing impacts and tracking progress can be done using a selection of appropriate metrics such as those described in the previous sections, but also others such as the natural capital protocol or IUCN standard for nature-based solutions. The Textile Exchange Biodiversity Benchmark largely follows this same SBTN process. A key element in these processes is also identifying risks to the business, either due to dependence or reputational risk from generating negative impacts on biodiversity. The ENCORE platform has just introduced a new module for assessment of biodiversity-associated risk among investments for the financial sector. The LIFE Biodiversity Management Indicators cover nine principles that require businesses to effectively manage their biodiversity impacts based on the LIFE metrics, but also compliance with CBD, scientific, ethical and social standards, with indicators under each principle for minimum immediate compliance and others where compliance is required over time as part of continuous improvement.

3.2. Approaches used for biodiversity mainstreaming

3.2.1. Type of inputs required

The types of inputs are dependent on the objectives of each specific tool. In some instances, they include elements at different scales such as the extent and condition of immediate land use and associated vegetation, species population data, appropriation of natural capital and resource consumption, greenhouse gas emissions, and waste generation. For more sectoral-specific cases, they reflect defined practices (such as fertiliser application rates or mowing frequency in the case of tools intended for on-farm use). The presence of organisational policies to address biodiversity loss or share good practice can also be an input. Tools may be relegated to conditions within the site of an activity or development or seek to incorporate activities along the supply chain.

Many tools have a significant range in data type requirements and require significant information across a range of activities to generate meaningful results. This is particularly the case for the tools other than the sustainability standards, which require substantial effort (in terms of time and expertise) and a certain level and organisation of internal environmental data mostly applicable to large companies. Standards and benchmarks tend to require less quantitative environmental data and are thus easier to use by companies of all sizes, as they are mostly practice based and situated within a broader process of support.

The tools reviewed required the following types of biodiversity-related data to be input:

- STAR: User data on land use.
- BIM: Company data on land use type and intensity, yield data where available.
- Biodiversity Performance Tool: Farm data on existing habitats, management and potential for creation of habitats, protection of species, agricultural practices with negative impact on biodiversity, agrobiodiversity, capacity building and engagement with local initiatives.
- LIFE Key: Company data on land use distribution, biodiversity local projects, species and habitats identified as priority, land use change, GHG emissions, water usage, waste generation and destination by hazardousness categories, energy source and consumption.
- IBAT: location of the area for development (geospatial data on threatened species, protected areas, and key biodiversity area are provided by the tool).
- LEAF: information related to integrated farm management practices across nine dimensions: Organisation and Planning; Soil Management and Fertility; Crop Health and Protection; Pollution Control and By-Product Management; Animal Husbandry; Energy Efficiency; Water Management; Landscape and Nature Conservation; Community Engagement.
- RSPO Certification: the tool requires a trained and certified verifier/auditor to generate the P&C scores and to identify High Conservation Value (HCV) and High Carbon Stock (HCS) areas. Field survey data on biodiversity, and communities and stakeholders' surveys are also required.
- Rainforest Alliance Certification: the tool requires trained and certified verifier/auditor to generate the (Principle and Criteria) P&C scores and to identify HCV areas.
- FSC Certification: the tool requires a trained and certified verifier/auditor to generate the P&C scores and to identify HCV areas.
- Textile Exchange Biodiversity Benchmark: information on company's public commitment to biodiversity strategy and targets, actions taken to identify biodiversity hotspots, strategies taken to evaluate biodiversity risks, implementation of actions to deliver targets, monitoring and evaluation activities and public disclosure practices.

- ENCORE: no actual data is needed from the businesses. It is an explorative tool. Indication on sector of the business is required.
- SBTN: complex data on business activities are needed to assess impacts on and dependencies to biodiversity.
- LAND360: businesses only need to provide data on land distribution. Remote Sensing data is used by LAND360 to map the habitats by experts and ecologists, who also carry out field surveys to access the biodiversity status per habitat units.
- UEBT: information on company's collection of information on biodiversity, actions taken to maintain, regenerate or enhance biodiversity, compliance with global, national and local rules on rare, threatened or endangered species, sustainable use practices.

3.2.2. Consideration of biodiversity pressures (drivers of biodiversity loss)

It is worth noting that not all drivers of biodiversity loss ('pressures') are significant for a company. Businesses will look for a tool or combination of tools that covers those pressures which are material from the company perspective (Lammerant et al., 2021). We found that the tools assessed covered land use change, pollution, and direct exploitation (especially through water use). Some also considered invasive alien species (such as STAR and the Biodiversity Performance Tool, BPT), erosion and pesticide use (such as BPT and LEAF Marque), and solid waste disposal (such as LIFE Key). Biodiversity pressures are directly measured by those tools which assess the effect of restoration to compensate pressures (such as STAR, Defra Biodiversity Metric 3.0 and LIFE Key) and by tools for certification which are directly linked to a specific natural resource use and exploitation, such as the case of trees (FSC Certification and UEBT Standard).

In the case of LIFE Key, pressures are integrated into one index (the Biodiversity Pressure Index). This has an underlying assumption that the use of energy and water, GHG emissions, waste generation (and disposal), and land occupancy can represent the main impacts upon biodiversity. The scoring and metrification of these pressures generates a score, which while based on a sound rationale from expert opinion, has no scientific mechanistic link to the biodiversity impact. The process is mathematically moderately complex but uses data most responsible companies ought to register, and in that sense, it is pragmatic. Nevertheless, there is potential for decision rationales that are primarily a consequence of the construction of the metric rather than any real reduction in biodiversity impact. Knowing how likely this is would require a broad monitoring of how companies have used and interpreted the metric. The potential for 'perverse' decisions should, however, be considerably moderated by the detailed and comprehensive Biodiversity Performance indicators that should inform the management decision processes.

The standard-type tools indirectly capture pressures through the assessment of activities, measures, or interventions which may affect pressures (LEAF Marque, RSPO Certification and Rainforest Alliance Certification). For instance, LEAF Marque's control points refer to actions taken to protect or enhance biodiversity. One point was added in the last update of the tool (version 15 – 2020) on whether at least one representative species or habitat is being monitored on the farm. This incorporation of outcomes alongside the existing practice-based approach signals the transition of the standard towards a hybrid approach.

3.2.3. Type of results generated

The results generated vary according to the objectives of the tools. Those that aim to provide certification usually generate results that indicate whether the business is compliant with a range of criteria. Many of these sustainability standards offer complementary tools to enable businesses to monitor their performance, identify strengths and weaknesses as well as set targets for improvement across the business (for example, the LEAF Sustainable Farming Review supports businesses to obtain the LEAF Marque certification).

Many tools express their results (either of pressures, impacts or action) in terms of scores or indices. Some tools aggregate results in integrated scores, whereas others (such as the Biodiversity Performance Tool) provide indication of performance across specific categories. This allows consideration of the multifaceted nature of interlinkages between biodiversity and businesses' activities and results. In addition, the use of scores seems to be easier to understand and communicate to business managers and to assess progress over time (or towards targets) and to allow comparison across companies, particularly within a specific sector (such as the Textile Exchange Biodiversity Benchmark).

3.2.4. Approaches used to link biological, ecological, socio-economic factors & assessing trade-offs

Most approaches don't explicitly calculate trade-offs, but these could be derived from their application. In the case of LIFE, interactions between human wellbeing, biodiversity, ecosystems, and natural capital are considered. Although the term 'trade-offs' is not used, it is implicit, and if the criteria are followed this should reveal any trade-offs. In the case of LEAF, key elements of integrated farm management are assessed so different aspects of biodiversity are considered across the whole farm including: Organisation and Planning, Soil Management and Fertility, Crop Health and Protection, Pollution Control and By-Product Management, Animal Husbandry, Energy Efficiency, Water Management, Landscape and Nature Conservation and Community Engagement.

3.3. Alignment with the Post-2020 Global Biodiversity Framework

In 2021, the Convention on Biological diversity published the first draft of the Post-2020 Global Biodiversity Framework (CBD, 2021). The overarching objective is to provide a commonly agreed framing for actors at different scales (but primarily governments) to mobilise actions towards halting and reversing biodiversity loss. The framework is built upon four long-term goals to be achieved by 2050, reflecting the 2050 Vision for Biodiversity. Each goal is supported by a number of intermediate milestone targets to assessment by 2030.

We mapped the 14 tools reviewed in-depth to the 2030 Action Targets proposed by the Post-2020 Global Biodiversity Framework under the category "Tools and solutions for implementation and mainstreaming" (Table 1). The tools were classed as either 'primary' – suggesting they are of direct relevance to the Target or Action, 'indirect' – suggesting their relevance or importance is less direct, and 'not aligned or unclear' if there was insufficient information publicly available to make a robust classification.

Table 1. Definition of the 2030 Action Targets considered by this study (CBD, 2021).

Target	Definition
14	"Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty-reduction strategies, accounts, and assessments of environmental impacts at all levels of government and across all sectors of the economy, ensuring that all activities and financial flows are aligned with biodiversity values."
15	"All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts, by at least half and increase positive impacts, reducing biodiversity-related risks to businesses and moving towards the full sustainability of extraction and production practices, sourcing and supply chains, and use and disposal."
16	"Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives, taking into account cultural preferences, to reduce by at least half the waste and, where relevant, the overconsumption, of food and other materials."
17	"Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts."
18	"Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way, reducing them by at least US$ 500 billion per year, including all of the most harmful subsidies, and ensure that incentives, including public and private economic and regulatory incentives, are either positive or neutral for biodiversity."
19	"Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation, taking into account national biodiversity finance planning, and strengthen capacity-building and technology transfer and scientific cooperation, to meet the needs for implementation, commensurate with the ambition of the goals and targets of the framework."
20	"Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent (FPIC), guides decision making for the effective management of biodiversity, enabling monitoring, and by promoting awareness, education and research."
21	"Ensure equitable and effective participation in decision making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth."

The majority of tools are in alignment (either primarily or indirectly) with targets 14, 15, and 16 which aim to include biodiversity values in policy, support the assessment of business impacts and dependencies on biodiversity, and advocate for responsible consumption, respectively (Fig. 3).

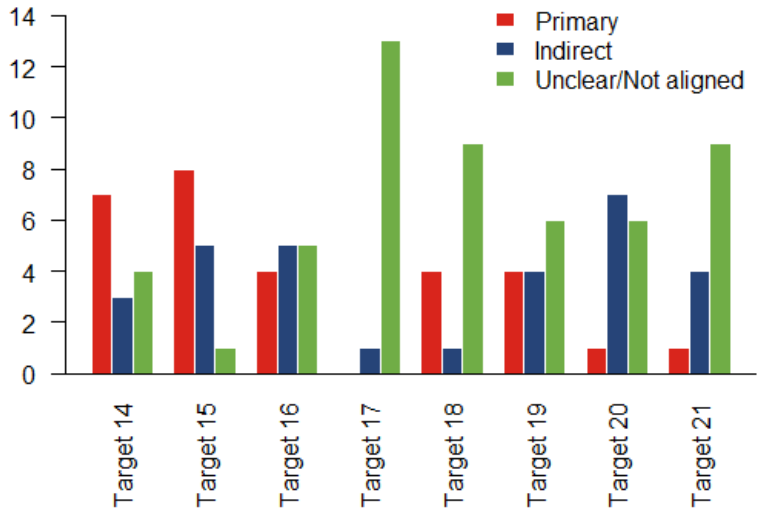

Figure 3. Number of tools aligned with the selected 2030 Action Targets.

The level of alignment of each tool is shown by the mapping wheel in Fig. 4. Integration of local knowledge and support of local participation which are advocated by Target 20 and Target 21 are not clearly supported by the 14 tools that were selected for the in-depth review. However, we found that in half of the tools, local or indigenous knowledge can be integrated, even if it is not explicitly recommended by the tool's guidance. Approximately half of the tools are directly or indirectly aligned to Target 18 which aims to reduce incentives harmful for biodiversity, and to Target 19, which calls for an increase in financial support for biodiversity conservation. Finally, only one tool is indirectly aligned to Target 17, which supports the reduction of potential adverse impacts of biotechnology on biodiversity. This is arguably unsurprising given the emergent and complex nature of biotechnological developments; this may point to potential prioritisation for future tool development. The other 11 tools do not explicitly mention how to prevent and control those impacts (Fig. 4). Further details on tools' alignment to the 2030 Action Targets are reported in Tables A3 of the Appendix.

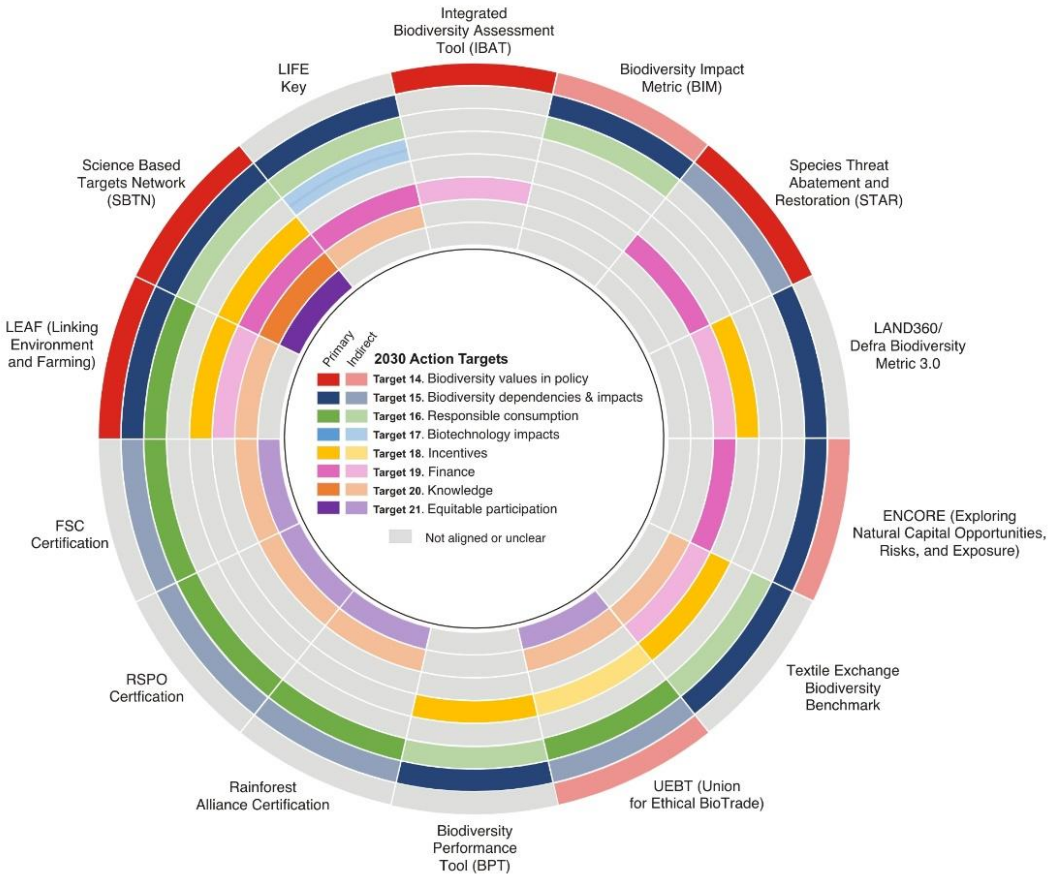

Figure 4. Mapping of tools to the 2030 Action Targets.

While the diversity of tools has enabled much-needed innovation in the definition and monitoring of impacts on biodiversity (as shown by almost all tools aligned with target 15), it has also given rise to its own set of questions, such as: what are the actual impacts of these initiatives on biodiversity, and where are these impacts occurring? Although this report does not aim to answer this question definitively, it does provide a starting point for making such determination. By linking the latest information on tool use with commonly used indicators of the state of biodiversity, we offer a first step to understanding the potential contribution of the tools to biodiversity conservation. We mapped out the use of two tools and bird/mammalian biodiversity in two countries: LIFE Key in Brazil and LEAF Marque in the UK (Fig. 5). In both cases, the locations where tool use is concentrated overlap with certain biodiversity hotspots. The concentration of tool use in these regions aligns well with strategic priorities for reducing the global biodiversity threats. On the other hand, given the prominence of agricultural production and natural resource encroachment in other biodiversity hotspots in these counties, there exist major areas of opportunity for more proactive adoption of standard-compliant production and business activity.

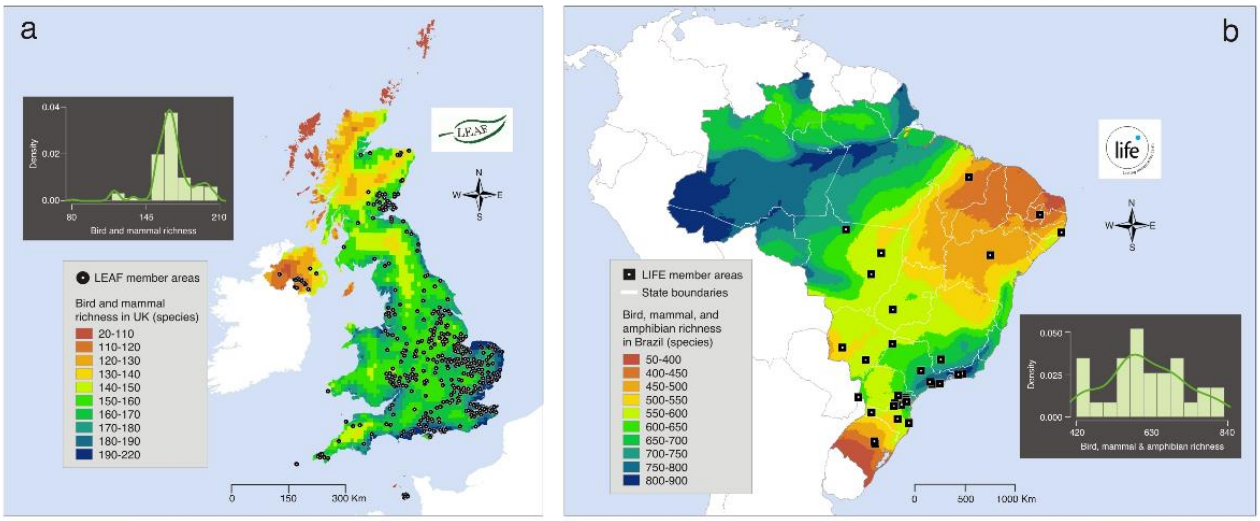

Figure 5. Businesses certified by LEAF Marque (a) and LIFE Key (b) mapped against bird and mammal richness in UK, and bird mammal and amphibian richness in Brazil respectively (Sources: (biodiversitymapping.org, www.iucnredlist.org, datazone.birdlife.org, www.natureserve.org, leaf.eco, personal communication with LIFE Institute).

3.4. Gaps and recommendations for further research

3.4.1. Spatial and temporal scales and spillover effects

Most tools characterise biodiversity conditions within a business or landscape unit, utilising empirical spatial data. This type of approach is a major strength as it moves beyond the conventional quality-based assessment towards evidence-based assessment, thanks to the increased availability of landscape datasets derived from remote sensing. Despite this progress, most tools we evaluated do not assess the spillover effect of business activities to the broader ecosystem beyond the farm boundaries or the surrounding areas, whether it is negative or positive. Businesses may comply with environmental and sustainability standards within their farms, but ecosystem functioning often operates at a broader spatial scale and transboundary negative effect of anthropogenic activities are often inevitable (Didham et al., 2015; Heilmayr et al., 2020).

Studies from development settings have shown that intensive extraction of natural resource activities by businesses can lead to broader environmental degradation, such as deterioration in the quality of waters in streams and soils and the concomitant loss of biodiversity important to support local livelihoods (Blitzer et al., 2012; van Schalkwyk et al., 2020). These activities can potentially further lead to the exacerbation of social inequality among communities (between those who benefit from the resource extraction within the business unit and those of outsiders), creating pockets of extreme poverty and gated communities (D'Odorico et al., 2017; Liao et al., 2020). On the other hand, business activities that promote biodiversity maintenance or improvement, such as through the creation of hedgerows, wildlife corridors, and forest conservation, can create positive effects on the surrounding landscapes and communities (Batáry et al., 2012; Aldieri et al., 2021). Accounting for spillover effects (either positive or negative) is therefore an important step towards transparent recognition of business roles to the broader ecosystem and to a just environment, economy, and society.

Most of the biodiversity indicator tools we evaluated provide current spatial snapshots of biodiversity conditions. They do not estimate the historical change in biodiversity and drivers of these changes

using empirical data. Whilst many tools can be used retroactively (depending on data availability) to compare trends in previous performance, without clearly defined parametrisation of impacts, this may not indicate when an important threshold (such as a critical reduction in semi-natural habitats) has been passed. This impedes robust development of analysis and models to reliably inform future biodiversity risk or trajectories within a business or landscape unit, and therefore hampers the design of tangible plans for biodiversity compensation or offsetting mechanisms (Mihoub et al., 2017). This is a missed opportunity, considering that various time series landscape datasets (Hansen et al., 2013; Liu et al., 2021) with relatively fine spatial and temporal resolution have been developed in recent years, making it feasible to conduct such rigorous analysis.

3.4.2. Biodiversity indicators

The tools we evaluated generally use biodiversity proxies related to ecosystem functioning and landscape metrics, such as forest cover, soil conditions, land degradation, and habitat connectivity, as opposed to the actual biodiversity measures such as species richness, occurrence rates, and abundance. The use of these proxies has some strengths and limitations. Landscape-based proxies are typically readily available from remote sensing data, they have good coverage for most parts of the world and provide relatively accurate representations of the reality on the ground. Comparatively, biodiversity datasets rely primarily on field surveys of certain species and are often not so rigorously sampled across the species range, especially in remote and difficult-to-assess areas. Furthermore, some species can often be difficult to detect due to their cryptic behaviour (Vodă et al., 2015; Wiliams et al., 2018), and species detection can vary by surveyor skills and local ecological knowledge and survey frequency (Guillera-Arroita, 2017; Camino et al., 2020). Limited survey coverage and surveyor skills can hamper reliable biodiversity assessment. Landscape indicators therefore provide the most pragmatic proxies for assessing biodiversity. Nonetheless, these indicators have limitations by providing uniform measures across different areas, despite biodiversity conditions being inherently different in different regions (by latitude and ecoregion). Furthermore, biodiversity takes a very long time to develop and recover (Martin et al., 2013; Rozendaal et al., 2019), and even planting of trees that can take decades to mature.

Whilst all tools have some conception of high-biodiversity impacts, the methods rarely explicitly reflect irreplaceable loss of biodiversity. In some instances (such as the number of semi-natural habitat types as measured by the BPT), total absence and paltry presence results in an equivalent score despite both conditions arguably having different implications for restoration and conservation.

The over reliance on landscape proxies can lead to unrealistic biodiversity recovery targets and policies and erroneous offsetting mechanisms, i.e. development in pristine forest allowed with the offset of planting trees elsewhere (Curran et al., 2014; Holl & Brancalion, 2020; Martin et al., 2021). While acknowledging that biodiversity can be quite complex to measure, tools to inform business decision-making need to move beyond landscape indicators as proxies. Biodiversity repositories storing citizen-science datasets of various species collected by researchers and the public have increased in the last decade (Chandler et al., 2017; Moussy et al., 2022). Along with a proper analytical approach, these data open a way to estimate the historical change of biodiversity to inform business (Isaac et al., 2020; Johnston et al., 2022).

3.4.3. Heterogeneity in biodiversity pressures

In the absence of data on the historical change in landscapes, the magnitude of pressures or threats to biodiversity is often defined based on expert opinion (in a form of weighting). While this is an acceptable approach when dealing with well-studied ecosystems (expert opinion could approximate well the actual conditions), it can be unreliable for ecosystems that are not so well studied and encompass large areas (where the extent of area can be too spatially and temporally complex to be understood by experts who tend to focus on certain geographical area and scope of research) (Costello et al., 2015; McNellie et al., 2020). Such uncertainties can potentially generate erroneous predictions of biodiversity risk (Dorrough et al., 2019).

Furthermore, tools have generally applied a fixed weighting value to different indicators of biodiversity impacts (either based on expert opinion or empirical estimates derived from sampled areas). This is an acceptable approach for a relatively narrow spatial extent or homogenous ecosystems. However, it can be a problem when the extent of the unit evaluated is broad and encompasses multiple ecosystem regions with differing biodiversity and anthropogenic characteristics and contexts, as pressure to biodiversity can vary substantially in different regions. Applying a fixed weighting can also potentially result in one-size-fits-all policies to be proposed across different regions, despite marked differences in the actual threats to biodiversity.

4. Case studies

4.1. LIFE Key

What is the rationale in developing a tool to identify biodiversity impacts?

Developed to be international and originally applied in the Latin American context, the LIFE Methodology is intended to allow businesses to communicate its biodiversity positive performance as well as to quantify their potential impact on biodiversity in a standardised way. The main rationale is to assist decision making within organisations, to compensate their pressure on biodiversity and to reduce their impact, but also to generate evidence on the value and benefits of biodiversity conservation.

The methodology is intended to be used by organisations, both large and small, across multiple sectors to generate an instantly comparable indication of biodiversity-positive performance based on a defined scoring system, considering that local direct biodiversity impacts are difficult to measure in a standardised way and difficult for business management to comprehend and act upon the results.

What kind of information/processes are considered essential to use the tool?

LIFE began as a qualitative guidance of indicators, but that was difficult to standardise and allow for full consideration of dependencies or comparison over time or amongst different companies. Therefore, a quantitative index of biodiversity positive performance (BPP) was developed. However, this index alone could lead to 'greenwashing' – branding something as eco-friendly, green or sustainable when this is not the case – if it is not linked to the company's biodiversity pressure. For example, a company could be certified because of its positive performance without considering the damage its operations represent for biodiversity. Thus, the Biodiversity Pressure Index (BPI) was developed to be used as a reference to establish the Minimum Biodiversity Performance (MBP) to be accomplished if a company wants to be recognised through a third-party certification system. BPI

reflects performance in GHG emissions, energy use, land occupation, waste production, and water use. The pressure index score (expressed from 1 to 1000) is generated on a universally comparable scale, whereas the indicators are specifically targeted to each business (as they are management indicators) to identify opportunities to reduce pressure or dependencies or to undertake scenario analysis. The MBP also considers the company turnover, beyond the Biodiversity Pressure Index, so that the investment capacity in biodiversity conservation is also considered.

One of the challenges and opportunities related to using this tool is incentivising companies to better understand and examine the risks of not conserving natural resources 'outside the fence'. Accredited certifying bodies evaluate annually the development of complex biodiversity conservation projects to guarantee there is enough technical evidence on the implementation and results of biodiversity actions that support the company's positive score. Something to consider is that in general, large companies are well staffed with technicians and are able to provide the information needed to implement all the methodology, while smaller organisations may struggle in generating the required information. To address the difficulties small business may have in implementation, a simplified (but still standardised) methodology is being developed for use in such cases. At present, consultants provide support on generating and interpreting impact scores for smaller companies.

How would you describe the sequential process of using this tool?

Ideally, the process involves an initial assessment of state conditions including a review of business management and landscape characterisation (e.g. eco-region conditions). This process can be very different for new companies as opposed to established ones in terms of data availability, but also business practices and culture. However, it is easier when one considers that the ecological information is provided by LIFE Key tool, through the work of a technical team and regional committees of LIFE Institute. Then, the software LIFE Key can be adequately adapted to each location, always keeping the universality that allows standardised comparisons among countries and sectors. Consideration is also given to important dependencies, through assessment of the impacts of feedstock and natural resource requirements. Upon evaluation of the score, the response at organisational level can include updated indicators of organisational policy and procedures. It means that important information related to biodiversity that eventually is not captured by LIFE metrics can be locally evaluated by the auditors through the company's management indicators and their evidence (as some local direct impacts). Crucially, the tool includes a consideration of conservation efforts in the BPP score, which can be used to develop a biodiversity action plan. This score can be seen as an indication of the positive impact of conservation projects to compensate negative impacts. They prefer to use the word 'compensate' as 'offsetting' can be understood as neutralising impacts, and we don't believe that any biodiversity impact can really be 'offset'.

How does the tool reflect areas of increased biodiversity value or impact thresholds?

They work with a 'hierarchy of mitigation' within the management indicators, which prioritises activities that prevent impacts. In addition, the benefit of conservation activities reflects the scores in terms of the composition, ecosystem structure and function. These scores, along with initial landscape characterisation, will reflect areas of increased biodiversity value including the fragility of ecoregions and presence of threatened species. At present, the rule is that a minimum (30%) of compensating points must be accrued in the same eco-region. Biodiversity dependence is reflected through inclusion of feedstock, and wider resource requirements are included in the methodology. Regionally specific characteristics (such as stress due to withdrawal/availability in the case of water and biodiversity importance) impact the scoring. Thus, the methodology is not purely reflecting resource efficiency.

Ideally how would you envision the tool being used?

Apart from informing decisions internally, comparison of benefits can influence investors, by demonstrating the more beneficial initiatives in a particular region of interest or where organisations have influence. This can also potentially demonstrate co-benefits across different ecosystem services (such as conservation and carbon sequestration). Equally comparing declining performance (especially below the threshold for the standard) can assist informing investment decisions. Certified companies are required to make information relating to performance publicly available, including the metrics results.

Can you provide examples of applications of the tool leading to significant changes in business practices?

The most fundamental change is the investment in concrete biodiversity conservation actions/projects, besides the enhancement of data collection and management systems. Following use of the method, companies have been invited to conferences to present their performance as they have demonstrated significant positive impacts. Through engaging with the certification process, companies are encouraged to understand the concept of 'eco-regions' in a practical way, demonstrating its impact on positive and negative performance and the risks of biodiversity loss. A large Japanese company operating in Brazil has used the tool as a platform for engaging with more than 10,000 farmers that supply them in Southern Brazil and ensuring that they source timber responsibly. This demonstrates the potential for the tool to influence activities 'over the fence' at scale when integrated with appropriate management decisions.

What are your future plans in terms of tool development/updating?

As well as the aforementioned simplified version, LIFE is launching a new tool later in 2022 for sustainable territorial management analysis. It is being piloted with 47 municipalities at the border between Brazil and Paraguay with the support of the company Itaipu. This collective approach utilises a series of appropriate indicators to monitor activities within a defined boundary. There is also a plan to test this territorial system in the Amazon.

LIFE has already adapted LIFE Key tool for application in the European Union (EU), as the method incorporates regional specificities. This work evolved through the LIFE European Technical team (coordinated through Ecoacsa in Spain). EU-based organisations (such as energy and insurance companies) have already used the tool.

From 2022, they are accrediting LIFE Training centres that can implement the training of support consultants and company staff. Auditors have a separate training for accreditation. They are also enhancing the method to allow biodiversity impacts to be offset by activities in a different country, effectively allowing an interface between regionally defined scoring. On a longer term, there may be the potential to allow companies to trade surplus scores associated with positive biodiversity performance that exceeded requirements for standardisation. In this line, LIFE has partnered with a company which focuses on carbon credits in Amazonia (PermianGlobal). The idea is to calculate a biodiversity score of carbon projects or investments that can be used to construct and exchange 'biodiversity credits'.

4.2. LEAF Marque

What is the rationale for an integrated farm management standard?

The LEAF Marque Standard aims to transform the farming and food system and have a positive impact across the whole supply chain by promoting a whole farm approach, and Integrated Farm Management (IFM) mindset.

How would you describe the sequential process of the standard?

Businesses become a LEAF Charity member first; they get access to publications produced by LEAF and the LEAF sustainable farming review. This is an online self-assessment tool which correlates with the nine aspects of the IFM wheel. This is a requirement of the LEAF Marque certification because that's how farmers can track their progress year on year. The essential control points are aligned with local, national and global legislation. The recommended control points are exemplar best practice that farmers can choose to adopt. Usually, new control points are introduced as recommended. Over time, to positively drive the agri-supply chain, some of them become essential. This staged introduction gives farmers time to start implementing certain strategies before they become essential. Because it is vital that the certification process is accessible, there are certain control points that are 'recommended', as the LEAF Marque understands it would be impossible for them to be implemented by all farmers. Audits are carried out by third-party certification bodies, which ensures impartiality.

How else would you envision the results of this tool being used?

LEAF really encourages peer-to-peer learning and demonstration farms. They also provide webinars and training sessions in terms of best practice.

In practical terms, how do you differentiate between biodiversity and other environmental impacts?

Because LEAF Marque is holistic and promotes integration, practices that affect local habitats and species are captured through a range of essential control points that the farmer must adhere to. For instance, in the 'Landscape and Nature Conservation' section of the standard, businesses must carry out a Landscape and Nature Conservation Audit and Enhancement Management Plan, which involves mapping locally important species and habitats. Across the board, biodiversity is also recognised in other sections, such as 'Crop Health and Protection' (best practice IPM strategies), 'Soil Management and Fertility' (no-till practices, incorporating soil organic matter and soil health monitoring practices), 'Water Management' (consideration of abstraction and monitoring quality), and 'Animal Husbandry' (evidence of protecting birds and wildlife by staff and contractors through the direction and timing of cutting forage crops). All of this is encompassed within the 'Organisation and Planning' section, where farmers must have an implemented IFM policy.

How does the tool reflect areas of increased biodiversity value or impact thresholds?

Some areas of the standard aim to ensure that management plans are aligned with local or country-level biodiversity action plans or other legislations, thus bringing stronger measures into environmentally sensitive areas.

Does the tool evaluate positive biodiversity impacts or offsetting?

Certain control points encourage businesses to have a minimum area for habitats, not used for cropping. In the 'crop health' section, farmers must justify methods they use to minimise their negative environmental impacts.

Can you provide examples of applications of the tool leading to significant changes in business practices (related to biodiversity)?

A LEAF independent evaluation survey, conducted by the Countryside and Community Research Institute (Read et al. 2017), found that 66% of participants reported that biodiversity on their land had improved because of LEAF Marque certification, while 53% of participants reported the certification improving the landscape values of the land that they farm. The initial focus of discussion was on bird populations, often the most visible aspect of biodiversity, but that focus quickly spread to other species and other aspects of the farmed environment. The evaluation also highlighted the business benefits of biodiversity conservation and the importance of synergies with other schemes and initiatives:

A virtuous circle of biodiversity conservation and business benefits: "(LEAF certified) growers and farmers demonstrated the integration of their farming systems, as answers began to intertwine as biodiversity benefits had consequences for crop protection decisions and in turn changed in-field operations. ....., there are those who do the minimum, but the substantial majority have embraced the chance to innovative, and draw great pride from that decision. ..... Most of the farmers saw themselves and their teams as having responsibility for protecting and enhancing the wildlife on the farm, that has practical and immediate benefits, such as crop protection, but also as part of a wider stewardship of the land."	*Synergies with other initiatives: "The focus of LEAF Marque on biodiversity and conservation management results in marked improvements in farmland birds, insects and mammals, often working in synergy with other programmes and schemes... The improvement in biodiversity, and fostering it in-depth was an intersection of LEAF Marque, various other certification schemes and state-run agri-environmental initiatives"*

What are your future plans in terms of tool development/updating?

- LEAF is currently working on significant changes to the **'Water Management' control points**, asking farmers to specify the ways in which they monitor their water courses, and encouraging collaborative working across biodiversity impacts within catchment areas ("we want adjoining farmers to work together").
- They are also bringing in **new control points to the 'Landscape and Nature Conservation'** section to make it more globally relevant (especially to areas where deforestation is a risk), to cover conversion of natural ecosystems to agriculture, and to ensure that protected or high conservation areas are protected and managed appropriately. In terms of seasonality and bird feeding, they now talk about "nesting or local species" to make it more globally relevant. In the LEAF Marque Standard v16.0, some of the new control points are essential due to the global importance of conserving biodiversity.
- LEAF is moving towards a **hybrid approach**, having outcomes included alongside the existing practice-based approach. Practice-based requirements remain valuable, and outcome-based control points do bring challenges. The primary areas to consider for transition have been biodiversity and soil management and will continue to identify opportunities for outcome-based control points where relevant.
- While the majority of LEAF-certified businesses are in the UK, the scheme is rapidly expanding its **global reach**. This process is mainly driven by major retailers and is aligned with LEAF's vision to transform the whole supply chain. For instance, in 2021, Tesco announced that it will ensure all UK fresh produce growers are certified by the end of 2022 and will begin the process of certifying the rest of its global fresh produce grower base from 2023, completing the transformation by 2025 (LEAF, 2021).

4.3. LAND360

What is the rationale in developing a tool to identify biodiversity impacts?

LAND360 is a service to enable landowners to understand their natural capital and effectively manage it. LAND360 has three stages:

i. Mapping+ which maps habitats and carbon storage/flux across the landholding
ii. Scoring+ that considers the potential for the biodiversity and carbon improvements
iii. Ecosystem+ which assesses potential financial benefits and costs of ecosystem enhancement.

The added value of LAND 360 as offered by Fera is the research-level analysis of remote sensing images, experienced ecologists with knowledge about the condition and potential for habitat improvements, and economics expertise to analyse the potential costs and benefits.

What kind of information/processes are considered essential to use the tool?

For biodiversity, LAND360 applies the Defra Biodiversity Metric 3.0 approach. The first step is to classify and digitise the land into habitat units using remote sensing images. LAND360 then applies the 3.0 metric using ecological experts to assess the current and potential future 'condition' of the habitat, i.e. the potential for biodiversity gain and what actions would be necessary to achieve that. Carbon stocks and flows are estimated using a range of secondary sources. Finally, through economic analysis, the potential costs (and benefits) of that gain are estimated to enable landowners to decide whether they wish to invest in the actions to achieve biodiversity gain.

Does the tool evaluate positive biodiversity impacts or offsetting?

LAND360 can use remote and on-the-ground expertise to assess the importance and condition of current habitat units and the risks and ease of achieving biodiversity gain. Field ecologists validate the remote sensing analysis and conduct field surveys to assess the actual biodiversity status of the habitat units, and their potential for improvement.

Ideally how would you envision the tool being used?

To inform land management and potentially generate carbon and biodiversity credits that could be used internally or sold. The economic evaluation assesses the cost of improvements in above and below-ground conditions to generate credits. The cost of credit generation (conservation activities plus potential productive losses) is then compared against possible prices of the credits. There is significant uncertainty as to the likely value of biodiversity credits, although Defra indicates a likely range in value of £9,000–£15,000 per credit.

Can you provide examples of applications of the tool leading to significant changes in business practices?

LAND 360 was only launched in January 2022 with about 10 clients so far, split between large estates wanting to better manage their landholdings; housing developers to evaluate their land bank and which properties they could generate biodiversity credits from to offset the development of others; and renewal energy companies. In the latter cases, the intention is to see if their business model changes, given the potential for landowners to create and sell credits. LAND360 is likely to be too expensive for family farms and smaller landholdings e.g., just step one of mapping habitats and first estimate of natural capital costs a few thousand pounds. They are discussing with both estates and coordinating groups such as the Farming and Wildlife Advisory Group (FWAG) to provide a collective service for groups of adjoining properties to make it more cost effective.

What are your future plans in terms of tool development/updating?

They are just starting out; what Fera offers is a bespoke process for each client. Different clients are interested in different components of LAND360 depending on the level of detail required. The market is characterised by uncertainty and LAND360 will develop alongside the development of the Environmental Land Management schemes and how they interact with private investment.

5. Conclusions

In the past two years, there has been a **pronounced surge in the demand from businesses for tools** (methods, criteria, and standards) that enable them to account for their impacts on and the value of biodiversity and the goods and services derived from nature into business decisions. At the same time, businesses are faced with a **fast-evolving set of tools and processes** to assess and manage their interactions with biodiversity. Understanding the strengths and limitations of each, and how they might respond to a business's needs, is not straightforward for companies who are not specialists in the area.

The tools reviewed perform a range of functions including assessing potential or actual negative effects on biodiversity of business activities, assessing potential or actual effects on biodiversity of restoration activities, assessing compliance with sustainability standards that include biodiversity aspects, identifying business dependencies on biodiversity, and providing guidance to manage all of the aforementioned aspects. However, any business decisions will also rely on other ecological and socio-economic considerations. Thus, supporting and requiring businesses to internalise externalities and integrate their impact and dependencies on biodiversity in decision making requires a scale-up of efforts for the development and operationalisation of **frameworks to harmonise methods and standards within an integrated business management approach**, rather than an isolated or ad-hoc approach to tool use.

While these tools contain significant requirements related to biodiversity conservation, their implementation, being driven by market forces, is, at best, only **partially aligned with biodiversity protection**. There is a growing need to develop a common view amongst key stakeholders on the measurement, monitoring and disclosure of corporate biodiversity impact and dependencies to help integrate more credible and comprehensive indicators of corporate contribution to global biodiversity goals into corporate reporting and global policy frameworks.

Exciting initiatives are arising to align measurement approaches and address key barriers to broader uptake through **concerted multi-stakeholder efforts**. For instance, while the focus so far has been on the development of tools for individual business use, we are now witnessing emerging initiatives for the collective application of tools to mainstream biodiversity considerations to advance conservation as a territorial or sectoral endeavour.

Policymakers have a crucial role to play in leveraging the momentum and infrastructure behind these tools to promote a more intentional, strategic and, ultimately, effective implementation of these tools for biodiversity conservation. **Key policy options** include collaborating with tool developers to facilitate and provide incentives for adoption in areas where they will have maximum impact; and providing research financing to determine the biodiversity impacts of tool use as a basis for continual improvement and for determining the strategic application of policy support to such initiatives.

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Appendix

Table A1. List of tools included in the rapid scoping exercise (in grey, the tools selected for the in-depth review).

1. LIFE Key (developed by LIFE Institute)
2. Integrated Biodiversity Assessment Tool (IBAT, hosted by WCMC)
3. LandScale's assessment framework
4. Biodiversity Impact Metric (BIM, developed by the Cambridge Institute for Sustainability Leadership)
5. Species Threat Abatement and Recovery (STAR) Metric (developed by IUCN, to be available through IBAT)
6. Global Biodiversity Score (GBS, developed by CDC-Biodiversité)
7. Biodiversity Guidance Navigation Tool (developed by Capitals Coalition and UNEP-WCMC)
8. Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE, produced by UN Environment Programme World Conservation Monitoring Centre - UNEP-WCMC)
9. Agrobiodiversity Index (produced by Bioversity International)
10. Biodiversity Performance Tool (BPT) and Monitoring System (developed by Solagro, the Global Nature Fund, Lake Constance Foundation, Fundación Global Nature and IST University of Lisbon)
11. Science Based Targets for Nature (SBTN, developed by the Global Commons Alliance, expected in 2022)
12. Rainforest Alliance Certification
13. Defra's Biodiversity Metric 3.0
14. Roundtable on Sustainable Palm Oil (RSPO) Certification
15. Union for Ethical BioTrade (UEBT) Standard
16. Roundtable on Sustainable Biomaterials (RSB) Certification
17. Nature and Biodiversity Benchmark (by the World Benchmarking Alliance)
18. Linking Environment and Farming (LEAF) Marque
19. Better Cotton
20. Forest Stewardship Council (FSC) Certification
21. Marine Stewardship Council (MSC) Certification
22. Textile Exchange Biodiversity Benchmark (launched by the Textile Exchange Program, Corporate Fiber & Materials Benchmark, CFMB)

23. Alliance for Water Stewardship (AWS) Standard
24. Climate, Community & Biodiversity (CCB) Standards
25. FAIRTRADE
26. GLOBALG.A.P.
27. Soil Association Organic farming Standards
28. EcoVadis
29. Programme for the Endorsement of Forest Certification (PEFC)
30. International Sustainability & Carbon Certification (ISCC)
31. Global Reporting Initiative (GRI) Standards
32. Round Table on Responsible Soy (RTRS) Certification
33. LAND360 (Fera)/Defra Biodiversity Metric 3.0 (LAND360)

Table A2. Summary of the rapid scoring exercise

Tool	Sector							Scale						Type					Reference website
	Agriculture	*Forests*	*Water*	*Fisheries*	*Biofuels*	*Other*	*All*	*Site*	*Landscape/Jurisdictional*	*Business unit*	*Corporation*	*Product*	*Value/Supply chain*	*Impacts Metric*	*Mitigation Metric*	*Biodiversity dependence*	*Sustainability Standard*	*Management Guidance*	
Lasting Initiative for Earth (LIFE) Key	x	x	x		x	x	x		x	x				x	x	x	x	x	https://institutolife.org/
Textile Exchange Biodiversity Benchmark						x			x			x	x			x		x	https://mci.textileexchange.org/biodiversity/
Species Threat Abatement and Restoration Metric (STAR)	x	x						x	x	x				x	x			x	https://www.ibat-alliance.org/star?locale=en
Biodiversity Impact Metric (BIM)	x				x				x	x	x	x	x	x				x	https://www.cisl.cam.ac.uk/resources/natural-resource-security-publications/measuring-business-impacts-on-nature
Global Biodiversity Score (GBS)	x	x	x		x	x	x			x			x	x				x	https://www.mission-economie-biodiversite.com/
Biodiversity Guidance Navigation Tool							x			x						x		x	https://capitalscoalition.org/tools/navigation-tool/
Exploring Natural Capital Opportunities, Risk and Exposure (ENCORE)							x			x						x		x	https://encore.naturalcapital.finance/en
Agrobiodiversity Index							x		x	x	x			x				x	https://www.agrobiodiversityindex.org/
Integrated Biodiversity Assessment Tool (IBAT)							x	x	x					x				x	https://www.ibat-alliance.org/

LandScale	x	x	x		x		x		x							x	x	https://www.landscale.org/
Science Based Targets for Nature(SBTN)	x						x			x	x		x					x	https://sciencebasedtargetsnetwork.org
Nature and Biodiversity Benchmark	x	x	x				x				x		x					x	https://www.worldbenchmarkingalliance.org/nature-benchmark/
Biodiversity Metric 3.0	x	x				x		x							x			x	http://nepubprod.appspot.com/publication/6049804846366720
Union for Ethical Biotrade (UEBT) Standard	x	x										x				x	x	x	https://uebt.org/setting-the-standard
LAND360	x	x						x							x			x	https://www.fera.co.uk/land360-land-management
Rainforest Alliance Certification	x				x			x	x			x					x	x	https://www.rainforest-alliance.org/
Roundtable on Sustainable Palm Oil (RSPO) Certification	x				x			x	x	x	x	x	x				x	x	https://rspo.org/certification
Roundtable on Sustainable Biomaterials (RSB) Certification	x				x			x		x	x	x	x				x	x	https://rsb.org/
Better Cotton	x							x		x		x	x				x	x	https://bettercotton.org/
Forest Stewardship Council (FSC) Certification		x						x		x		x	x				x	x	https://fsc.org/en
Marine Stewardship Council (MSC) Certification				x						x		x	x				x	x	https://www.msc.org/uk
International Sustainability & Carbon Certification (ISCC)	x				x			x		x		x	x				x	x	https://www.iscc-system.org/
Roundtable on Responsible Soy (RTRS) Certification	x				x			x		x		x	x				x	x	https://responsiblesoy.org/?lang=en
Biodiversity Performance Tool and Monitoring System	x							x					x				x	x	https://www.biodiversity-performance.eu/
Alliance for Water Stewardship (AWS) Standard		x						x									x	x	https://a4ws.org/the-aws-standard-2-0/

Climate, Community, and Biodiversity (CCB) Standards							x	x	x								x	x	https://www.climate-standards.org/ccb-standards/
FAIRTRADE	x											x					x	x	https://www.fairtrade.org.uk/
GLOBALG.A.P.	x											x					x	x	https://www.globalgap.org/uk_en/
EcoVadis	x	x	x										x					x	https://ecovadis.com/
Program for the Endorsement of Forest Certification (PEFC)		x											x				x	x	https://www.pefc.org/
Linking Environment and Farming (LEAF) Marque	x							x									x	x	https://leaf.eco/
GRI Standards							x			x			x				x	x	https://www.globalreporting.org/standards/
Soil Association Organic Standards	x	x				x						x	x				x	x	https://www.soilassociation.org/our-standards/read-our-organic-standards/

Table A3. Mapping of tools against 2030 Action Targets.

2030 TARGET	SBTN	LEAF	Textile Exchange Biodiversity Benchmark	BIM	STAR	IBAT	LAND360
Target 14. Biodiversity values in policy	Target 14. Considered explicitly in step 3 (ACT).	Target 14. Used by government schemes.	Target 14. Not explicitly aligned with public policy.	Target 14. Useful for policies that target impacts across supply chains.	Target 14. Useful to integrate biodiversity conservation and restoration into policy.	Target 14. It is used to assess the potential biodiversity impacts of development.	Target 14. Not explicitly aligned with public policy.
Target 15. Business biodiversity dependencies+impacts	Target 15. Core objective of the tool.	Target 15. Aimed for farmers to improve the sustainability of their operations.	Target 15. Core objective of the tool.	Target 15. Core objective of the tool, only for ag commodities.	Target 15. The tool quantify opportunity for offsetting biodivesrity extincion risk of different activities.	Target 15. Does not assess impacts but it can inform avoidance of impact by company.	Target 15. Land-owners assess biodiversity and C on their land-holdings, and can assess potential and costs of activities to generate net biodiversity gain.
Target 16. Responsible consumption	Target 16. The tool indirectly support responsible consumption.	Target 16. Independent certification and branding.	Target 16. Indepent benchmarking and guidance for disclosure.	Target 16. Useful for business advocacy.	Target 16. Not explicitly considered.	Target 16. Not explicitly considered. IBAT can be used to inform choices between sites as regards potential biodiversity impact.	Target 16. Not explicitly considered.
Target 17. Biotechnology impacts	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicitly considered.
Target 18. Incentives	Target 18. Incorporated in guidance for target setting.	Target 18. Through alliances with government departments and agencies.	Target 18. Through industry-level benchmarking.	Target 18. Not explicitly considered.	Target 18. Not explicitly considered.	Target 18. Not explicitly considered.	Target 18. The service enables land-owners to calculate a cost-benefit analysis of biodiversity restoration against a possible value of biodiversity credits in the market.
Target 19. Finance	Target 19. Explicit call for financial support.	Target 19. Promotes targeted investment on sustainability.	Target 19. Key component in implementation module.	Target 19. Not explicitly considered.	Target 19. The tool can be useful to identify area for restoration purposes (treath abatement and/or recovery) which could attrach fundings.	Target 19. Through the use of STAR can inform the need for investment to support biodiversity.	Target 19. If the tool could be used to offer biodiversity credits, for which the market is still in development but is supported by government planning requirements.
Target 20. Knowledge (IPLC)	Target 20. Explicit incorporation of other forms of knowledge.	Target 20. Community engagement.	Target 20. Incorporated in guidance.	Target 20. Not explicitly considered.	Target 20. Not explicitly considered.	Target 20. Not explicitly considered.	Target 20. Not explicitly considered.
Target 21. Participation (IPLC+gender+youth)	Target 21. Incorporated in guidance for target setting.	Target 21. Not explicitly considered.	Target 21. Not explicitly considered.	Target 21. Not explicitly considered.	Target 21. Not explicitly considered.	Target 21. Not explicitly considered.	Target 21. Not explicitly considered.

Table A3. Cont.

2030 TARGET	LIFE Key	RSPO Certification	Biodiversity performance tool	Rainforest Alliance Certification	FSC Certification	ENCORE	UEBT
Target 14. Biodiversity values in policy	Target 14. Not explicitly aligned with public policy.	Target 14. The RSPO certification set the requirements for companies to comply with biodiversity protection.	Target 14. Not aligned with policy, main target group is farmers.	Target 14. The stardand include assessment of tree shades, wildlife corridors, and High Conservation Value areas.	Target 14. The standard consider biodiversity value through the identification of High Consevation Value areas.	Target 14. Useful to inform decisions that consider impacts on and dependencies to biodiveristy.	Target 14. Not specifically targeted at governments, but it can support policies on trade.
Target 15. Business biodiversity dependencies+impacts	Target 15. Core objective of the tool.	Target 15. Impacts on biodiversity is assessed (dependancy is not considered).	Target 15. Wide range of impacts from farm activities included.	Target 15. Impacts on biodiversity are assessed over time to ensure biodiversity is mantained or enanched.	Target 15. Impacts on biodiversity are assessed over time (dependencies are not explicitly considered).	Target 15. Core objective of the tool.	Target 15. Impacts on biodiversity are indirectly assessed.
Target 16. Responsible consumption	Target 16. Useful for business advocacy.	Target 16. Not explicitly considered.	Target 16. Intended to support auditors and certifiers of standards as well as product, quality and sourcing managers of food companies.	Target 16. The standard supports auditing and certification of small and medium scale producers.	16 Target. The standard should support responsible choices by constumer, however transparency and accountability do represent an hindrance.	Target 16. Not explicitly considered.	Target 16. Advocating responsible and substainable consumption is the core objective of the tool.
Target 17. Biotechnology impacts	Target 17. Impacts of biotechnology on biodiversity are considered.	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicit mention of biotechnology.	Target 17. Not explicit mention of biotechnology.
Target 18. Incentives	Target 18. Not explicitly considered.	Target 18. Not explicitly considered.	Target 18. Actions/priorities for biodiversity conservation are identified.	Target 18. The standard does not explicitly consider the harmful incentives for biodiversity.	Target 18. Not explicitly considered.	Target 18. Not explicitly considered.	Target 18. The standard indirectly support the reduction of incentives harmful to biodiversity.
Target 19. Finance	Target 19. To comply to the tool standard company will need to financially support conservation plans.	Target 19. Not explicitly considered.	Target 19. Not explicitly considered.	Target 19. Not explicitly considered.	Target 19. Not explicitly considered.	Target 19. Promotes investments on sustainable use of biodiversity.	Target 19. Not explicitly considered.
Target 20. Knowledge (IPLC)	Target 20. Compliance with the Nagoya protocol is included in the standard.	Target 20. Local stakeholders complaints need to be considered by the standard.	Target 20. Not explicitly considered.	Target 20. The standard requires that the certified farms respect rights of local communities and indigenous people (free, prior, and inform consent is is required).	Target 20. The standard requires the inclusion of local communities/indigenous people knowledge through the free, prior and informed consent framework.	Target 20. Not explicitly considered.	Target 20. Local and community knowledge is considered.
Target 21. Participation (IPLC+gender+youth)	Target 21. Not explicitly considered.	Target 21. Local participations is considered by the standard of the certification.	Target 21. Not explicitly considered.	Target 21. Participation of local communities and indigenour people is supported by the standard.	Target 21. The standard requires the participation of local communities/indigenous people through the free, prior and informed consent framework.	Target 21. Not explicitly considered.	Target 21. Participation of local and indigenous communities is supported by the tool.

In-depth review of tools

Biodiversity Impact Metric (BIM)

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
The Biodiversity Impact Metric can be used by businesses to quantify and screen their impacts on biodiversity along the supply chain for their sourcing of agricultural/raw materials (overall impacts can be divided by sourcing materials and sourcing locations). The metric can also be used to identify and prioritise areas where the impacts on biodiversity area greater. The metric can inform businesses' sustainable targets and can be used to identify options for reducing impacts on biodiversity and to monitor how different strategies could have different impacts on biodiversity.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
The metric evaluates the impacts on biodiversity based on

i. the area needed for the production of the sourcing materials considered
ii. the proportion of biodiversity lost due to land use change to produce the sourcing materials as opposed to the natural habitat (this depends on the type of land use and on the management intensity)
iii. the relative importance of the biodiversity in the particular area considered (based on species richness and rarity of these species based on the relative range size). The objective of the tool is to identify the areas of production of the sourcing material with higher impacts on biodiversity in order to set options and targets to reduce those impacts.

(iii) When? Is the tool informing current or future operations?
The metric underpins current operations (impacts on biodiversity for production of sourcing materials and commodities) but can also be used to identify strategies for future operations (different scenarios, e.g. reduction of land area for production in a certain area or reduction of intensity of management in other areas).

(iv) Who for? What is the primary audience that uses the result of tool?
Businesses and companies whose activities rely on agricultural commodities.

(v) How often? What is the frequency of use of the tool?
There is no specific indication on how often the tool should be used.

(vi) How detailed is it? What is the spatial scale of tool use?
The metric can be used at any scale. However, the metric was parametrised at eco-region scale (area with a particular collection of species, natural communities, and environmental conditions), therefore care is needed when trying to use the metric at a fine spatial scale. Country scale is often the best compromise for many businesses. If finer information is available, assessments at fine scale can be obtained.

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological & socio-economic factors
The indicator considers the area involved in the production of the commodities of interest, the management of the area (level of intensification), and biodiversity affected by the production (species richness and uniqueness/rarity). Socio-economic factors are not included in the metric but can be indirectly and partially considered through management intensity.

(ii) Creating indicators as proxies for biodiversity
The metric assesses impacts on biodiversity. Biodiversity is accounted for by species in the area of interest (their richness and rarity) and the proportion of biodiversity lost due to a particular land use (compared to the natural status). The metric can be compared to the global average, in order to identify priority areas for intervention.

(iii) Quantifying and valuing biodiversity impacts
The metric assesses impacts on biodiversity of producing certain commodities in a specific area.

(iv) Screening biodiversity risks and tipping points
The metric can identify areas with higher impacts on biodiversity, so it can be used by businesses to identify areas of high-risk locations where impacts most likely contribute to species' extinction and therefore biodiversity depletion (e.g.: areas with high range rarity).

(v) Assessing trade-offs between different types of capital
The tool does not assess trade-offs.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
The metric needs numerical measurements of

i. area required to produce the materials purchased by the company or the volume purchased (if available actual yield)
ii. land use type and management intensity
iii. location of the production of the sourcing commodities at least at country level.

The last part of the information is used to infer biodiversity importance for that area. Detailed information about the commodities' sourcing area improves the assessment of impacts on biodiversity.

(ii) Indicators
Due to how the metric is calculated with equal weight to all variables (area under production x proportion of biodiversity lost x biodiversity importance) much importance is given to the area. Therefore, relative estimations should be used, instead of absolute values of the metric. Due to the equal weight of the different variables, the metric cannot properly inform trade-offs between the variables. As a result, it cannot quantify how a reduction in area used for production could reduce impacts on biodiversity, as opposed to decreasing the intensity of the management in the same area. This is because the metric is mainly driven by the area.

(iii) Capacity or skills required to use the tool or generate a score
The tool can be used by a business with relatively little data and information needed. However, for more locally detailed assessments, scientific expertise and skills might be needed.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	Impact on biodiversity is assessed by evaluating the supply chain of a business. The tool is for use by businesses and companies; it does not account for poverty reduction strategies.
Target 15. All businesses (public and private, large, medium and small) assess and report on	Impacts on biodiversity and dependencies on certain commodities can be evaluated by all

their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	businesses (that use agricultural commodities) at different spatial levels (local, country). Comparison with the global average metric can help a business to prioritise certain areas for reduction of impacts.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	It can help businesses to evaluate their impacts on biodiversity and advocate for sustainable activities and strategies on where to purchase the necessary commodities to reduce those impacts.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	Businesses can evaluate the impacts on biodiversity due to different intensity of management, therefore informing stakeholders on better strategies and on feasible targets.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	The tool does not specifically address impacts on biodiversity due to harmful incentives or subsidies. It can, however, indirectly assess those risks by introducing their impact on the variable on proportion of biodiversity lost.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	Out of scope of the tool.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision making for the effective management of biodiversity.	The tool does not integrate local communities' knowledge into the biodiversity impacts assessment. However, if the commodities considered are cultivated by local communities and indigenous peoples, the tool can integrate their knowledge into the metric.
Target 21. Ensure equitable and effective participation in decision making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	Out of scope of the tool.

Biodiversity Performance Tool (BPT)

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
The tool is intended to allow assessment of the integration of biodiversity-based management decisions at the farm level. The intention is to provide an evidence base for integration of agricultural activities that provide benefits, not just in terms of biodiversity, but also ecosystem services that operate at landscape level (natural regulation, pollination reduction/prevention of soil erosion, etc.).

(ii) What? What aspect of biodiversity is being assessed and for what objective?
The characterisation of the environmental/agroecological condition of the farm through quantification of semi-natural habitats (hedgerows, field margins, woodlots, grasslands with no fertilisers and pesticides), as well as accompanying focus on the role of local, indigenous, exotic and invasive species. Farm practices (such as intensive use of pesticides and fertilisers, destruction of semi-natural habitats) are characterised based on indicator scores across different criteria.

(iii) When? Is the tool informing current or future operations?
Present performance mostly.

(iv) Who for? What is the primary audience that uses the result of tool?
Farm managers including food sector actors (sourcing/product managers) as well as for certification companies (certifiers and auditors).

(v) How often? What is the frequency of use of the tool?
Not specified but some indicators imply a time restriction based on seasonality/growing period.

(vi) How detailed? The spatial scale of tool use?
78 indicators across a number of categories. Reflecting state of biodiversity, farm management (including livestock) and farmer value sets. It works at farm and plot level, but there is potential for Landscape/Territory elements to be included.

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological & socio-economic factors
Indicators reflect agronomic practices and ecological conditions as well as management emphasis (Knowledge exchange with suppliers, millers or distributors and exchange experience on biodiversity aspects).

(ii) Creating indicators as proxies for biodiversity
The tool contains 78 indicators across three main pillars. Some are arguably proxies (e.g. grazing use, presence of intercropping, % of semi-natural habitats, presence of woodlots and forest edges close to cultivated plots), albeit proxies with a justified and credible applicability to biodiversity. Others are arguably more direct measures, e.g. composition of agroforestry or hedge elements, number of rare or endangered species/varieties.

(iii) Quantifying and valuing biodiversity impacts
Each indicator has a different unit of quantification (e.g. total number of livestock unit at farm level is calculated by using defined tables of LU coefficients, the higher score is obtained if the maximal mean livestock density is < 0,5 LU/hectare (ha) of main fodder area). Based on the result, a score of (very) unfavourable to (very) favourable is obtained for each indicator.

(iv) Screening biodiversity risks and tipping points
Locational site/conditions such as semi-natural habitat are included to reflect current conditions of the farm. For each indicator, the score is determined against criteria established to be more or less beneficial to biodiversity. For example, for evidence of good practice in nitrogen management is scored against presence of practices from a defined list, farmers obtain the lowest score when just the splitting of nitrogen inputs (at least at three specific crop stages) is performed; a medium score where two or three actions are applied and the score highest when four or more actions are implemented.

(v) Assessing trade-offs between different types of capital.
The tool does not assess trade-offs.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
Scores based on both descriptive and numerical inputs including observing/recording of conditions on the farm and broad descriptions of activities undertaken. Each indicator has criteria for a high to low score based on defined thresholds informed by a categorisation of practices that are more or less favourable. There is limited direct evaluation. Thresholds appear fixed, although weightings can be applied to prioritise key aspects of performance.

(ii) Indicators
The tool uses a wide range of indicators. In some cases, it is not clear exactly how data can be used to generate a score. For example, the data used to measure soil biological functioning is unclear, as are the thresholds. Presumably, these would have to be relevant to the specific crop, region or soil type. This links to the point that the thresholds are arguably heavily influenced by conditions for European farming systems (not necessarily a shortcoming) and therefore performance thresholds would need to be adapted to other settings. This has been done for Coffee Cultivation in Colombia in conjunction with Rainforest Alliance.
The extent to which the thresholds for translating inputs into scores is unclear in some cases and arguably may not accurately translate into biodiversity impacts, as the score is dependent on time since the most recent (e.g. soil analysis) was undertaken. Additionally, the benefits of changing practices may not linearly scale with benefits (e.g. moving from 2 to 'good' 4 practices does not mean the biodiversity benefit doubles or the benefit is more favourable). There is some element of subjectivity in determining the performance against criteria, but guidance is given.

The inclusion of mapping software to evidence some inputs (such as linear length of low hedgerows) is interesting but potentially difficult to verify. Scores are presented across criteria (bad and good performance evidenced), but this limits comparability, except over time for the same criteria.

(iii) Capacity or skills required to use the tool or generate a score
Online tool, familiarity of using Google Maps needed.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty-reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	Focused on farm level interaction. However, results intended to identify both practices that can be expanded and implemented within a farm planning and management cycle. Unclear how poverty reduction is included. Greater number of main crop varieties rewarded but not yield.

Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	Mostly applicable to farm activities. Wide range of farm activities and appropriation of natural capital included which present individuated scores. The presence of semi-natural habitats is a key component.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	SWOT analysis generated based on scoring. There is a dedicated component on the weakness to be improved by actions being implemented (found in the tab 'Proposal of actions').
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	Focused on Europe. Health impact measured indirectly through indicators based on inputs and nutrient security. Use of pesticides figures in several indicators.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	The identification of strengths and weaknesses along with opportunities or priorities can emphasise the importance of key attributes. The tool includes a list of proposed actions to be implemented to improve the biodiversity conservation at farm level.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	Very limited; the tool includes workers' qualifications and update of knowledge and cooperation with external experts as indicators.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision making for the effective management of biodiversity.	The tool rewards involvement in a local network and self-learning about agroecology and alternative methods which presumably can include traditional knowledge bases.
Target 21. Ensure equitable and effective participation in decision making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	The tool rewards engagement of the farm in a product certification process, attendance at training sessions organised by standards or farmers association or cooperative, etc.

Union for Ethical Biotrade (UEBT) standard

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
It establishes good practice guidance on the way companies source ingredients from biodiversity (cultivation, harvesting collection). In practice, this amounts to companies making commitments to ethical sourcing. This is achieved through a family of mechanisms such as UEBT Membership Conditions and Obligations, UEBT Ingredient Certification Protocol, UEBT Ethical Sourcing System Protocol, and UEBT certification of natural raw materials, UEBT chain of custody certification, UEBT certification checklists. It seeks to support biodiversity regeneration and consists of the standard, an association of companies that have made commitments and a knowledge-sharing platform.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
The Ethical BioTrade Standard is applied to raw materials such as plant parts (e.g. flowers, leaves, roots, stems, fruits or bark) and plant compounds (e.g. plant-based oils, butters, waxes, extracts, flavours, fragrances, colorants). Plant cells, microorganisms, algae and beeswax would also be covered. This standard also refers to this type of raw material as 'natural raw material'. The standard includes good practices on biodiversity conservation, good agricultural practices, fair prices for smallholders and pickers, and decent wages for workers in local processing companies.

The UEBT standard is applicable to a wide variety of production systems including agroforesty and wild collection, which refers to harvesting of plants and other natural raw materials from natural habitats (e.g. shea, sea buckthorn, wild apples, rosehip, blackcurrant leaves).

The first principle (1 of 7) is based on conservation and is implemented through 3 areas:

i. Information on biodiversity is collected in cultivation or wild collection areas
ii. Concrete actions are taken to maintain, regenerate, or enhance biodiversity in cultivation or wild collection areas
iii. To ensure relevance and continuous improvement, concrete actions are periodically adjusted to changing conditions. For example a **critical stepwise** component for ii) above includes demonstrating concrete actions to maintain, regenerate, or enhance biodiversity are initiated or supported in cultivation or wild collection areas.

The standard recognises concrete actions as:

i) Actions to protect and regenerate ecosystems and habitats, including: contributing to management plans and monitoring systems for water basins, forests and other relevant habitat.
ii) Actions to protect and regenerate biodiversity in specific areas, including: Setting up, maintaining or regenerating areas covered by naturally occurring, rare, protected and endangered vegetation.
iii) Actions to protect plant and animal species, including: Regenerating or maintaining vegetation bordering waterways as important habitats.
iv) Actions to promote habitat connectivity, including: Creating corridors that connect habitats in cultivation or collection areas.

Principle 2 practices concern key components of biodiversity such as species diversity and genetic diversity. These practices also extend to soil, water and air in cultivation and wild collection sites.

(iii) When? Is the tool informing current or future operations?
Intended primarily to current practices but intended to embed good practices in the longer term through review of performance against standard. Verification is required to maintain UEBT membership.

(iv) Who for? What is the primary audience that uses the result of tool?
Businesses.

(v) How often? What is the frequency of use of the tool?
UEBT certification is granted once an independent audit establishes compliance with the UEBT standard in the cultivation and wild collection areas of specific raw materials. For critical stepwise indicators, additional time for compliance is provided. Compliance with these indicators must be achieved in a maximum of three years. The monitoring and evaluation system focuses on short-term changes in the first instance, and medium and long-term effects achieved by member companies and their supply chains up to the cultivation and wild collection areas.

(vi) How detailed? What is the spatial scale of tool use?
Primarily Value chain but embodied activities at the farm level indirectly (e.g. How many farms adopt X practice?).

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological & socio-economic factors
The standard contains 7 different principles which collectively generate a number of sub-criteria, each of which contains a number of indicators against which performance is scored. These principles include a range of aspects from environmental to social and economic:

1 Conservation of biodiversity
2 Sustainable use of biodiversity
3 Fair and equitable sharing of benefits derived from the use of biodiversity
4 Socio-economic sustainability (productive, financial and market management)
5 Compliance with national and international legislation
6 Respect for rights of actors involved in biotrade activities
7 Clarity about land tenure, right of use and access to natural resources

For example 7.2 is a critical indicator requiring the rights and traditional practices of indigenous peoples and local communities are respected.

(ii) Creating indicators as proxies for biodiversity
Most indicators are proxies or indirect measurements of performance. For example, an indicator for Principle 1 is the number of actions implemented for biodiversity conservation, and an indicator for Principle 2 is the number of farmers that have reduced or stopped the use of agrochemicals.

The standard includes a set of indicators across each principle; compliance is required to receive or maintain UEBT certification. Evidence of good practice in each of these principles is assessed via performance against sub-criteria indicators, each of which is designated by their criticality and required level of performance. For example, compliance is always required for indicators that constitute a minimum requirement, and companies and organisations must comply with these requirements **prior to** obtaining UEBT membership. For critical stepwise indicators, additional time for compliance is provided. Compliance with these indicators must be achieved in a maximum of three

years. A scoring system is applied against each indicator ranging from Not applicable (0) to Fulfilled (3).

(iii) Quantifying and valuing biodiversity impacts
The standard provides guidance on measuring progress against indicators and provides time for critical indicators to be verified. But the specific guidance is not clear. Quantitative or qualitative parameters can be assessed in relation to criteria. Where an indicator applies only to a specific situation (e.g. cultivation or collection), this is expressly mentioned in the indicator.

(iv) Screening biodiversity risks and tipping points
Some indicators require compliance of the defined regional sensitivities such as those under the first sub-criterion of the second pillar 'Sustainable use of biodiversity'.

2.1 Practices are adopted to ensure sustainable use of the species cultivated or wild collected, and to prevent or mitigate negative impact on other species'.

> 2.1.1 Minimum requirement: Cultivation, wild collection and trade in cultivated and wild collected species comply with laws and regulations implementing the **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)** and other national or local rules on rare, threatened or endangered species.
>
> 2.1.2 Minimum requirement: Cultivation and wild collection activities do not take place **in protected areas** where such activities are not allowed.
>
> 2.1.3 Critical stepwise: In protected areas where cultivation and wild collection activities are allowed, such activities take place in line with official management plans.
>
> 2.1.4 Critical: Cultivation and wild collection activities do not intentionally introduce invasive species, as defined in the 'Global Register of Introduced and Invasive Species,' other scientific information, and local knowledge.

Examples of sustainable use practices in wild collection include collection quantities and intensity ensure regeneration over time.

(v) Assessing trade-offs between different types of capital
Given the breadth of topics, the trade-offs between natural capital and economic and social capital enhancement will be reflected indirectly. However, this requires a coherent process to identify the most appropriate indicators to evidence trade-offs. As part of evidencing the impact, the standard explicitly references the use of indicators to measure medium/long-term effects of implementing Ethical BioTrade practices in UEBT members and their supply chains. These effects are considered to include the benefits for people and biodiversity, as well as possible unintended effects of implementing Ethical BioTrade principles.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
UEBT has a procedure for identifying addressing and managing exceptions to the Ethical BioTrade Standard and the assessment process but this not immediately clear.
The scoring system is not as clearly defined as in other cases (0-3) and there may be risk of over scoring. A score of 2 is achieved where 'Measures have been taken towards compliance with the indicator. Though improvement is possible, the measures are enough to find compliance with the

indicator, but improvements are recommended. Therefore, this depends on sufficiently robust minimum compliance requirements. In addition, good performance may be easily identified for some indicators (e.g. 6.4.4 Critical First aid equipment is available, and safety instructions and procedures for accident prevention are in place. (Performance may be less clearly definable in others, e.g. 4.1.1 Critical stepwise: Formal commitments are established to advance Ethical BioTrade practices).

(ii) Indicators
Wide range of (> 100) individual indicators used. Mostly covering good practice.

(iii) Capacity or skills required to use the tool or generate a score
Intended for use for larger companies with significant interaction along all aspects of the supply chain and ability to mobilise and engage with farmers, processers etc.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	Not necessarily targeted at governments but a government could use when establishing trade rules or enforcing.
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	Yes, indirectly.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	Yes, fully.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	Not aligned
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	Yes
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private	N/A

finance, and increasing domestic resource mobilisation.	
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision making for the effective management of biodiversity.	Yes
Target 21. Ensure equitable and effective participation in decision making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	Yes

RSPO (Roundtable on Sustainable Palm Oil) Certification

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?

The RSPO is a certification scheme for palm oil production and its supply chain. The purpose of certification is to demonstrate that specified requirements under the scheme's Principle and Criteria (P&C) are met by the producer or supply chain actor being evaluated/audited. The latest RSPO standard (updated in 2020) is defined by 7 broad principles:

1) behave ethically and transparently
2) operate legally and respect rights
3) optimise productivity, efficiency, positive impacts and resilience
4) respect community and human rights and deliver benefits
5) support smallholder inclusion
6) respect workers' rights and conditions
7) protect, conserve and enhance ecosystems and the environment.

Within each of these principles, there are numerous criteria (requirements) and indicators that need to be met by the entity being evaluated in order to be certified as 'sustainable'.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
Biodiversity is assessed through the HCV (High Conservation Values) and HCS (High Carbon Stock; above ground) assessment methodology. The identified HCV and HCS area(s) would then need to be conserved or maintained.

The HCV assessment was developed by the Forest Stewardship Council (FSC) in 1999 as part of its Forest Management Certification standards. It is designed to maintain or enhance six environmental and social values in production landscapes. It is not intended to prevent all deforestation, but to maintain environmental and social values of particular importance.

Detailed methodology for HCV assessment:
www.proforest.net/fileadmin/uploads/proforest/Documents/Publications/hcv-20good-20practice_final.pdf.

The HCS assessment approach was developed by the palm oil company Golden-Agri Resources (GAR), Greenpeace and The Forest Trust (TFT) in 2013. The methodology separates HCS (above ground) areas (viable natural forest) from non-HCS areas (degraded land). highcarbonstock.org/wp-content/uploads/2017/05/HCSA-Toolkit-v2.0-Module-1-Introduction-190917-web.pdf

Note on RSPO P&C specifically related to biodiversity:
"Protect, conserve and enhance ecosystems and the environment" is one of the RSPO principles for sustainability. The P&C related to biodiversity is outlined in Criteria 7.12: "Land clearing does not cause deforestation or damage any area required to protect or enhance High Conservation Values (HCVs) or High Carbon Stock (HCS) forest. HCVs and HCS forests in the managed area are identified and protected or enhanced. "

This includes indicators (to be verified against):

- 7.12.1 (C) Land clearing since November 2005 has not damaged primary forest or any area required to protect or enhance HCVs. Land clearing since 15 November 2018 has not damaged HCVs or HCS forests. A historic Land Use Change Analysis (LUCA) is conducted prior to any new land clearing, in accordance with the RSPO LUCA guidance document.

- 7.12.2 (C) HCVs, HCS forests and other conservation areas are identified as follows:
  a) For existing plantations with an HCV assessment conducted by an RSPO-approved assessor and no new land clearing after 15 November 2018, the current HCV assessment of those plantations remains valid.
  b) Any new land clearing (in existing plantations or new plantings) after 15 November 2018 is preceded by an HCV-HCS assessment, using the HCSA Toolkit and the HCV-HCSA Assessment Manual. This will include stakeholder consultation and take into account wider landscape-level considerations.
- 7.12.3 (C) In High Forest Cover Landscapes (HFCLs) within HFCCs, a specific procedure will apply for legacy cases and development by indigenous peoples and local communities with legal or customary rights, taking into consideration regional and national multi-stakeholder processes. Until this procedure is developed and endorsed, 7.12.2 applies.
- 7.12.4 (C) Where HCVs, HCS forests after 15 November 2018, peatland and other conservation areas have been identified, they are protected and/or enhanced. An integrated management plan to protect and/or enhance HCVs, HCS forests, peatland and other conservation areas is developed, implemented and adapted where necessary, and contains monitoring requirements. The integrated management plan is reviewed at least once every five years.
- The integrated management plan is developed in consultation with relevant stakeholders and includes the directly managed area and any relevant wider landscape level considerations (where these are identified).
- 7.12.5 Where rights of local communities have been identified in HCV areas, HCS forest after 15 November 2018, peatland and other conservation areas, there is no reduction of these rights without evidence of a negotiated agreement, obtained through FPIC, encouraging their involvement in the maintenance and management of these conservation areas.
- 7.12.6 All rare, threatened, or endangered (RTE) species are protected, whether or not they are identified in an HCV assessment. A programme to regularly educate the workforce about the status of RTE species is in place. Appropriate disciplinary measures are taken and documented in accordance with company rules and national law if any individual working for the company is found to capture, harm, collect, trade, possess or kill these species.
- 7.12.7 The status of HCVs, HCS forests after 15 November 2018, other natural ecosystems, peatland conservation areas and RTE species is monitored. Outcomes of this monitoring are fed back into the management plan.
- 7.12.8 (C) Where there has been land clearing without prior HCV assessment since November 2005, or without prior HCV-HCSA assessment since 15 November 2018, the Remediation and Compensation Procedure (RaCP) applies.

(iii) When? Is the tool informing current or future operations?
Verification of the standards through auditing process informs past and present performance.

(iv) Who for? What is the primary audience that uses the result of tool?
Business itself, investors, policymakers, and consumers/public. Certification is intended to increase confidence in the organisation's products and services and to boost trust both between cooperation partners and among suppliers in a supply chain.

(v) How often? What is the frequency of use of the tool? (annually, one-off, every X years…)
RSPO standards undergo re-certification auditing every five years. In between these five-year intervals, there are annual surveillance audits.

(vi) How detailed is this? What is the spatial scale of tool use?
There are different kinds of certification schemes associated with the unit being evaluated: (1) mills and the associated plantations; (2) smallholders; (3) landscape (jurisdictional, at regency or kabupaten level for Indonesia).

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological & socio-economic factors
The standards distinguish these elements separately under the P&C. P&C 1-3 (behave ethically and transparently; operate legally and respect rights; optimise productivity, efficiency, positive impacts, and resilience) is associated with the PROSPERITY goal (towards competitive, resilient, and sustainable sector). P&C 4-6 (respect community and human rights and deliver benefits; support smallholder inclusion; respect workers' rights and conditions) is associated with the PEOPLE objective (towards sustainable livelihoods and poverty reduction). P&C 7 (protect, conserve, and enhance ecosystems and the environment) is associated with the PLANET objective (towards conserved, protected and enhanced ecosystems that provide for the next generation).

(ii) Creating indicators as proxies for biodiversity
As proxies for measuring biodiversity as part of the auditing process, the standards used HCV (High Conservation Values) and HCS (High Carbon Stock) assessment methodology. The HCV and HCS results are not normally made public, and assessors and auditors often lack knowledge and capacity for HCV management and monitoring.

(iii) Quantifying and valuing biodiversity impacts
Biodiversity impact based on RSPO standards is evaluated by tracking the change over time, e.g. before and after certification, or before and after recertification, to ensure that areas identified as HCV and HCS are maintained.

(iv) Screening biodiversity risks and tipping points
The standards measure social and environmental conditions through time, i.e. improvement, maintained, or reduction.

(v) Assessing trade-offs between different types of capital
No assessment of trade-offs between different capitals.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
Descriptive, tracking change based on HCV and HCS, which can vary by skills of assessors.

(ii) Indicators
HCV and HCS assessments require a complex procedure and trained/skilled assessors. Results of the assessment are not typically made public.

(iii) Capacity or skills required to use the tool or generate a score
The tool requires a trained and certified verifier/auditor to generate the P&C scores. HCV assessment is particularly challenging as it requires numerous surveys, both field surveys of biodiversity (plants and animals) and stakeholder surveys (communities around the candidate HCV areas).

An example of complexities of the HCV assessment:
In a 60,000-ha concession of lowland rainforest in Sumatra, Indonesia, data from a local university field trip together with sightings by the forest management company staff, indicate the presence of both elephants and tigers together with a number of other threatened and vulnerable species. Therefore, the HCV is present. As tigers and elephants both have large ranges, even without any data it can be assumed that if they are present, they are potentially located throughout the assessment area and, since both tigers and elephants are known to use agricultural land to hunt or browse respectively, also in any adjacent agricultural areas. Therefore, it can be concluded that this HCV is distributed throughout and around the assessment area. However, more specific data is required to understand the current status and behaviour of the species, which is needed to make the link to management planning. This requires some understanding of the size of the population and the relative importance of different habitat types for different activities including resting, feeding, and reproduction.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	The RSPO certification scheme P&C outlines the requirement for companies, smallholders and supply chain to comply with biodiversity protection and enhancement targets, as well as remediating social issues.
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	As part of the certification compliance, producers and supply-chain actors need to make the auditing results public and accessible from their company webpage or RSPO website. However, there is no requirement for the biodiversity assessment (data and analysis of HCV, HCS, and peat depth) to be made public.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	Not explicitly considered.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	Not explicitly considered.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	Not explicitly considered.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to	Not explicitly considered.

developing countries, leveraging private finance, and increasing domestic resource mobilisation.	
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity.	The RSPO's P&C outlines the requirement for companies, smallholders and supply chain to respect rights of local communities and indigenous people with free, prior, and informed consent (FPIC). The P&C also requires a mutually agreed and documented system for dealing with complaints, grievances and conflicts, which is implemented and accepted by all affected parties.
Target 21. Ensure equitable and effective participation in decision making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth	Same as Target 20.

Rainforest Alliance Certification Sustainable Agriculture Standard (RA-standard)

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
The RA-standard is a certification scheme for agricultural commodity production and supply chain (mainly cocoa, coffee, tea, and banana). The purpose of certification is to demonstrate that specified requirements under the scheme's Principle and Criteria (P&C) are met by the producer or supply-chain actor being evaluated/audited. The latest RA-standard (updated in 2022) is defined by 6 broad principles: (1) management; (2) traceability; (3) income and shared responsibility; (4) farming; (5) social; and (6) environment.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
Various requirements in the RA-standard aim to maximise the positive impact and minimise the negative impact of production on biodiversity, including:

1. Maintaining and increasing the diversity of native vegetation through practices like **agroforestry** (a practice of nurturing existing trees and planting new ones side by side with crops) and establishing **wildlife corridors**.
2. Taking steps to diversify the type of crops and vegetation grown on the farm and support functional biodiversity (i.e. pollinators and natural predators of pests) through an **Integrated Pest Managemen**t strategy.
3. Supporting the **protection of endangered species** and other native flora and fauna by prohibiting hunting, minimising the spread of invasive species, and taking steps to **minimise human-wildlife conflict.**
4. Minimising negative impacts from farming by **improving soil health** through mechanisms like erosion control and increasing soil organic matter.

To identify area for protection/maintenance, HCV assessment is primarily used.

(iii) When? Is the tool informing current or future operations?
Verification of the standards through auditing process informs past and present performance.

(iv) Who for? What is the primary audience that uses the result of tool?
Business itself, investors, policymakers, and consumers/public. Certification is intended to increase confidence in the organisation's products and services and to boost trust both between cooperation partners and among suppliers in a supply chain.

(v) How often? What is the frequency of use of the tool?
RA-standards undergo re-certification auditing every three years. In between these three-year intervals, there is a surveillance audit every year.

(vi) How detailed? The spatial scale of tool use?
There are three types of certification units: (1) small farms, (2) large farms, and (3) group certification. Smallholders can either become individually certified or be granted a group certification. Large producers can be granted certification at farm level, or jointly as a group (i.e. if they can form part of a mixed group with both smallholders as well as large farms).

Small farms are small-scale agricultural producers that primarily rely on family or household labour, or workforce exchange with other members of the community. They might hire temporary workers for seasonal tasks or even hire (a few) permanent workers when the farmer or his/her family cannot do the work by themselves. Small farms can't afford to be certified individually and usually need to rely on the group management/certification for record development and record keeping. Large

producers are defined as producers that use hired labour, and therefore do not rely primarily on family labour.

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological & socio-economic factors
The standards distinguish these elements separately under the P&C: (1) management; (2) traceability; (3) income and shared responsibility; (4) farming; (5) social; and (6) environment.
The standard also treats small farmers and large producers differently so that each producer type can focus on topics that are most relevant for their situation. For large producers, there is a stronger focus in the core requirements on social issues related to workers and families that live on-site, as well as on certain environmental topics. For smallholders, the standard gives special attention to strengthening the group management capacity over time.

(ii) Creating indicators as proxies for biodiversity
As proxies for measuring biodiversity as part of the auditing process, the standards used HCV (High Conservation Values). The HCV assessment was developed by the FSC in 1999 as part of its Forest Management Certification standards. It is designed to maintain or enhance six environmental and social values in production landscapes. It is not intended to prevent all deforestation, but to maintain environmental and social values of particular importance. Detailed methodology for HCV assessment: www.proforest.net/fileadmin/uploads/proforest/Documents/Publications/hcv-20good-20practice_final.pdf

(iii) Quantifying and valuing biodiversity impacts
Biodiversity impact based on RA-standards is evaluated by tracking the change over time (through audit reports), before and after certification, or before and after re-certification, to ensure that areas identified as HCV and other biodiversity indicators are maintained or enhanced.

(iv) Screening biodiversity risks and tipping points
The standards only measure environmental conditions through time, i.e., improvement, maintained, or reduction.

(v) Assessing trade-offs between different types of capital
No assessment of trade-offs between different capitals.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
Descriptive, tracking change based on HCV and other biodiversity indicators (e.g., natural vegetation, riparian buffers, shade-tolerant crops).

(ii) Indicators
HCV assessment require a complex procedure and trained/skilled assessors; thus results may vary by assessor skills.

(iii) Capacity or skills required to use the tool or generate a score
The tool requires a trained and certified verifier/auditor to generate the P&C scores.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	The standard includes assessment of tree shades, wildlife corridors, and High Conservation Value areas.
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	Impacts on biodiversity are assessed over time to ensure biodiversity is maintained or enhanced.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	The standard supports auditing and certification of small- and medium-scale producers.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	No explicit mention of biotechnology.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	The standard does not explicitly consider the harmful incentives for biodiversity.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	Not explicitly considered.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity.	The standard requires that the certified farms respect rights of local communities and indigenous people (free, prior, and inform consent is required).
Target 21. Ensure equitable and effective participation in decision making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	Participation of local communities and indigenous peoples is supported by the standard.

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
The FSC standard covers ten principles which any forest operation must adhere to before it can receive FSC certification. These principles cover a broad range of issues, from maintaining high conservation values to community relations and workers' rights, as well as monitoring the environmental and social impacts of forest management.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
HCV assessment is primarily used to identify biodiversity hotspots and high conservation values areas perceived by local communities for protection/maintenance. HCV assessment requires not only biophysical biodiversity measures, but also consent from local communities as users of the HCV areas (through FPIC mechanism).
www.proforest.net/fileadmin/uploads/proforest/Documents/Publications/hcv-20good-20practice_final.pdf.

(iii) When? Is the tool informing current or future operations?
Verification of the standards through auditing process informs past and present performance.

(iv) Who for? What is the primary audience that uses the result of tool?
Business itself, investors, policymakers, and consumers/public. Certification is intended to increase confidence in the organisation's products and services and to boost trust both between cooperation partners and among suppliers in a supply chain.

(v) How often? What is the frequency of use of the tool?
FSC undergoes re-certification auditing every three years. In between these three-year intervals, there are surveillance audits every year.

(vi) How detailed is it? What is the spatial scale of tool use?
There are four types of certification unit: (1) Group & SLIMF (small or low-intensity managed forests) for smallholders; (2) Company (operating under Forest Management Unit – FMU), (3) National; and (4) Supply chain (Controlled wood standard, material from acceptable sources).
The controlled wood requirements identify five categories of unacceptable sources for wood:

- Illegally harvested wood
- Wood harvested in violation of traditional and human rights
- Wood harvested in forests in which high conservation values (HCVs) are threatened by management activities
- Wood harvested in forests being converted to plantations or non-forest use
- Wood from forests in which genetically modified trees are planted

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological & socio-economic factors
The standards distinguish these elements separately under the P&C: (1) Compliance with Laws: (2) Workers' Rights and Employment Conditions; (3) Indigenous Peoples' Rights; (4)Community Relations; (5) Benefits from the Forest; (6) Environmental Values and Impacts; (7) Management Planning; (8) Monitoring and Assessment; (9) High Conservation Values; (10) Implementation of Management Activities.

(ii) Creating indicators as proxies for biodiversity
As proxies for measuring biodiversity as part of the auditing process, the standards use HCV (High Conservation Values). The HCV assessment was developed by the FSC (Forest Stewardship Council) in 1999 as part of its Forest Management Certification standards. It is designed to maintain or enhance six environmental and social values in production landscapes. It is not intended to prevent all deforestation, but to maintain environmental and social values of particular importance. Detailed methodology for HCV assessment:
www.proforest.net/fileadmin/uploads/proforest/Documents/Publications/hcv-20good-20practice_final.pdf.

(iii) Quantifying and valuing biodiversity impacts
Biodiversity impact is evaluated by tracking the change over time (through audit reports), before and after certification, or before and after re-certification, to ensure that areas identified as HCV and other biodiversity indicators are maintained or enhanced.

(iv) Screening biodiversity risks and tipping points
The standards only measure environmental conditions through time, i.e., improvement, maintained, or reduction.

(v) Assessing trade-offs between different types of capital
No assessment of trade-offs between different capitals.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
Descriptive, tracking change based on HCV assessment.

(ii) Indicators
HCV assessment requires a complex procedure and trained/skilled assessors, thus results may vary by assessor skills.

(iii) Capacity or skills required to use the tool or generate a score
The tool requires a trained and certified verifier/auditor to generate the P&C scores.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	The standard considers biodiversity value through the identification of High Conservation Value areas.
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	Impacts on biodiversity are assessed over time (dependencies are not explicitly considered).
Target 16. Ensure that people are encouraged and enabled to make responsible choices and	The standard should support responsible choices by customers; however transparency and accountability do represent a hindrance.

have access to relevant information and alternatives.	
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	Not explicitly considered.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	Not explicitly considered.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	Not explicitly considered.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity.	The standard requires the inclusion of local communities/indigenous peoples' knowledge through the free, prior, and informed consent framework.
Target 21. Ensure equitable and effective participation in decision-= making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	The standard requires the participation of local communities/indigenous people through the free, prior, and informed consent framework.

Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE)

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
To inform businesses about their exposure to nature (natural capital and the ecosystem services it provides) and the associated risks, dependencies. and opportunities.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
Biodiversity is included directly as 'species' and 'habitat' components of natural capital; a number of the ecosystem services are direct functions of biodiversity such as pest regulation, or pollination. Nevertheless, all ecosystem services by definition depend on biodiversity and a functioning ecological system.

(iii) When? Is the tool informing current or future operations?
Its aim is to inform future decisions but based on the exposure of the business given the nature of its operations. There is a classification of business types by sector, subsector, and process that businesses can choose from, and based on this selection the programme automatically selects the natural capital and ecosystem services which the business is considered to depend on, plus an assessment of the degree of dependency (materiality rating) should that service be disrupted.

(iv) Who for? What is the primary audience that uses the result of tool?
Businesses are the main audience.
Furthermore, ENCORE has just introduced a Biodiversity module specifically for finance companies to assess the biodiversity associated risk for their investments.

(v) How often? What is the frequency of use of the tool?
As needed.

(vi) How detailed is it? What is the spatial scale of tool use?
This is based on the processes that the business undertakes. There is a broad range of defined options, that presumably attempt to cover all major business types, but inevitably there must be some missing. Perhaps more importantly, as far as could be seen, the results are provided for generic groupings of production processes which don't allow for adaptations or variations by the business of the production processes to mitigate the exposure or risks.

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking biological, ecological & socio-economic factors
The main focus is to assess the dependence on and risks for ecological processes.

(ii) Creating indicators as proxies for biodiversity
Ratings are given for the level of dependence or materiality and risks of the service associated with biodiversity, not of biodiversity per se.

(iii) Quantifying and valuing biodiversity impacts
The services provided by biodiversity to businesses are valued and scored in relative terms. But this valuation is pre-set based on expert opinion.

(iv) Screening biodiversity risks and tipping points
Risks to business from loss of ecosystem services associated with biodiversity is assessed qualitatively and primarily through expert opinion.

(v) Assessing trade-offs between different types of capital
Dependence on a range of natural capital is evaluated, but there is no facility to assess trade-offs.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
The central method of assigning natural capital and ecosystem services to business processes and assessing associated dependency and risks, appears to be largely based on expert opinion, although presumably informed by much data and experience. There are also satellite quantitative mapping of natural capital hotspots and other risks such as drought etc, also access to other tools such as IBAT and Trase. How they integrate or inform the central process is not immediately clear.

(ii) Indicators
The criteria for the selection of ecosystem services considered is not clear; for example, why is fibre, and animal draft power included but not food as provisioning services? Otherwise, selection of natural capital, drivers of loss, etc are based on pre-established comprehensive lists.

(iii) Capacity or skills required to use the tool or generate a score
As process depends on selection of sector and business processes from drop down windows and results are pre-set, no specialist skills are needed to generate the reports. Interpretation of the results and how to respond to them would take specialist inputs.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	Useful to inform decisions that consider impacts on and dependencies to biodiversity.
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	Core objective of the tool.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	Not explicitly considered.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and	Not explicitly considered.

human health, reducing the risk of these impacts.	
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way,	Not explicitly considered.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	Finance sector is also targeted, especially in a new biodiversity module.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity.	Not explicitly considered.
Target 21. Ensure equitable and effective participation in decision making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	Not explicitly considered.

LEAF Marque

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?

LEAF Marque is an environmental assurance system recognising more sustainably farmed products. LEAF Marque certification covers the whole farm businesses and applies to all products from the business. This practice-based farming standard is currently transitioning towards a hybrid approach, with biodiversity being the primary area currently being considered for transition.

In addition, LEAF also provides a biodiversity booklet to help farmers develop an effective on-farm management strategy in order to maintain, protect and enhance our valuable biodiversity and to improve the farm's contribution to the environment. Based on Six Simple Steps to help improve the performance, health and long-term sustainability of land, farmers are encouraged to set a baseline by assessing and mapping their habitats and identifying priority areas for monitoring, managing, and enhancing biodiversity:

Monitoring
Step 1 Identify habitats
Step 2 Identify key species
Management
Step 3 Manage farmland sympathetically
Step 4 Be pro-active in your management of habitats
Enhancement
Step 5 Enhance existing habitats and populations
Step 6 Work with others

Each of these steps is individually scored (into three levels: poor, medium, and good), and an overall score is calculated, which is meant to be revisited by the farm on an annual basis.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
Biodiversity is mainly captured in the 'Landscape and nature conservation' module of the Standard, by capturing actions reflecting a responsible management of the landscape, which ultimately leads to enhanced biodiversity.

Key change in Version 15 (2020): Outcome-based approach:
Introduction of a new Recommended outcome-based Control Point on monitoring habitats and species. This is part of a pioneering project on transitioning the LEAF Marque Standard to a hybrid outcome-based approach.

(New v15.0) At least one representative species or habitat, that can be justified in environmental terms, is monitored on the farm.

- Species/habitat or collections of species/habitat chosen are justified by a person with relevant local environmental knowledge
- Monitoring records show the presence of the chosen species/habitat or collection of species/habitat (these could include: visual inspection, electronic records, e.g. apps, photos, satellite images, and/or written records)

Biodiversity is also captured in the 'ANIMAL HUSBANDRY MODULE':
Measures are taken to avoid damage to grassland by livestock and to optimise biodiversity
Measures taken to optimise biodiversity and reduce soil erosion and run-off may include:

- adjusting stocking rates

- adjusting animal movements and/or using rotation
- consideration of permanent tracks
- positioning of gateways and fencing
- positioning of supplementary feeders and drinkers

(iii) When? Is the tool informing current or future operations?
The tool informs mainly current operations so that businesses are able to become LEAF Marque certified.

(iv) Who for? What is the primary audience that uses the result of tool?
Consumer/public & retailers
Investors
Regulators/bodies: governments may require farmers to be LEAF certified in order to be eligible for certain incentives or payments for environmental/social benefits, (for example: Government of Jersey's new Rural Economy Strategy (RES).

(v) How often? What is the frequency of use of the tool?
LEAF Marque certificates are valid for 12 months, and the annual certification cycle is determined by the initial date of certification.

(vi) How detailed? The spatial scale of tool use?
Questions cover the whole farm business.

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological & socio-economic factors
The principles of Integrated Farm Management (IFM) underpin the requirements of LEAF Marque certification, as set out in the LEAF Marque Standard. IFM is a whole farm business approach that delivers more sustainable food and farming. It uses the best of modern technology and traditional methods to deliver prosperous farming that enriches the environment and engages local communities. A farm business managed according to IFM principles will demonstrate site-specific and continuous improvement across the whole farm including: Organisation and Planning, Soil Management and Fertility, Crop Health and Protection, Pollution Control and By-Product Management, Animal Husbandry, Energy Efficiency, Water Management, Landscape and Nature Conservation and Community Engagement.

(ii) Creating indicators as proxies for biodiversity
Most control points refer to actions taken to protect/enhance biodiversity. One point was added in the last update of the tool (version 15–2020) on whether at least one representative species or habitat is being monitored on the farm.

(iii) Quantifying and valuing biodiversity impacts
Not directly, although with the inclusion of the new outcome-based indicator, if species/habitats are being monitored, then impacts could eventually be quantified.

(iv) Screening biodiversity risks and tipping points
The biodiversity booklet (resource) provides guidance on how to set a baseline by assessing and mapping habitats and identifying priority areas for monitoring, managing, and enhancing biodiversity. It suggests that businesses should try to link information to wider initiatives such as Biodiversity Action Plans (BAP) in their specific areas.

(v) Assessing trade-offs between different types of capital
The tool does not allow for this.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
Descriptive measurements (monitoring). They provide in-depth information on monitoring methods on the LEAF Green Box (only for members).

(ii) *Indicators*
The standard does not require the use of any specific indicator on biodiversity per se, control points refer to actions taken to protect habitats and enhance biodiversity. The LEAF green box should provide information on monitoring methods and perhaps indicators, but it is only accessible to members (paid).

(iii) C*apacity or skills required to use the tool or generate a score*
LEAF also has another tool called 'LEAF sustainable farming review' which is a pre-requisite for LEAF Marque certification. It offers a very practical, easy-to-use management tool to help farmers make more informed decisions that will drive their business forward economically, environmentally and socially. In addition, LEAF provides its members with access to many useful resources such as the IFM Bulletin, the LEAF Information Centre and LEAF Sustainable Farming Review (LSFR) Guidance.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	LEAF Marque certification is also being used by government schemes to leverage practical change on the ground. LEAF also engages frequently in government consultations and represent the voice of farmers at many industry and government groups, including the UK Trade and Agricultural Commission. This enables LEAF to push the case for protection of trade deals which address environmental concerns and champion LEAF Marque certification as a global assurance system.
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	Strongly aligned. LEAF offers leadership, advice and the tools for farmers to improve the sustainability of their operations.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	LEAF Marque recognises farmers' achievements and provides the independent certification by which this is communicated to brands and consumers.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and	Not directly aligned.

human health, reducing the risk of these impacts.	
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	LEAF works with government departments and agencies and looks to drive a more interconnected approach; creating opportunities and incentives for farmers to be recognised and rewarded for their environmental commitments.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	Not aligned.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity.	LEAF Marque includes 'community engagement' as one of its sections. The question broadly asks about community engagement activities but does not provide explicit guidance on how to incorporate citizen/traditional knowledge into farm/landscape practices. However, the LEAF biodiversity booklet does include some brief advice on how to identify local experts with specialist knowledge.
Target 21. Ensure equitable and effective participation in decision-making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	Not aligned.

Science-based Targets for Nature (SBTN)

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
The tool proposes a five-step process that companies can follow to supplement their current strategy for addressing environmental issues or to begin exploring these issues for the first time.

1. ASSESS: To begin, you gather and/or supplement existing data to estimate your value chain-wide impacts and dependencies on nature, resulting in a list of potential issue areas and locations for target setting. Here they refer to several existing tools (IBAT, ENCORE, Biodiversity guidance navigation tool, etc.)
2. INTERPRET & PRIORITIZE: You then interpret the outputs of Step 1, prioritising key issues and locations for taking action. You will consider actions across different 'spheres of influence' – from your operations to the landscapes surrounding your value chain(s).
3. MEASURE, SET, & DISCLOSE: Next, you collect baseline data for prioritized targets and locations. Using the data from this and previous steps, you can set targets aligned with Earth's limits and societal goals, and then disclose these publicly.
4. ACT: Once targets are set, you utilise SBTN's Action Framework (AR 3 T)—Avoid, Reduce, Regenerate, Restore, Transform – to make a plan and begin to address your contributions toward the unsustainable use and loss of nature.
5. TRACK: Finally, you monitor progress toward your targets and report publicly on this progress.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
Biodiversity impacts and dependencies, although the tool talks about nature in general.

(iii) When? Is the tool informing current or future operations?
Mainly future.

(iv) Who for? What is the primary audience that uses the result of tool?
Businesses themselves
Guidance for other more specific tools

(v) How often? What is the frequency of use of the tool?
Not specified.

(vi) How detailed? The spatial scale of tool use?
Full value chain and associated 'spheres of influence'.

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological, & socio-economic factors
Following a corporate-level assessment of impacts and dependencies on nature (throughout the value chain and the places companies affect), the tool asks companies to also assess how their targets address prevailing and proportional societal challenges in the landscapes or seascapes they are focusing on. How these targets are planned, executed, and achieved will have differing impacts on different groups of people.

(ii) Creating indicators as proxies for biodiversity

Indicators are specifically used for companies to measure progress towards targets set by them. Targets are meant to be 'controllable' by companies (e.g. 'avoid sourcing from areas with high extinction risk' 'reduce extinction threat by X%') while indicators are outcome-based (e.g. STAR).

(iii) Quantifying and valuing biodiversity impacts
Steps 1 and 2 provide guidance on using other tools to quantify impacts. Guidance on valuation/prioritisation is under development (Step 7 Valuation of the Natural Capital Protocol is mentioned).

(iv) Screening biodiversity risks and tipping points
Biodiversity risks are mapped (hotspot mapping in step 1). They suggest that all targets should be set with as recent a baseline as possible.

(v) Assessing trade-offs between different types of capital
A key advantage of integrated SBTs is that they are being designed to recognise the interconnection of issue areas. This allows companies to take action on multiple issues at once and not create new problems. When designed and implemented correctly, SBTs can help resolve interrelated climate and nature risks.

The framework aligns closely with the IUCN Global Standard for Nature-based Solutions, given the focus of that standard on actions that benefit nature, people, and climate. Targets implemented in step 4 (ACT) must consider the full extent of costs and benefits. Costs and benefits must be assigned, especially for nonmarket services like biodiversity or cultural value and the distribution of costs not associated with labour (e.g., unpaid household work). Targets should be based on an equitable approach to balancing trade-offs between sustainability objectives. Companies should pursue strategies for operating that help resolve multiple problems at once and generate multiple types of benefits.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
Step 2 (interpret & prioritise) expects companies to consider prioritising the locations – associated with their operations and/ or value chain(s) – where they can have the highest impact. Companies can use the hotspot assessment in Step 2, as well as established impact assessment methods (Natural capital protocol). Consideration of the company's current (and, where possible, historical) impacts and contributions, through direct and indirect impacts, should be considered where data exists. Similarly, companies may account for how other stakeholders directly or indirectly influence the state of nature in the places where they have direct operations or value chain activities, and/or in the landscapes adjacent to their value chains. For some issue areas and locations, a company may have a high degree of influence over the state of nature – for instance, in remote locations where the company is observed to be the major driver of pollution. In others, improving the state of nature may require collective action of multiple stakeholders. Understanding relative contributions is a key step toward resolving collective action problems.

(ii) Indicators
Current guidance presents Initial proposed impact areas and indicator framework. A Final indicator framework with measurement guidance and/or standards across issue areas is expected in 2022.

(iii) Capacity or skills required to use the tool or generate a score

The tool consists of a framework and guidance to support business action, making reference to various other tools and indicators. The guidance itself could be well interpreted by a non-specialist audience, but the use of the tools mentioned may require specific expertise.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	Yes, aligned. Considered explicitly in step 3 (ACT) on value-chain adjacent areas.
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	Yes, aligned. This resonates with the core objective of the tool.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	Yes, aligned.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	Not aligned.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way,	The tool stresses the need to consider the full range of costs and benefits in target setting, even if challenging, to correct system-wide issues (like inability to price environmental goods/capture the cost of externalities) and lead to more robust and equitable results. Companies engaged in target setting must understand the structural and historical impediments to equal and representative participation in decision-making processes and use this work to unseat historically inequitable and socially damaging power structures. Taking a just and responsive approach to target setting will not only help ensure that targets met are targets kept, but it will also guarantee a higher degree of equality in terms of bearing the costs of action, as well as better distribution of the benefits created through SBTs for nature.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year,	The tool explicitly calls for financial support, incentives, and technical assistance for

including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation	suppliers to meet desired standards and transition to improved practices.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity.	The tool states that an orientation toward equity requires giving attention to other forms of knowledge beyond that in the technical, hard, or natural sciences.
Target 21. Ensure equitable and effective participation in decision-making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	The tool states that where possible, targets should be created in consultation and collaboration with value chain stakeholders, using participatory processes that uphold equity and rights-based approaches (especially including the rights of Indigenous peoples) and adhere to the principle of free, prior, and informed consent (FPIC). Those groups of society that have been historically marginalised, discriminated against, or persecuted must be given fair opportunities to participate in decision making related to benefits generated by the company and its operations, and to accessing these benefits (where applicable).

Textile Exchange Biodiversity Benchmark

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
The tool consists of a survey-based benchmark together with a companion guide that comprises a library of reference metrics, approaches, and documentation that companies can use to fill out the survey and to take initial actions.

1. This survey-based tool consists of six sections to help companies compare performance to fundamental elements of good practice biodiversity risk management by: Making commitments, setting strategies and targets based on science
2. Mapping sourcing locations of raw materials against the biodiversity value of the location
3. Evaluating biodiversity risks associated with raw material sourcing
4. Implement measures to mitigate biodiversity risks within supply networks
5. Monitor the effectiveness of mitigation actions
6. Publicly disclose biodiversity risks and opportunities, activities underway, and progress on efforts to mitigate those risks

(ii) What? What aspect of biodiversity is being assessed and for what objective?

<u>Biodiversity strategies & commitments/targets</u>
Whether the company has set specific measurable targets towards addressing biodiversity impacts and contributing to positive outcomes.

While the Science-based Targets for Nature are under development by the SBT Network, their Initial Guidance for Business provides a five-step process that companies can follow to supplement current strategy (or as first exploration) for addressing nature-related issues that would take companies in the right direction to become nature-positive.

<u>Biodiversity value mapping</u>
The tool helps companies to identify and evaluate the 'value' of the biodiversity impacted by a company's material use. A company should identify 'what' risks its materials sourcing poses to biodiversity and 'where' they occur (i.e. where, geographically, in terms of sourcing/processing locations). This data can then be used to map and investigate the biodiversity 'context' of the location. They suggest methods to evaluate the vulnerability and rarity of species and ecosystems impacted by an activity, such as (a) the IUCN Red List of Threatened Species for assessing presence of threatened species; (b) Key Biodiversity Areas (other areas of biodiversity importance – may or may not be protected), Protected Areas, UNESCO World Heritage Sites, and Alliance for Zero Extinction (AZE) sites which are helpful for understanding globally important places for biodiversity and (c) global biodiversity data layers (e.g., Critical Habitat and Natural Habitat data layers by UNEP-WCMC, IUCN STAR, and others) which are useful for understanding relative global importance of habitat/ecosystems incorporating inhabiting-species' diversity, vulnerability, and rarity. The tool's guidance also points to the use of Critical Habitat and Biodiversity Risk Screening Industry Briefing Note by The Biodiversity Consultancy, IBAT, IUCN, Draft Guidelines for Planning and Monitoring Corporate Biodiversity Performance.

<u>Biodiversity risk assessment: loss, dependencies, impact</u>
Aims to understand if a risk assessment has been carried out to identify all biodiversity issues, assess the level of risk and opportunity, and determine the company's most 'material' (i.e. most significant) impacts and dependencies on biodiversity, including where they occur in the supply chain or geographic locations. By undertaking an initial assessment to identify biodiversity impacts from the supply chain, including production of the fibre/material sourced, the company can identify the highest

priority ‘hotspots’ within its ‘biodiversity footprint’ with a shortlist of potential thematic and spatial target areas to focus on.

A company has to include the method, scope and findings of the assessment. Options range from qualitative to quantitative methods [natural capital accounting (NCA), Life Cycle Assessment (LCA), Environmental Profit & Loss (EP&L), HCV/HCS, BIM (Cambridge), biodiversity footprinting, IBAT/other mapping tool].

(iii) When? Is the tool informing current or future operations?
The tool evaluates present impacts to biodiversity associated with textile production and elicits actions taken by companies to reach biodiversity targets following the SBTN’s AR3T framework (which is a modification of the mitigation hierarchy method developed by the Biodiversity Consultancy), actions taken to monitor and evaluate progress and actions taken to disclose biodiversity risks and mitigation actions. The tool is accompanied by guidance that provides information on supply chains, feedstock locations, biodiversity risks, suggested actions and programs for each different material (cotton, rubber, wool, cashmere, leather, synthetic fibres) for actions that can be taken while a company’s biodiversity strategy is being fully developed and science-based targets confirmed.

Participants receive a ‘standard scorecard’ for their efforts. The scorecard provides a gap analysis and highlights where a company should focus next.

(iv) Who for? What is the primary audience that uses the result of tool?
Businesses – to assess risks and develop mitigation actions
External – shareholders, investors, stakeholders, civil society (as a result of disclosure)

(v) How often? What is the frequency of use of the tool?
Annually.

(vi) How detailed is it? What is the spatial scale of tool use?
It mainly focuses on the value chain, as it contextualises biodiversity risk from a materials sourcing starting point. However, the assessment of risks and biodiversity mapping is asked at country level and an unspecific geographical detail.

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological, & socio-economic factors
The tool provides guidance to use various metrics and approaches that consider biological and ecological factors in their assessment of biodiversity risks. It also takes into account whether a company consults an appropriate mix of stakeholders, internally and externally, to verify the scope and approach of the biodiversity risk assessment. The tool’s companion guide provides risk lists for each material type which include risks that may not be directly related to biodiversity, such as social risks (child labour, human rights violation, health and safety, etc.). It also provides information on programmes for each material (standards, initiatives, processes) that link these factors.

(ii) Creating indicators as proxies for biodiversity
The tool does not create any indicators but makes reference to external metrics.

(iii) Quantifying and valuing biodiversity impacts
The tool provides guidance to perform quantitative biodiversity risk assessments, using a ‘biodiversity footprinting approach’. The tool makes reference to the following metrics:

- Area x Condition metrics, like the habitat-hectare method
- Biodiversity Impact Metric (BIM):
- Environmental Profit and Loss methodology
- High Carbon Stock approach (HCSa):
- High Conservation Value methodology
- Life Cycle Assessment
- Natural capital accounting
- Species Threat Abatement and Restoration (STAR).

(iv) Screening biodiversity risks and tipping points
The tool provides information on approaches and metrics that can be used to assess biodiversity risks and emphasises that it is important that the assessment is spatially explicit so it can take the place-specific nature of biodiversity into account.

(v) Assessing trade-offs between different types of capital
No, it does not assess trade-offs.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
To determine whether the company undertakes a biodiversity risk assessment, the survey collects information on the use of external metrics on descriptive measurements. However, the survey does introduce an element of causality in the 'monitoring and evaluation' theme by assessing whether the company is using a Pressure-State-Response (PSR) framework to designing a monitoring programme that measures the following aspects:

- Pressure (the causes of biodiversity loss): The outcome of the mitigation measures implemented is reflected in changing pressures on biodiversity. Monitoring 'pressure indicators' helps a company track progress toward set targets, e.g. changes in deforestation rates or hunting rates as a result of the risk/impact mitigation the company implemented.
- State (condition of the biodiversity in question): The species or ecosystem that was targeted by the company's mitigation programme as a way of confirming that the mitigation is indeed effective, e.g. area and condition of forest, water quality and species abundance in a catchment.
- Response (intervention): The intervention/action output that is taken by the company is typically monitored using key performance indicators (KPIs), e.g. number and area of farms switching to low-input techniques. When responses are occurring, but pressure is not changing, then this gives an indication that the mitigation may not be fully effective.

There is also an open question on 'improvement tracking' that aims to assess whether companies are able to measure outcomes and impacts and how (through evidence provided by an industry tool; through anecdotal feedback; qualitative evidence of a positive impact; quantitative evidence of a positive impact). The question is motivated by challenges related to a) the complexity of measuring impact; (b) the timeframe (which is often long term since impact needs to be sustained); and (c) the difficulty in identifying the specific cause of change.

(ii) Indicators
The tool does not preclude the use of any specific indicator and considers that there may well be limitations to using biodiversity metrics, and these should be taken into consideration. However, it does not provide any insights into what these limitations may be or how to consider them.

(iii) Capacity or skills required to use the tool or generate a score

The survey is relatively simple to fill out. A wealth of information is provided through a survey guide and a companion guide to support answering of each question and to provide additional guidance on how companies in the textile sector can start to think about their biodiversity performance and the type of actions that they can take to mitigate/minimise risks.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	Not aligned.
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	Yes, this is the main target it is aligned with.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	Yes, mainly companies.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	Not aligned.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	Yes, but no reference to justice/equity.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	Not aligned.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity.	Yes

Target 21. Ensure equitable and effective participation in decision-making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	Not aligned.

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
Its aim is to map and quantify natural capital by land parcels across the landscape or farm, but also to identify opportunities to improve/increase biodiversity or carbon stocks. This can then be used to inform farm management decisions, and document net gain in biodiversity (according to the Defra 3.0 method) or carbon due to those management decisions. LAND360 has three steps i) mapping habitats, ii) scoring the biodiversity (and carbon) iii) assessing options for ecosystem enhancement.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
Biodiversity assessment is through application of the Defra/Natural England Biodiversity Metric 3.0. This is based on assessment of habitat value for biodiversity according to ratings of habitat distinctiveness (relative biodiversity value), condition of the habitat and significance (whether located in a protected area category). For areas of habitat enhancement, the levels of difficulty and risk are assessed to moderate the score of potential biodiversity gain.

(iii) When? Is the tool informing current or future operations?
Land360 is designed to initially map current biodiversity and carbon distribution across the land, but then also it can be applied to assess likely future impacts (positive or negative) of changes in management. This is done through the application of the Defra Biodiversity Metric 3.0, which was initially designed to assess impacts of land development and inform planning consent processes. This is not applicable to changes in management of farmland as no planning application is required, as long as there is no change from agricultural use. Nevertheless, it can be used for farms to document their biodiversity and C, and potentially to monitor changes in their biodiversity in accordance with the Defra standard. Fera offer technical support in application of the tools and identification of opportunities to increase biodiversity or carbon across the land.

(iv) Who for? What is the primary audience that uses the result of tool?
The primary audience is farmers/landowners. Application to date has been to enable landowners to establish a baseline of their biodiversity and carbon against which they can monitor their future performance. The intention appears to be to enable farms to document changes in their biodiversity rating according to the Defra standard and then potentially sell biodiversity credits from improvements to their biodiversity score, to land developers to offset their impacts.

(v) How often? What is the frequency of use of the tool?
Undefined, but it is applied as a service offered by Fera, whose staff apply the tool and provide reports to the landowner.

(vi) How detailed is it? What is the spatial scale of tool use?
It uses high-resolution satellite data – 30cm pixels – to map land into parcels including hedges, margins, even individual trees. It generates a map of UK Habitat Classification (UKHAB) land cover for landscape parcels compatible with the Defra/Natural England UK Biodiversity Metric 3.0. Maps indicate areas of high and low biodiversity and carbon storage and carbon sequestration. The Metric 3.0 measures habitat both as area, and in case of hedges, streams, or other linear features by length.

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological, & socio-economic factors

The tool assesses and maps biodiversity potential and carbon stocks. When assessing options for enhancement of these natural capitals, Fera integrates assessment of the economic performance of the land concerned. Fera staff model and discuss with the landowner the potential outcome of different management scenarios.

(ii) Creating indicators as proxies for biodiversity
The biodiversity metric is based on a scoring of habitat distinctiveness, condition, and strategic significance of the habitat unit – which are multiplied to give an overall score. While distinctiveness and significance ratings are reasonably well defined, the condition score is rather more subjective. When applied by Fera, their ecologists assess habitat quality in the field and further define the habitat qualification to identify areas of high conservation value. Nevertheless, the biodiversity score is a proxy of likely biodiversity value, and values are relative.

(iii) Quantifying and valuing biodiversity impacts
The potential biodiversity gain post-management is calculated in the same way but with the score moderated by the level of difficulty, time, and risk of achieving the intended habitat restoration. The score with/without intervention should only be compared when assessing the same kind of habitat. Application in offsetting should only be within the same habitat type.

(iv) Screening biodiversity risks and tipping points
The mapping of biodiversity across the farm can highlight hotspots and inform farm management decisions to reduce risks to biodiversity

(v) Assessing trade-offs between different types of capital
The scenario modelling applied appears to also assess the relationships between economic return (gross margins) and natural capital changes. Presumably, it could also help visualise trade-offs between biodiversity and carbon.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
As indicated, the Defra Biodiversity Metric has limitations in that it doesn't measure actual biodiversity but generates a score based on qualitative factors of habitat quality. In its application under LAND360, the field verification of habitat quality by ecologists would strengthen the most subjective component of this scoring which is the condition of the habitat. Also, the field verification is used to highlight areas of high conservation value based on actual presence of biodiversity.

(ii) *Indicators*
In using the Defra Biodiversity Metric, the tool is designed to be practical. Applying it through LAND360, Fera bring greater scientific criteria through providing ecological expertise to the landowner to ensure quality of the assessment.

(iii) Capacity or skills required to use the tool
LAND360 as a service offered by Fera scientists doesn't require the landowner to have the skills, just the money to pay for the service.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning,	Not explicitly aligned with public policy.

development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	Enables landowners to assess and manage the biodiversity on their landholdings, and potentially document biodiversity gain that could be sold to land-developers.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	Not explicitly considered.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	Not explicitly considered.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	Some may consider that enabling offsetting of biodiversity impact could incentivise development of land with biodiversity value, because it is perceived that this damage is compensated.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	By better informing landholder management, the tool could help owners improve the effectiveness of their investments to support biodiversity. If it transforms into a means to offer biodiversity credits to developers, this could result in an increase in financial resources into biodiversity conservation.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity	Not explicitly considered.
Target 21. Ensure equitable and effective participation in decision-making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	Focus is on the landowner's decisions rather than other stakeholders in what happens to the land. Notable that a featured user is an aristocratic estate.

International Biodiversity Assessment Tool (IBAT)

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
IBAT enables companies (or any organisation) to assess the proximity of any activity or development to key biodiversity areas, presence of red list species, and proximity to protected areas. Potential for species threat abatement and restoration can also be generated via STAR. In terms of proximity, a buffer can be set to estimate the likely geographic extent of impact of the development of a specific location. The tool is aimed to inform a hierarchy of decision making in business development informing steps of 1) avoidance of development in high biodiversity sites, 2) minimisation of impacts if there is development,3) rehabilitation of biodiversity where there has been impact, and 4) if all else fails, offsetting biodiversity impacts. The tool may also be used to inform offsetting of biodiversity impacts in non-key areas by investing in biodiversity restoration within key areas. There is also an option to generate International Finance Corporation (IFC) standard performance 6 reports and World Bank Environmental and Social Standard 6 reports.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
The tool draws upon several different geospatial databases of biodiversity. These include the IUCN Red list of Threatened Species, which lists which threatened species are present at a particular location, the World Database on Protected Areas, which indicates if a site is within a protected area and the level of protection according to the IUCN categories; and the World Database on Key Biodiversity Areas, which again indicates if a site is within one of these areas. Additionally, a range rarity spatial index is provided, plus in the Species Threat Abatement and restoration coverage can be accessed (STAR is reviewed separately). It has a specific reporting format for assessing impacts on freshwater sources.

(iii) When? Is the tool informing current or future operations?
The tool is primarily to inform the planning of future operations to avoid impacts on biodiversity. Presumably it could also be used to help understand impacts of current operations and the need to restore or offset. The STAR geographic coverage enables identification of potential for threat abatement of restoration; full application of the STAR process would enable monitoring of progress, but this is a separate tool.

(iv) Who for? What is the primary audience that uses the result of tool?
Main target groups are businesses and investment companies to inform the potential impacts and risks associated with development decisions or sourcing of products from different geographic locations. Examples of companies that have used the tool are Olam commodity trading company, Heidelburg cement company, and the International Olympic Committee. There are also specific tools and instructions targeting environmental risk assessment in the financial sector.

(v) How often? What is the frequency of use of the tool?
Probably usually once at planning stage of a development, or review of case for financing to decide whether to proceed or not, or under what conditions. It doesn't provide the basis for monitoring or offsetting of impacts once development is underway.

(vi) How detailed is it? What is the spatial scale of tool use?
This varied according to the database used; maps are global and resolution for most coverages looks very fine. The Proximity reports use buffers (e.g. presence of red list species within a radius) of 1Km, 10 km and 50 km (or others of the users' choice) of the geographic central point. The resolution for STAR metrics is 5 x 5 km squares.

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological, & socio-economic factors
The metrics provided only consider biodiversity-related ecological and geographic factors.

(ii) Creating indicators as proxies for biodiversity
The tool uses a variety of metrics developed to integrate information available on biodiversity – but particularly threatened species – range and abundance. The IUCN red list of threatened species uses range maps for all species that occur within the proximity ranges set by the user. Likewise, proximity or presence within IUCN protected area categories is registered. The Key biodiversity areas uses Alliance for Zero Extinction areas and Import Bird and biodiversity areas as the main references, geographic regions that have been identified by various international conservation organisations. A range rarity index developed by IUCN is also provided that seeks to integrate the threatened species presences geographically, but it does not seem to be used in the reporting system. Similarly, STAR generates a set of maps that assess the potential for threat abatement and recovery across the geographic area of interest.

(iii) Quantifying and valuing biodiversity impacts
Impacts are mainly assessed based on geographic coincidence of development sites with the different biodiversity metric coverages, according to different buffer distances from the sites. This simply generates a list of species, key biodiversity areas and IUCN protected areas that are present at different distances from the site of interest. There is no assumption of impact per se.

(iv) Screening biodiversity risks and tipping points
The guidance associated with the use of the metrics promotes that the information should be used to assess biodiversity risks for the development of a particular site, or activities conducted on the site. In particular, there is a focus on using these metrics for risk assessment by international development organisations (and thus the option to generate reports specific to World Bank and IFC procedures) and private-sector finance.

(v) Assessing trade-offs between different types of capital
Not considered.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
The proximity reporting is based simply on distance from a particular site at 1 km, 10 km, and 50 km distances. As this is only based on distance, and not, for example, habitat extent, it can generate a considerable number of anomalies for large buffer distances, e.g. listing threatened marine species for a terrestrial site. Also, the IUCN accuracy of ranges for many threatened species is very uncertain, and the ranges don't differentiate between species permanently resident or regularly migrant to an area, and vagrant species that may turn up but are not dependent on that location. There appears to be little guidance as to how to discriminate the information presented in the long lists of species to enable identification of those that might really be affected by any development.

(ii) *Indicators*
The indicators primarily if not exclusively consider presence of threatened species. There is little consideration of broader biodiversity (except perhaps via the IUCN protected area categories), nor ecosystem services that might be derived from that biodiversity.

(iii) Capacity or skills required to use the tool

The tools are generally easy to use in the sense of generating the proximity or other reports. What is complex is the discrimination of the data to identify where real threats lie and how to interpret and act on that information. Some useful generic guidance is provided as to how they hope organisations might respond to the information provided in terms of avoidance, minimisation, rehabilitation and offsetting. The reports state that the information provided should be used as a first step in identifying biodiversity impacts and should be used to inform more in-depth environmental impact studies.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	Can be used to give a first indication of potential biodiversity impacts of development or to differentiate across different options according to their impact or potential to restore biodiversity.
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	IBAT can inform avoidance of impact by companies, but doesn't assess impact per se.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	IBAT can be used to inform choices between sites as regards potential biodiversity impact.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	Not aligned.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	Not aligned.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	It could help prioritise areas that should receive finance to support biodiversity, particularly through the application of STAR assess potential for threat abatement and recovery.
Target 20. Ensure that relevant knowledge, including the traditional knowledge,	Not considered

innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity.	
Target 21. Ensure equitable and effective participation in decision-making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	Not considered.

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
LIFE is a standard against which companies can be certified to demonstrate good practice as regards reducing and managing impacts on biodiversity and even compensating impacts or generating biodiversity benefits. The standard was started in Brazil and has now expanded to Paraguay, and soon Mexico. A pilot adaptation to EU conditions is being conducted in Spain.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
Biodiversity is assessed in three ways. Firstly, by compliance of the company with a set of 9 principles, each with various criteria and indicators – Biodiversity Management Indicators – that assess the company's management practices and performance with respect to understanding its dependence on biodiversity, impacts upon biodiversity, and processes to compensate impacts or generate biodiversity benefits. Secondly, the standard calculates a Biodiversity Pressure Index based on the company's water and energy, GHG and waste generation and land occupation. This is converted to a Biodiversity Minimum Performance index that relates the impacts to the size of the business. Thirdly, the company's biodiversity conservation actions are scored against a range of conservation-related criteria to generate a Biodiversity Positive Performance score. The whole process is third-party verified.

(iii) When? Is the tool informing current or future operations?
In application of the principles and criteria, they generate a guide for companies to manage current and future operations towards ever more 'biodiversity-friendly operations. Compliance is required with at least 70% of the indicators, and 100% of essential indicators (there are over 100 indicators in total).

(iv) Who for? What is the primary audience that uses the result of tool?
Mainly businesses, but also customers and regulators (land planners).

(v) How often? What is the frequency of use of the tool?
Amongst the criteria it indicates it should be updated annually. LIFE certification is valid for 5 years, after which it needs to be re-verified and renewed.

(vi) How detailed is it? What is the spatial scale of tool use
The standard is applied to individual businesses – these may be discrete sites e.g. a farm or a factory, or can be aggregated for a whole company. Furthermore, companies identify and assess ecosystem risk for 100% of its direct suppliers.

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking biological, ecological, & socio-economic factors
The Biodiversity Management Indicators include a principle of the interaction between Human Wellbeing, Biodiversity, Ecosystems and Natural Capital. Also, there is a principle relating to equitable benefit sharing in accordance with the Nagoya protocol.
Overall, the nine management principles are:

1. The organisation or producer must commit to acting effectively in the conservation of biodiversity, a common asset under everyone's responsibility, regardless of whether they are individuals or legal entities, private or public, in their direct or indirect use.

2. The organisation or producer, whether of any nature, size, or sector, as well as organisations and/or outsourced professionals who provide services to it, must comply with the current legislation applicable to its activities, in addition to respecting the International Treaties and Agreements signed by the country where it operates.
3. The organisation or producer should: identify, implement, or support, and monitor actions for the conservation of biodiversity, ecosystem services, and the natural capital.
4. The organisation or producer must promote the inclusion and maintenance of the value of nature in decision-making process.
5. The organisation or producer, based on its sustainability strategy, must respect the following hierarchy: identify, prevent, minimize, and recover damages caused by impacts, and then compensate those residual impacts.
6. Science, considering the contribution of the applicable associated traditional knowledge, must support and guide actions for the conservation and sustainable use of biodiversity.
7. The organisation or producer must act considering the interaction between human wellbeing, biodiversity, ecosystem services and natural capital.
8. The organisation or producer must share the benefits derived from access to biodiversity genetic resources and/or associated traditional knowledge fairly and equitably, in accordance with local legislation or, in the absence of specific legislation, in accordance with the Nagoya Protocol (CBD), regardless of the country commitment to the Protocol.
9. The organisation or producer must monitor its pressure index, its impacts and dependencies and its performance in biodiversity, promoting the continuous improvement of its management.

(ii) Creating indicators as proxies for biodiversity & (iii) Quantifying and valuing biodiversity impacts
Biodiversity pressure (impact) is assessed by quantifying the energy use, water consumption, GHG emissions, waste generation and land occupancy. The first four measures are assessed according to the quantity used or generated and severity of impact on biodiversity of that type of use. These are then related to the total use or generation nationally, and with respect to the most polluting industry for that factor. The land occupancy is assessed according to the ecological importance and scarcity of the ecoregion occupied. Scores are generated for each factor and combined into a Biodiversity Pressure Index. The Biodiversity Minimum Performance index is the Biodiversity Pressure Index as a function of the economic turnover of the company.

The Biodiversity Positive Performance scores the likely ecological or biodiversity benefit from the conservation actions the company financially supports. These include factors such as the ecological importance/scarcity of the habitat or species being conserved, the designation of the area conserved, continuity of management, size of areas, and influence on policy among 15 different indicators.

(iv) Screening biodiversity risks and tipping points
Screening of biodiversity risks is included among the Management Performance Indicators. Tipping points are not explicitly considered, but the importance of scientifically informed management is highly stressed and has its own Principle.

(v) Assessing trade-offs between different types of capital
Under Principle 7 the interactions between Human wellbeing, biodiversity, ecosystems, and natural capital are considered. Although the term 'trade-offs' is not used, it is implicit, and if the criteria are followed this should reveal any trade-offs.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance

The calculation of the Biodiversity Pressure Index has an underlying assumption that the use of energy and water, GHG emissions, waste generation (and disposal), and land occupancy can represent the main impacts upon biodiversity. The scoring and metrification of these generates a score. While based on a sound rationale from expert opinion, it has no scientific mechanistic link to the biodiversity impact. The process is mathematically moderately complex but uses data most responsible companies ought to register and, in that sense, it is pragmatic. Nevertheless, there is potential for decision rationales that are primarily a consequence of the construction of the metric rather than any real reduction in biodiversity impact. Knowing how likely this is would require a broad monitoring of how companies have used and interpreted the metric. The potential for 'perverse' decisions should, however, be considerably moderated by the detailed and comprehensive Biodiversity Performance indicators that should inform the management decision processes.

(ii) Indicators
As indicated above, the Biodiversity Management indicators are detailed and comprehensive, with 9 Principles each, with between 2 and 12 criteria and each criterion with 2 or more indicators. Compliance with some indicators is mandatory, while for others at least 70% must be complied with; additionally there is a scaling according to the length of period certified within which they are considered (initial, after 2 years, after 5 years) in a process of continual improvement. As such, they constitute the core of the standard and an important guide to businesses as to their performance. Application and compliance of the full LIFE process would require a significant investment by a business, and some capacity building (see below).

(iii) Capacity or skills required to use the tool
The amount of information required to generate the Biodiversity Pressure index is considerable, but a company with a good sustainability strategy ought to manage most of this information. In the scoring of land occupancy, it is not entirely clear how the severity component is generated, particularly in the adaptation to EU conditions. The calculation of the BPP is a little complex but could probably be done through an Excel sheet with pre-programmed macros.

The Biodiversity Performance indicators are more straightforward but might in some cases require support from an experienced ecologist or conservationist. Although if significant conservation investments are being made, such expertise should be available.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	Not explicitly aligned with public policy.
Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	LIFE application fully responds to this target, and LIFE certification has been supported by the CBD for this purpose.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and	'People' is as far as they constitute a business.

have access to relevant information and alternatives.	
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	Standard provides some consideration of impacts of biotechnology on Biodiversity.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	Not explicitly considered.
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	As the process includes the mitigation of Biodiversity impacts through financing of Biodiversity positive actions, businesses will need to make greater financial resources available for conservation to comply with this standard.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision making for the effective management of biodiversity.	The standard includes, as one of its principles, compliance with the Nagoya protocol on these aspects.
Target 21. Ensure equitable and effective participation in decision-making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	Not explicitly covered.

Species Threat Abatement and Recovery (STAR)

Categorisation according to six elements of use

(i) Why? What is the context and objective for use of the tool?
STAR can be used to assess biodiversity-related opportunities and risks, to define targets and plan conservation activities at different spatial and socio-economic levels. It can identify reduction of species risk extinction for all species globally due to threats abatement and restoration activities (through two separate scores). It can be used by businesses, finance industries, and governments. It can help to screen for opportunities to reduce biodiversity risk, and for risks related to business operations. It can help to identify targets to reduce species risk extinction, to assess ongoing mitigation and conservation plans, to identify area for offsetting activities, to track progress towards conservation goals.

(ii) What? What aspect of biodiversity is being assessed and for what objective?
Biodiversity is assessed through the threatened species of the IUCN Red List (amphibian, mammals, and birds only), through their range and distribution, and their extinction risk. Two scores can be produced: i) the $STAR_T$ which indicates the contribution towards reduction of the global species extinction risk from threats abatement activities (the threats can be threated separately to identify the relative contribution of each threat considered in a specific area.), ii) the $STAR_R$ that identifies area that could contribute to reduction of species extinction risk through restoration activities and programmes.

(iii) When? Is the tool informing current or future operations?
The tool/score can primarily inform how future operations could help set targets for species extinction risk reduction. It can also be used to identify how current activities help to reduce biodiversity depletion risk and to set new areas for restoration and offsetting activities.

(iv) Who for? What is the primary audience that uses the result of tool?
Businesses, companies, policymakers are the primary audience that could benefit from using the tool.

(v) How often? What is the frequency of use of the tool?
There is not a specific indication on how often the tool should be used. An annually monitoring is suggested.

(vi) How detailed is it? What is the spatial scale of tool use?
Local scale (e.g. business's area of interest) as well as country scale (for governments to plan policies to halt biodiversity depletion).

Categorisation according to how the tool supports mainstreaming of biodiversity considerations in business decisions

(i) Linking of biological, ecological, & socio-economic factors
The indicator considers threatened species range and risk of extinction as in the IUCN Red List, and the role of threat abatement and restoration activities in reducing species risk extinction globally. Different ecological threats are considered together or singularly (socio-economic factors are not evaluated).

(ii) Creating indicators as proxies for biodiversity
It creates two spatial scores with data on actual ($STAR_T$) or past ($STAR_R$) species distribution, relative species population, species risk of extinction. The score can be broken down to evaluate the relative

contribution of the threats considered. It can therefore be considered as a biodiversity indicator to offset biodiversity risk of extinction.

(iii) Quantifying and valuing biodiversity impacts
The score assesses the impacts of removing threats and restoring area of interest on biodiversity risk.

(iv) Screening biodiversity risks and tipping points
The metric can use local data (local land use, locally specific species distribution and population) to obtain locally detailed information. The fact that the score only considers threatened species makes it useful to identify biodiversity hotspots, where restoration or threat abatement could really offset biodiversity depletion risk. It does not reflect impacts against undisturbed condition, but it quantifies reduction of potential species extinction risk.

(v) Assessing trade-offs between different types of capital.
It does not assess trade-offs.

Identification of gaps/shortcomings

(i) Methodologies used for assessing biodiversity performance
Numerical measurements calculated by summing relative actual and restorable species range (% over the total area) within the area of interest weighted by the species extinction risk. The score indicates the opportunity for offsetting and conserving biodiversity, a percentage of reduction of species extinction risk over the global risk of extinction for the species considered. The score can be disaggregated by threats. However, it is not based on rigorous impact evaluation techniques (like randomised control trials).

(ii) Indicators
The STAR scores can better quantify the contribution of threats abatement and restoration activities in reducing the risk of species extinction in areas which are hotspots for threatened species. Non-threatened species are not considered, therefore in some area biodiversity might be underestimated. Moreover, if the threatened species have a wide range, the STAR score in a certain area of interest would be relatively low. Furthermore, many species are not yet addressed (marine species, reptiles, plants, invertebrates). Complex relationships and trade-offs between different aspects of biodiversity as well as ecosystems might remain overlooked by the quite simple STAR scores.

(iii) Capacity or skills required to use the tool or generate a score
Enterprises can use globally available STAR layers to assess their opportunities and to set science-based targets for biodiversity restoration and offsetting. However, specific and local information is needed to obtain accurate risk and impacts assessment of the area of interest. For this, assistance from outside specialists [experts in Geographic Information System (GIS) and biodiversity] might be needed to obtain a reliable assessment and to be able to interpret the scores.

Alignment with the 2030 Action Targets

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government.	It can be used to integrate biodiversity values into policies, regulation, planning (NOT an assessment of environmental impacts at all levels of government or across all sectors of the economy).
Target 15. All businesses (public and private, large, medium and small) assess and report on	Impacts on biodiversity and opportunity for offsetting activities are assessed by the tool at

their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts.	local as well as global level. The reduction of negative impacts on biodiversity can be informed by the tool. However, it does not provide information about dependencies on biodiversity.
Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives.	Not aligned.
Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.	It can assess the reduction on species extinction risk (biodiversity risk) by reducing biotechnology threats (e.g. pollution). Human health is not directly considered.
Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way.	The tool does not specifically address impacts of incentives harmful for biodiversity (unless specific threats identified by the tools are considered are sustained by harmful incentives (e.g. use of a certain pollutants, mining).
Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilisation.	The tool can be used to inform policymakers on implementation of restoration activities and to set targets for biodiversity conservation.
Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity.	The tool brief does not specifically integrate local communities' knowledge into the biodiversity score. However, their knowledge (e.g. on species distribution and locally relevant threats) can be considered for a local-based biodiversity assessment.
Target 21. Ensure equitable and effective participation in decision-making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.	As for Target 20 not specifically addressed in the tool brief.