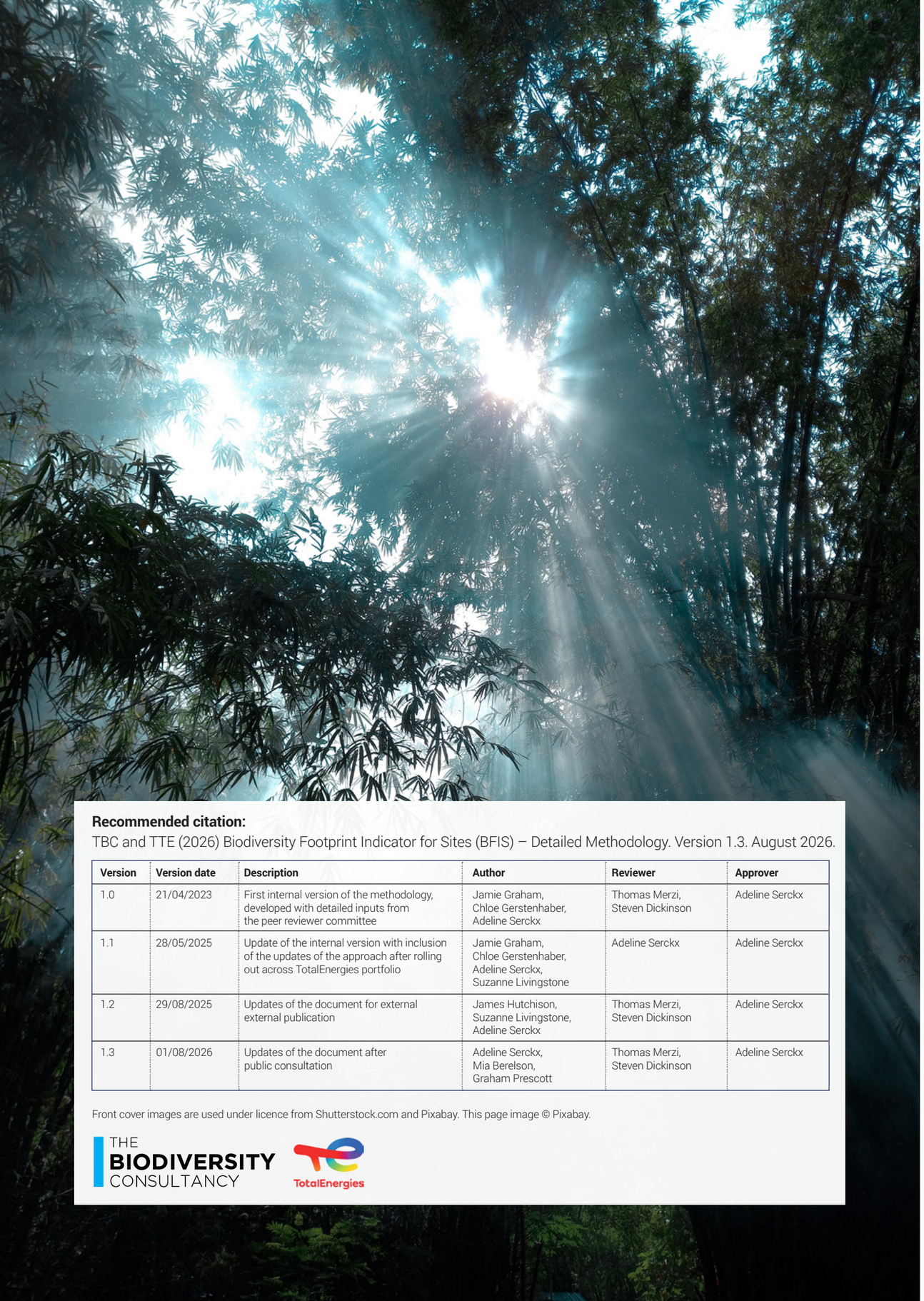
Biodiversity Footprint Indicator for Sites (BFIS)

Detailed Methodology

Version 1.3

THE BIODIVERSITY CONSULTANCY

TotalEnergies



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1.0	21/04/2023	First internal version of the methodology, developed with detailed inputs from the peer reviewer committee	Jamie Graham, Chloe Gerstenhaber, Adeline Serckx	Thomas Merzi, Steven Dickinson	Adeline Serckx
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1.2	29/08/2025	Updates of the document for external external publication	James Hutchison, Suzanne Livingstone, Adeline Serckx	Thomas Merzi, Steven Dickinson	Adeline Serckx
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Executive summary

The explosion of nature-related data and tools and the increasingly complex requirements for the private sector to assess and report on nature-related risks and impacts has created the need for a simple but effective framework to assess and prioritise biodiversity risks in a portfolio of sites.

The Biodiversity Footprint Indicator for Sites (BFIS) is a standardised framework designed to meet this need. It does so by assembling global datasets on pressures to biodiversity resulting from the construction and operation of built infrastructure and on biodiversity significance.

BFIS assigns sites a biodiversity-risk-based score based on the area (extent) of the site footprint (infrastructure, associated infrastructure, degradation and disturbance buffer zone, impacts from the economic displacement of local communities and indirect impacts), the impact per area on biodiversity condition, and the global significance of the biodiversity located there.

BFIS takes a step-wise approach to efficiently categorise sites in order to triage an efficient level of investment into sites of high, medium, and low biodiversity risk. It comprises the following steps:

- **Step 1a** Pre-evaluation of sites through initial assessment of footprint and significance for every site in the portfolio
- **Step 1b** Categorise sites by setting thresholds for low, medium, and high risk
- **Step 1c** Validate site categories by stakeholders familiar with the context
- **Step 1d** Prioritise sites based on the validation outcomes and on additional requirements, policies and risk concerns of the user
- **Step 2a** Determine the best mitigating actions to use for each site category
- **Step 2b** Define expectations for monitoring based on risk category
- **Step 2c** Align metrics for consistent reporting on biodiversity risks

BFIS is currently primarily designed for companies with energy infrastructure portfolios to manage and monitor biodiversity impacts from their operational portfolio. However, the risk screening results (outcomes of step 1) may also be highly relevant to support decision-making for investors. BFIS outputs are designed to be compatible with nature-focused reporting frameworks, including TNFD, CSRD, and SBTN.

The key limitations of the approach are it is focused on land-use and land-use change impacts, direct operations rather than supply chain, and does not assess risks to potential dependencies. Further development to include dependencies and a greater range of pressures is underway. Future work will include the development of additional guidance for Step 1c (validation), Step 2 (act, monitor, report), and opportunities to tailor the tool to guide investment decision-making.

BFIS has been released with an accompanying data template, guidance document, and R package. This methodology document is intended to cover all the information that a user needs to know about BFIS before running it themselves.

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1. Introduction

1.1 What is BFIS?

The Biodiversity Footprint Indicator for Sites (BFIS) is a standardised framework to evaluate, manage, and monitor biodiversity impacts from a company's site-based operations portfolio. BFIS outputs are designed to be compatible with nature-focused reporting frameworks.

The BFIS approach has been developed to align with the expectation for companies to manage and externally disclose on biodiversity impacts, driven in part by the emergence of voluntary and mandatory reporting frameworks (e.g., Taskforce on Nature-related Financial Disclosures (TNFD), Corporate Sustainability Reporting Directive (CSRD), Global Biodiversity Framework (GBF) Target 15, Nature positive for business (IMEC)), as well as heightened scrutiny from investors and civil society. Some of the reporting frameworks require that companies measure and report on their impacts, dependencies, risks and opportunities. The challenge is that there is often little data readily and affordably available in a standardized or comparable format at the site level to support a corporate level assessment across all assets. For example, Environmental Impact Assessments, a regulatory requirement for new projects, are carried out at a site level by different teams and consultants, vary in scope, quality and regulation required in the country where it is located. Results are therefore often difficult to consolidate at corporate level. BFIS step 1 aims to address this issue by providing a common automated approach for estimating total impact footprint and biodiversity risk at each site. A validation step then supports the integration of specific site-level data. Site-level data across large portfolios is collated in a sequential and prioritised manner, targeting the sites with the largest impact and more significant risk for biodiversity. BFIS allows companies to present a single aggregated estimated impact and risk figure for their portfolio, which can be disaggregated in various ways depending on user needs. BFIS step 2 provides guidance to manage and monitor identified biodiversity risk and enable consistent biodiversity reporting.

The approach was developed to enable aggregation and provide both an estimated footprint and an understanding of biodiversity risk.

BFIS has two main components (Figure 1):

BFIS step 1

BFIS step 1 applies a tool to estimate the total impact footprint and potential presence of features of biodiversity importance across both operational and prospective sites within a corporate portfolio. The impact footprint and biodiversity importance are provided at site-level, are aggregable at portfolio level, and are used to determine the b-risk category for each site. This subsequently informs the scope of management actions, monitoring and reporting.

Step 1a. Pre-evaluate:
Step 1a provides a preliminary estimate of the impacts and identification of biodiversity importance, based on modelled global biodiversity datasets. It acts as a preliminary screening, before validation of results in step 1c.

Step 1b. Categorise:
Step 1b categorises sites based on the magnitude of the estimated impact and the potential presence of biodiversity features of conservation value. It provides a rubric to guide which sites to verify with site-based data in the validation step.

Step 1c. Validate:
Step 1c provides guidance on how to verify the estimated impact and presence of features of biodiversity importance, specifically regarding the actual presence of, and impacts on, biodiversity features of interest on site. Outcomes from step 1a are then adjusted to provide a refined assessment of the impact and the b-risks for each site.

Step 1d. Prioritise:
The outcomes of step 1c are used to update the b-risk category output from step 1b for each site. Step 1d provides the final b-risk category for each site and prioritises the highest b-risk sites for effort and action for the company.

BFIS step 2

BFIS step 2 is divided in three steps and provides guidance on site-level action, monitoring, and reporting. The level of expectation of effort and alignment with key principles is determined based on the b-risk category validated in step 1d.

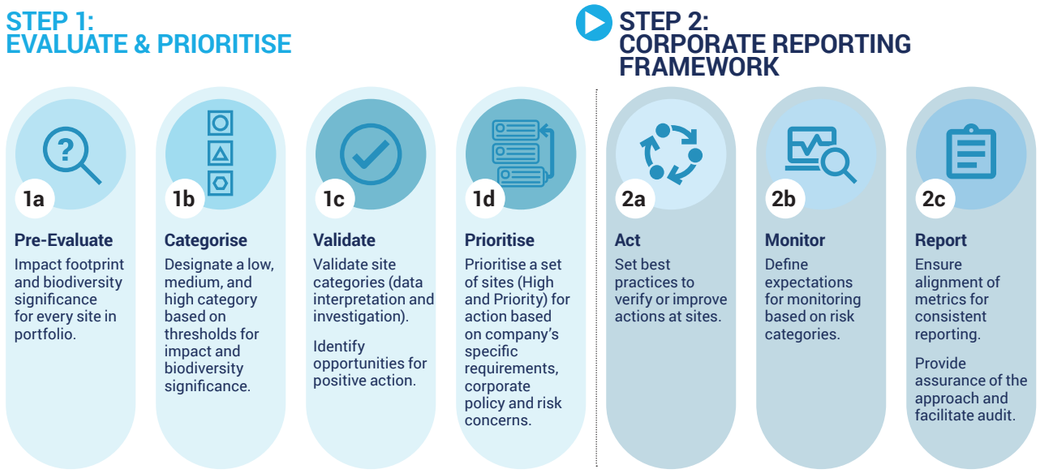
Step 2a. Act:
Step 2a is focused on the actions that the company can take to mitigate impacts on biodiversity. It provides guidance on the key principles for developing and/or reviewing existing actions.

Step 2b. Monitor:
Step 2b provides guidance on the type of monitoring (type of approaches, type of features) to be conducted at site, the level of effort determined on the b-risk category.

Step 2c. Report:
Step 2c provides guidance on the type of indicators used to report for each site with recommendations on how to aggregate indicators at portfolio level to give an overview of company progress to reduce impacts. This can also be tailored to the company level of ambition for biodiversity (e.g. a reduction of impacts to as low as possible, achieving no net loss or net gain).

A glossary table of all key terms used in BFIS is provided in Appendix 1.

Figure 1: Overview of BFIS steps



Please note that the focus of this methodology report is on the method behind step 1. The BFIS method is focused on the direct operations portion of the value chain only. Upstream and downstream are currently out of scope.

1.2 Intended use of BFIS

The development of BFIS comes at a time of increasing expectations in terms of assessing and reporting on businesses' interactions with biodiversity, from both regulators and investors. The purpose of the BFIS approach and outcomes has evolved since the project's inception, but BFIS has been developed for companies who want to be able to lead on their biodiversity risk management and reporting, being autonomous (tools and guidance are available to run the steps internally) whilst having the confidence that they will follow best practice. BFIS framework brings together a suite of core concepts and best practice, such as the identification of priority biodiversity features or the implementation of the mitigation hierarchy, providing a stepwise approach to enable companies to keep leadership of their risk management.

BFIS can help users:

- To estimate impacts and determine the State of Nature at locations in order to categorise sites based on their impacts and b-risk.
- To provide a framework of minimal expectations for mitigation actions, monitoring and reporting based on the level of b-risk to support businesses in verifying that their sites manage biodiversity risks with the level of expectation from best practice, including for example implementation of the Mitigation Hierarchy (Ekstrom et al., 2015).
- To inform annual internal and/or external reporting on the total impact footprint of operational sites and b-risk across the corporate portfolio, and more specifically to enable biodiversity reporting for Corporate Sustainability Reporting Directive's European Sustainability Reporting Standards (CSRD). It includes all sites owned and operated by the company, presented as a list which is updated on an annual basis to reflect any changes in the company portfolio, including divestments and acquisitions.

BFIS could also be used to inform decision-making at corporate level e.g., biodiversity risk screening before the acquisition of new sites or strategic decision-making related to operation types since the b-risk will inform companies on the level of expectations for biodiversity risk management and monitoring for that specific site. This level of expectations for biodiversity risk management and monitoring will have implications on the investment in the project (both in terms of budget and resourcing), timeline for development, expectations to get credits and insurance, and is therefore useful to support investment decision-making.

BFIS has been developed for the energy sector. However it is designed to be of interest to all sectors having significant impacts on nature from direct operations, especially due to land occupancy. The impact estimation tool is readily applicable to the energy sector (see list of operations in Section 2.1) but could easily be developed to cover other operation types with significant land occupancy footprint.

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1.3 Alignment with standards and disclosure frameworks

The BFIS framework has been developed to enable biodiversity reporting for Corporate Sustainability Reporting Directive's European Sustainability Reporting Standards (CSRD). It also aligns with the guiding principles and publication of several other disclosure frameworks by providing relevant reporting information, including:

- Taskforce on Nature-related Financial Disclosures (TNFD);
- International Sustainability Standards Board (ISSB);
- Aligning Accounting for Nature (Align) Project;
- Global Reporting Initiative (GRI) Biodiversity Topic Standard;
- International Finance Corporation Performance Standard 6 (IFC PS6);
- Convention on Biological Diversity (CBD) Global Biodiversity Framework and;
- Partnership for Biodiversity Accounting Financials.

It offers key nature-related indicators to help businesses meet various regulatory requirements and set science-based targets. Appendix 2 provides a detailed breakdown on how BFIS helps alignment with the LEAP framework (TNFD) and how BFIS enables responses to ESRS E4 datapoints.

Figure 2: Supporting the business in aligning with global frameworks

		CSRD	TNFD	SBTN
Steps 1a. & 1b. Pre-evaluate and Categorise	• Identifies priority sites through impact estimates and potential biodiversity risks	ESRS 2 IRO-1	Scoping, Locate	1a. Assess
	• Estimate of impacts for land use • List of potential biodiversity risks • *Estimate of impacts from other pressures and dependencies*[1] • Allows breakdown of main contributors to impact within a site	ESRS 2 SBM-3, E4.5	Evaluate, Assess	1b. Assess
Steps 1c. & 1d. Validate and Prioritise	• Verify estimated impact and biodiversity risk with site data • Site prioritisation based on impact or biodiversity risk	ESRS 2 SBM-3, E4.5	Evaluate, Assess	2. Interpret & Prioritise
Step 2a. Act	• Supports the development of corporate goals and ambition • Identifies action targets for each site and KPIs • Level of detail and ambition scaled to site priority level	E4.1, E4.2, E4.3, E4.4	Prepare	3. Measure, Set & Disclose
Step 2b. Monitor	• Guidance to develop protocols for monitoring KPIs • Performance tracking • Implement management and monitoring plans	E4.1, E4.2, E4.3, E4.4	Prepare	4. Act, 5. Track
Step 2c. Report	• Reporting and disclosure	Annual Disclosure	Ongoing Reporting	4. Act, 5. Track

*"Risk" in the context of BFIS refers to the **potential threat to biodiversity**.*
The scores for each indicator are comparable to "potential impacts" in ESRS or the "State of Nature" score in SBTN.

1.4 BFIS limitations

BFIS has been designed to support the management and reporting of biodiversity impacts across a portfolio of direct operations. It does not include a tool and/or guidance to estimate supply chain impacts, although it is widely recognised that supply chain is the main contributor of company impacts on biodiversity (Bull et al., 2022). The decision was taken to focus on impact estimation, management, and monitoring that the company has direct control over and for which immediate actions could be implemented in case of identification of key gaps in their existing approach. However, the general stepwise approach described in BFIS framework could be applied to supply chains, if other tools (e.g. life-cycle analysis) are used to estimate the impacts in step 1a.

Initial development focused on developing models to enable an estimate of land use impacts (step 1a) given land-use change (which includes the ongoing occupancy of land for human activities as well as transformation) is the largest driver of terrestrial biodiversity loss (Jaureguiberry et al. 2022), including for the energy sector (current focus of BFIS). However, global understanding of all key pressures on nature and key dependencies to ecosystem services are essential for business to properly manage their risks and impacts. Therefore, additional work is currently being conducted to include estimated impacts for other pressures on biodiversity (climate change, water, pollution) and identification of key dependencies to ecosystem services (see Section 8.1).

BFIS does not currently include guidance to define company risks and opportunities (c.f. 'Assess' step for the LEAP framework). However, the outputs of BFIS step 1a-1c can enable a company to determine risks and opportunities and this component could be integrated into the criteria to define priority sites in step 1d.

The BFIS step 1a is designed to provide quick and simple impact estimates for corporate assessment and is therefore based on global datasets with known assumptions and limitations. However, to ensure transparency and reduce the risk of misinterpretation it is important to report on the confidence in the results. To enable this, a list of criteria was developed, based on a review of several standards, metrics and approaches including both the Align Project, the Partnership for Biodiversity Accounting Principles, and other resources. A full set of the principles used can be found in Appendix 7.

BFIS step 1a has the following limitations which need to be considered when interpreting the results:

- BFIS step 1a provides a broad estimate of the expected or potential impacts, based on a general understanding of the operation types and with limited site data. It does not report actual measured impacts from site assessments.
- BFIS only includes permanent and long-term impacts from direct operations. The approach has been developed with the assumption TotalEnergies (and any other company applying the approach) applies general good practice mitigation. BFIS does not include temporary impacts occurring during the construction phase, unless it is considered that these impacts will last beyond the construction phase. It also does not include unplanned impact events (e.g. oil spills). These assumptions are part of the core development of the approach and are unlikely to change in future iterations of the approach.

BFIS is based on and only uses available global (as opposed to local) data layers and databases, which limits the resolution of data and the level of assessment[1]. Additionally, for the sake of pragmatism, the BFIS model sometimes makes broad assumptions as part of the process for calculating results (e.g. the approach taken for deciding whether economic displacement is likely to occur for a site). The confidence levels score is designed to report on confidence in a transparent way. However, none of the outputs included in BFIS step 1a should be considered as a measure of biodiversity, and further validation (via step 1c) is necessary to determine actual values.

[1]For global data layers, different biases (e.g., taxonomic) and limitations (e.g., resolution and data completeness) will inherently exist.

1.5 Purpose of this report

The purpose of this methodology report is to provide:

1. Guidance to companies on the BFIS methodology.
2. How to practically use the tool to produce portfolio results.
3. How the tool can be used to prioritise sites for further action, monitoring and reporting.

Any changes to the methodology itself and resultant effects on the interpretation of results will be clearly communicated via an updated version of the methodology report. This will include a process of external verification, whereby changes and updates will be reviewed by an external peer review committee (see Section 7).

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2. BFIS Step 1a. Pre-evaluate

Step 1a of BFIS involves an initial evaluation of impacts to biodiversity (Pressures on Nature) and biodiversity risk (State of Nature) at site operations using readily available global datasets and standardised impacts for different operation and infrastructure types.

The outputs of step1a should be considered with caution due to potential inaccuracies in the datasets used to assess biodiversity risk. This would result in a potential overestimation of sites categorised as High biodiversity risk in step 1b due to the precautionary approach built into the analysis. The intent is to avoid overlooking any potential risks whether from scale of impact or biodiversity sensitivity. However, this is the first step in the process, and the categorisation of sites is refined in later steps of the BFIS process, particularly in step 1c (Validate), which incorporates site-specific information.

Table 1 provides a description of the two components of step 1a.

Table 1: Indicators and metrics in BFIS step 1a

	Indicator	Metric
Pressures on Nature	Overall land occupancy footprint (area impacted)	*ha*
	Overall biodiversity land occupancy footprint	*Impact-adjusted_L.ha*
	Other pressures[2]	
State of Nature	Land for potential positive actions	*Impact-adjusted_R.ha*
	Natural Habitat (presence of NH/MH)	*Natural/Non-natural – area (ha) and percent*
	Habitat significance (potential presence of Critical Habitat)	*area (ha) and percent*
	Species significance (species extinction risk)	*Sum of STAR threat abatement values*
	Overall biodiversity importance	*Score: Very Low – Low – Medium – High – Very High*
Dependencies on Nature[2]		

[2]"Other pressures" and "dependencies" are still in development and will be available in a future iteration of BFIS (see Section 8.1

Pressures on Nature

Land occupancy footprint and biodiversity land occupancy footprint

This indicator estimates the pressure and resulting impact that occurs from land or sea use within the area that each site is operating. It is broken down into several sub-components for each site (see Section 2.2.2). Two indicators are used:

- The land occupancy footprint, the total physical area occupied by direct and indirect (influx) activities.
- The biodiversity land occupancy footprint, which represents the pressure-adjusted impact on biodiversity from site activities.

Other pressures [still in development – will be available in a next version]

Although land use and land use change are the main drivers of biodiversity loss, other pressures defined by IPBES, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (climate change, air and water pollution[3], resource exploitation, invasive species) also significantly impact biodiversity. These pressures will be addressed in a future iteration of BFIS, using an approach based on life cycle analysis (see Section 8.1.1).

State of Nature

Land for potential positive actions

This indicator represents the area within the land occupancy footprint that remains available for habitat protection and restoration after site impacts have been accounted for. It is calculated for both the area of direct control (GIS polygon) and the landscape (area of influence). This is the reverse of the biodiversity land occupancy footprint, which uses the same metric (the 'other side of the coin').

Natural Habitat

The Natural Habitat indicator estimates the proportion of the area of influence (in hectares and %) which is considered as Natural Habitat as per the International Finance Corporation Performance Standard 6 (IFC PS6) definition.

Habitat significance

This indicator presents the proportion of Natural Habitat within the area of influence (in hectares and %) that are habitats suitable for the species potentially qualifying under Critical Habitat, as per IFC PS6 definition.

Species significance (species extinction risk)

The species significance is assessed using the threat abatement component of the Species Threat Abatement and Restoration (STAR) metric and is calculated as the sum of STAR values within the Area of Influence. It represents the total value of opportunities to abate threats and therefore reduce the global species extinction risk in the defined area.

Overall biodiversity importance

The overall biodiversity importance is assessed using a combination of biodiversity indicators which represent both the significance for species and for habitat: (1) the number of Critically Endangered species potentially present, and the potential presence of species which meet the thresholds for Critical Habitat, (2) the maximum value of the STAR metric (Abatement or Restoration components) within the area (representing the likelihood that some areas of high importance for species at significant risk of extinction are present within the area of influence), and (3) the proximity to areas of biodiversity importance (Protected Areas, World Heritage Sites, Key Biodiversity Areas, and Alliance for Zero Extinction Sites) (representing the areas where species of biodiversity importance are more likely to be present in higher abundance and where their habitat is likely to be less degraded than elsewhere and therefore priorities to protect). Each indicator receives a score from very low to very high, and the overall score of the site is the highest score of the indicators.

Dependencies on nature

[still under development – will be available in a next version – see Section 8.1.2]

This indicator represents the type of dependencies each operation type has on nature, from both a natural capital assets (NCA) point of view and an ecosystem services (ES) point of view. It will utilise the ENCORE database to assign a qualitative breakdown and categorisation of type and severity of dependency.

[3]Nuisance pollution (light, noise, vibration) is considered as a driver of land occupancy loss and is included in the direct impact buffer.

2.1 Site operation typologies

The BFIS model uses direct operations associated with the energy sector. A set of discrete operation types were developed, based on the general concepts and framework outlined in the rest of this methodology report. Table 2 summarises the different operation types included in the BFIS model.

Table 2: Operation types in the BFIS model

Company branch	Operation type
Exploration and Production	Onshore Oil and Gas Extraction
	Offshore Oil and Gas Extraction
	Oil and Gas Pipeline
	Oil Tank Farm
Refinery and Chemicals	Petroleum Refinery
Gas, Renewables and Power	Onshore Wind Farm
	Offshore Wind Farm
	Onshore Solar Farm
	Combined Cycle Gas Turbine (CCGT) Power Plant
	Biogas
Marketing and Services	Tank Farm / Fuel Farm

2.2 Pressures on Nature

2.2.1 Temporal scope

Only permanent impacts from operated sites are estimated for the Pressures on Nature. This includes impacts occurring during the operational phase and the medium- to long-term impacts from the construction phase for the land occupancy footprint.[4] Temporary impacts occurring at construction phase such as noise, dust or light disturbances caused by increased traffic and construction are not included in the footprint. Impacts are modelled based on expected impacts at full operation of the site; therefore, no additional or future impacts are included in the assumptions of the model. Cumulative impacts are also excluded. This may result in impacts of concern to local stakeholders being understated (e.g., in areas where multiple projects are under development / developed, the cumulative impacts would not be highlighted) – however, as this is a risk screening approach for categorisation of sites for actions and reporting, the inclusion of these other impact sources is challenging to model.

If the step 1a of BFIS is calculated annually, any resultant changes in impact will be a result of either changes in the portfolio (e.g., acquisition or divestment) or changes in the site design (e.g., number of turbines or well pads) and will not reflect application of mitigation measures. The ability of BFIS to reflect the impacts of mitigation measures taken at each site will be included in step 2 of the BFIS approach.

[4]Impacts from the construction phase are excluded for other IPBES pressures, due to how LCA (life cycle analysis) models are built and the complexities of extracting that data specifically.

2.2.2 Spatial scope: Footprint components

BFIS captures the estimated impacts from the ongoing activities of operational sites (i.e., direct and indirect impacts of operations). For each operation type, five components of the footprint are considered for the land occupancy footprint:

- **Infrastructure footprint**, i.e. the footprint associated with infrastructure developed specifically for the site.
- **Degradation and disturbance** in direct proximity to the infrastructure, i.e., noise, dust, light.
- **Associated infrastructure**, i.e., road and rail, transmission line, pipeline.
- Impacts from **economic displacement** of local communities.
- **Indirect impacts**. Only indirect impacts from agriculture and extraction of terrestrial natural resources from influx are considered, i.e., land use change for agriculture, pastoralism, collection of fuel wood or non-timber forest products due to influx.[5]

The other pressure impacts (climate change, pollution, resource exploitation) will be estimated on the infrastructure footprint, degradation and disturbance and associated infrastructure only (excluding economic displacement of local communities and indirect impacts).

The significance of these different impact sources was determined through discussions between experts at TBC and TotalEnergies. For more information on the sources supporting the impacts derived from each of these areas, please see Appendix 3.

2.2.3 Land occupancy footprint and biodiversity land occupancy footprint

Land use impacts are estimated using "extent x condition", a globally recognised framework used for example in the Biodiversity Impact Metric developed by the Cambridge Institute for Sustainability Leadership (CISL) and the "Align Project - Aligning accounting approaches for nature" developed by UNEP-WCMC and funded by the European Commission.

This footprint reflects a cost for nature, where the presence of sites and their activities hinders the area from reverting to a hypothetical "pristine/natural" state. The approach is activity-based, using information about the types of activities at each site to derive the proportion of biodiversity loss in an estimated area, and is location non-specific.

- The "extent" of the footprint is the area of habitat impacted within and around the site due to site activities. It is represented with the **land occupancy footprint indicator**.
- The impact on biodiversity "condition" is the proportion (%) of biodiversity lost through different activities calculated based on land use types/ intensities.[6] It has been estimated for each activity (see Section 2.2.3.2).
- The "extent by condition" framework represents the pressure-adjusted impact of site activities on biodiversity. It is expressed through the **biodiversity land occupancy footprint indicator**, which reflects the area modelled as functionally unavailable to biodiversity. This metric accounts for the fact that different activities exert different levels of pressure. It does not assume that the habitat was in good condition before the activities started; it estimates the ongoing impact on biodiversity of not being able to recover to a natural baseline due to functional and structural constraints imposed by the land use. For example, permanent concrete infrastructure will eliminate existing biodiversity entirely (100% loss), while disturbances like noise or pollution may only reduce it by around 35%. The metric Impact-adjusted hectares (Impact-adjusted.ha) expresses the biodiversity impact in terms of an equivalent area where biodiversity is completely lost. In other words, it translates partial impacts (like noise or pollution) into a standardised unit that reflects how much land would need to be entirely degraded to have the same effect on biodiversity. For example, if site activities cause noise pollution that reduces biodiversity by 35% over 10 hectares, the impact-adjusted_L.ha would be 3.5 (equivalent to 3.5 hectares losing 100% of biodiversity).

[5]Indirect impacts do not include impacts where a land use footprint is not appropriate to quantify impacts e.g., fishing or hunting.
[6]This differs from how condition is assessed in other contexts (e.g., in a Quality Hectare metric) where condition is based on the state of the biodiversity feature prior to impact rather than the 'condition lost' approach applied in BFIS.

2.2.3.1 Extent

The "extent" of the footprint is the area of habitat impacted at a site. To estimate the extent of the five footprint components, a split approach was adopted:

- **Infrastructure footprint and degradation and disturbance impacts:** A bespoke model for each operation type was developed to estimate the extent of the infrastructure footprint and degradation and disturbance impacts based on literature review and interviews with TotalEnergies site managers (Appendix 3). As a result of the modelling, application to a site requires little input data from a company.

The infrastructure footprint and direct impact are assumed to occur in the geospatial area provided by the company in the form of a GIS polygon (usually this is the concession area or equivalent. Appendix 3 contains the GIS polygons required per operation type).

- **Associated infrastructure** (road, railway, pipeline and powerline), land conversion for agriculture and land degradation for resource extraction due to **economic displacement of local communities and indirect impacts**: One approach has been developed for all operation types, which uses a list of criteria and decision trees to adapt the impact estimates based on the specificities of the site (see below for details).

Box 1: Data input from the company

Using the information provided by the company, BFIS estimates the footprint for the 5 major components of land occupancy.

The required information differs between the operations and can be found in Appendix 2 for each operation type. Below are examples of the required information from companies for an onshore wind farm and onshore gas and oil extraction site.

Onshore Wind farm

Field	Value
Middle point of GIS circle	3.1720 44.6125
Total Capacity (MW)	14.4
Number of turbines	3

Offshore oil and gas extraction site

Field	Value
GIS polygon of concession area	
GIS layer of pipeline(s) to the coast	1 pipeline
Presence of FPSO (Y/N)	Y
Number of FPSO	1
Presence of floating platforms (Y/N)	N
Number of floating platforms	0
Presence of fixed platforms (Y/N)	N
Number of fixed platforms	0
Number of wellheads	3
Is there an onshore component for this site (not considered as a separate asset)?	No
If yes, please provide the footprint in ha	N/A

Infrastructure footprint

The most readily identifiable and easiest to calculate component of the footprint comes from the permanent infrastructure required to operate each site. This could include buildings, well heads, pipelines, wind turbines, solar panels, etc., and will vary from site type to site type.

The calculation of the infrastructure footprint is based on a combination of geospatial data provided for each site, along with site-specific supplementary information e.g. number of wind turbines. For a full description of the infrastructure footprint for each site, see Appendix 3.

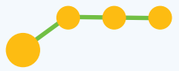
Box 2: Infrastructure footprint

The infrastructure footprint is estimated in BFIS using standardised models for each operation type. These models combine site-specific information provided by the company (see box 1) with standardised parameters.

The examples below show how BFIS standardised models calculate the infrastructure footprint calculations for an onshore wind farm and an offshore oil and gas extraction site.

Onshore Wind farm

Worked example
*Company input: **3 turbines***



Turbines & Power Station

BFIS assumptions:
Turbine footprint radius 50 m
- A = π(50 m)²
- = 7,854 m²

An additional turbine is included within the BFIS model as a proxy for the associated infrastructure.

BFIS Formula:
Total turbine footprint = (*n* + 1) × 7,854 m²
= (**3** + 1) × 7,854 m² = **31,416 m²**

Internal network

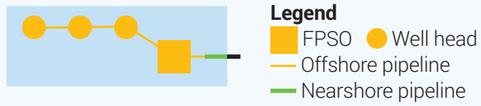
BFIS assumptions:
Turbine footprint radius 50 m
- Network Width = 10 m
- Network Length = 500 m

BFIS Formula:
Network footprint = *n* (10 m ×500 m)
= **3** × 10 m × 500 m = **15,000 m²**

Total infrastructure footprint
= 31,416 m² + 15,000 m²
= 46,416 m² = 4.6 ha

Offshore oil and gas extraction site

Worked example
*Company input: **FPSO** operation, **3 well heads**, **GIS location data***



Onshore = No onshore component; considered as a separate asset

Offshore
(The oil rig/FPSO, pipelines and well heads)

BFIS calculations:
- Oil Rig / FPSO =10 anchor points × 5 m² = 50 m²
- Well heads = *no. of well heads* × 30 m²
- Network = *no. of well heads* × 15 km × 10 m
- Pipeline = *distance to coast up to* 15 m *depth* × 10 m

Distance from coast up to 15 m depth is calculated by BFIS using the GIS location data. In this example it is **8,000 m**.

Combined BFIS Formula:
Offshore footprint
= 50 m² + (**3** × 30 m²) + (**3** × 15,000 x 10 m)
+ (**8,000 m** × 10 m) = **530,140 m²**

Nearshore (Pipeline)

BFIS assumptions:
- Pipeline Width = 130 m
- Pipeline Length = *distance from coast to* 15 m *depth*

Distance from coast to 15 m depth is calculated by BFIS using the GIS location data. In this example it is **5,000 m**.

Total infrastructure footprint
= 530,140 m² + 650,000 m²
= 1,180,140 m² = 118 ha

Direct impact buffer

In addition to the immediate impacts from infrastructure, a direct impact buffer is created for each site. The buffer represents the impacts from place-specific sources of pollution such as noise, light or sedimentation using the extent x condition approach.

For each site type, a buffer zone around the infrastructure footprint is delineated, and within this area a certain biodiversity loss coefficient (i.e. "condition") value is assigned, based on the impact source in question. For a full list of buffer values and corresponding biodiversity loss coefficients, see Appendix 3.

Box 3: Direct impact buffer

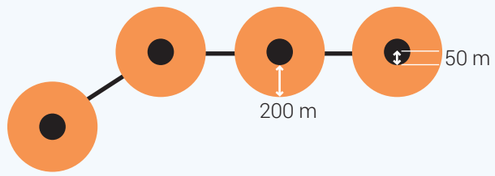
The direct impact buffers represent the area around the infrastructure footprint where site-specific impacts (e.g., noise / light) influence biodiversity condition. For each operation type and infrastructure, BFIS defines a buffer distance.

The worked examples below show how these buffers are applied for an onshore wind farm and an offshore oil and gas extraction site.

Onshore Wind farm

Worked example
*Company input: **3 turbines***

Legend
- Turbine / Power station
- Internal network
- Direct Impact Buffer



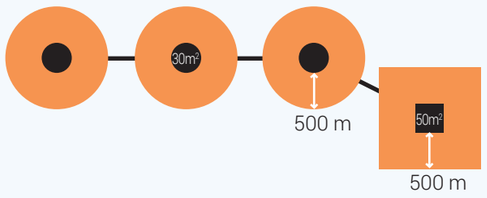
BFIS calculations:
- Turbine / Power station buffer radius:
  200 m around the footprint (50 m)
  $\pi[(250'' m'')^2-(50'' m'')^2]$
- Add +1 to turbine number to generate proxy for power station buffer

BFIS Formula:
Direct Impact Buffer = **4** × $\pi(250^2 - 50^2)$
$\approx 753{,}982\ m^2 \approx 75.40$ ha

Offshore oil and gas extraction site

Worked example
*Company input: **FPSO** operation, **3 well heads**, **GIS location data***

Legend
- FPSO
- Well head
- Internal network
- Direct Impact Buffer



BFIS calculations:
FPSO / Platform buffer radius:
- FPSO / Platform size = 50 x 50 m
- 500m buffer from each edge
- Total buffered region = 1050 x 1050 m

Well heads buffer radius:
- 500 m around the footprint (30 m^2)
- π (500 m^2) - 30 m^2

BFIS Formula:
Direct Impact Buffer
= (**1** ×$(1050^2 - 50^2)$+ (**3** × (π (500 m^2) − 30 m^2))
= 110 ha + 235.61 ha
= 345.61 ha

Associated infrastructure

Box 4: Associated infrastructure

Associated infrastructure is determined by BFIS from the site's GIS location, country and operation type. Each operation uses standard infrastructure widths, and a decision tree assigns a Low, Medium, or High length category.

The examples below illustrate this for an onshore wind farm and a petroleum refinery.

Onshore Wind farm

Included infrastructure
- Road
- Powerline

Not Included Infrastructure
- Rail
- Pipeline

Question	Answer
Is site located in OECD country?	No
Is site located in or near to an area of high population density?	No

Length category = **High**

Associated infrastructure area:

Road
- Width = 10 m
- Length = **20 km**
- Area = (10 m × **20 km**)

Powerline
- Width = 20 m
- Length = **20 km**
- Area = (20 m × **20 km**)

Associated infrastructure = 0.2 km^2 + 0.4 km^2
= 0.6 km^2 = 60 ha

Petroleum refinery

Included infrastructure
- Road
- Powerline
- Rail
- Pipeline

Question	Answer
Is site located in OECD country?	Yes
Is site located in or near to an area of high population density?	Yes

Length category = **Low**

Associated infrastructure area:

Road
- Width = 10 m
- Length = **0.1 km**
- Area = (0.1 km × **0.1 km**)

Powerline
- Width = 20 m
- Length = **0.1 km**
- Area = (0.02 km × **0.1 km**

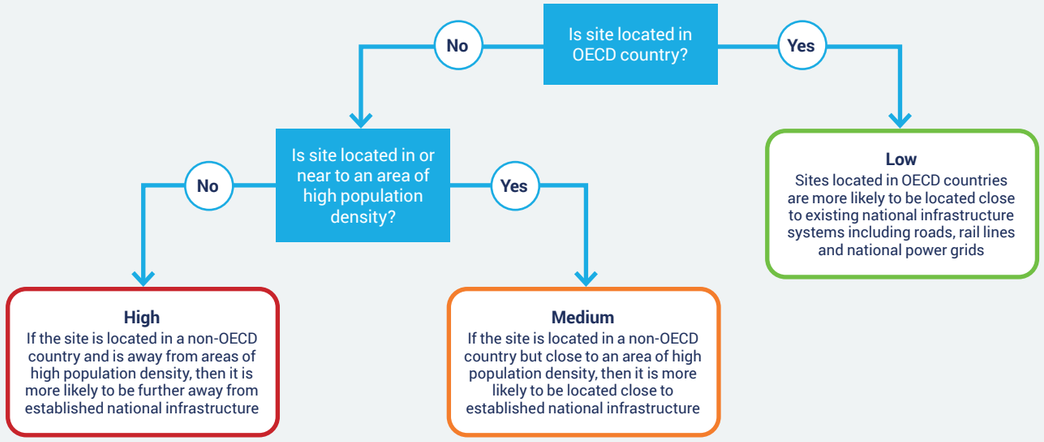
Rail
- Width = 20 m
- Length = **0.5k m**
- Area = (0.02 km × **0.5 km**)

Pipeline
- Width = 10 m
- Length = **0.1 km**
- Area = (0.01 km × **0.1 km**

Associated infrastructure = 0.001 km^2+0.002 km^2
+0.010 km^2+0.001 km^2
= 0.014 km^2= 1.4 ha

If associated infrastructure is built to support the needs of project development (connecting the site to public infrastructure), this is included as part of the footprint. The relevant types of associated infrastructure will vary by operation type. The broad categories of associated infrastructure for each operation type (i.e., road, rail, pipeline, powerline) have been identified based on the experience of TBC team in consultation with TotalEnergies.

Figure 3: Decision tree to identify length of associated infrastructure



The approach uses an average width for each associated infrastructure type and a decision tree (Figure 3) to estimate the lengths of the associated infrastructure (taking site location into account). Users can refer to Table 3 to understand which types of associated infrastructure apply to each site type, with the corresponding widths provided in Table 4. Each site is then categorised as "low", "medium" or "high" based on the outcomes of the decision tree in Figure 3. Lengths for all relevant types of associated infrastructure are assigned based on this categorization, with further details in the Appendix 4.

Table 3: Associated infrastructure associated with each operation type (defined based on discussion with TTE experts for each sector)

Operation type	Road	Rail	Pipeline	Powerline
Offshore oil and gas extraction site	Yes	No	No*	Yes
Onshore oil and gas extraction site	Yes	No	Yes	Yes
Oil and gas pipeline	Yes	No	No	No
Oil tank farm	Yes	Yes	Yes	Yes
Petroleum Refinery	Yes	Yes	Yes	Yes
Onshore wind farm	Yes	No	No	Yes
Offshore wind farm	Yes	No	No	Yes
Onshore solar farm	Yes	No	No	Yes
CCGT	Yes	No	Yes	Yes
Biogas	Yes	No	No	Yes
MS tank farm	No	No	No	No

*Included within the infrastructure footprint rather than associated infrastructure footprint

Table 4: Width of associated infrastructure (estimated from literature and expert consultation, validated with data from TTE sites)

Type of associate infrastructure	Width (m)
Rail	20 (dual lanes/tracks*)
Road	10 (dual lanes/tracks*)
Pipelines	10 in OECD; 30 in non-OECD
Power lines	20

*Two separate paved surfaces side-by-side

The approach assumes that remote sites are likely to require longer associated infrastructure than those in industrial areas. The widths and average lengths of associated infrastructure are defined through a literature review combined with expert consultation, and validated with data from TTE projects.

The impact of associated infrastructure is assumed to occur outside the site's concession area, within a buffer zone around the concession (and is therefore additive to the direct impacts occurring within the concession area). To approximate this, a polygon is drawn around the concession area with a radius equal to the longest identified associated infrastructure length.

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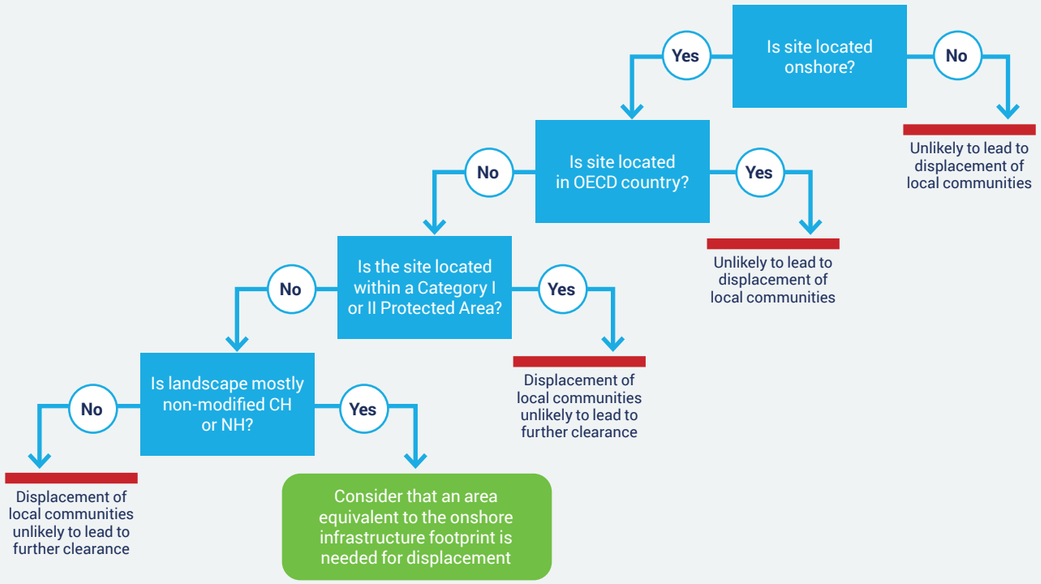
Economic displacement of local communities

Figure 4: Decision tree to identify if economic displacement of local communities should be included in the direct operation footprint



Box 5: Economic Displacement

All sites undergo a standard assessment to determine whether economic displacement of local communities should be included in the footprint.

This assessment is based on site location and context, including the OECD status of the country, protected area designation, and landscape type.

Onshore Wind farm

Inclusion of economic displacement of local communities in the footprint

Question	Example answer
Is site located onshore?	Yes
Is site located in OECD country?	No
Is the site located within a Category I or II Protected Area?	No
Is landscape mostly non-modified CH or NH?	Yes

Economic displacement **should** be included

BFIS uses the area equivalent to the onshore infrastructure footprint for displacement

Economic displacement footprint = 4.6ha

Offshore oil and gas extraction site

Inclusion of economic displacement of local communities in the footprint

Question	Example answer
Is site located onshore?	No
Is site located in OECD country?	Yes
Is the site located within a Category I or II Protected Area?	Yes
Is landscape mostly non-modified CH or NH?	No

Economic displacement should **not** be included

BFIS does not include economic displacement in the site footprint

Economic displacement footprint = 0ha

The approach to assess the likelihood of economic displacement of local communities and the impact of economic displacement is based on a decision tree (Figure 4) which makes the following assumptions:

- Only onshore sites can potentially lead to displacement of local communities[7];
- Displacement of local communities is more likely to occur in non-OECD countries (the list of countries considered as OECD is available here)[8];
- Displacement of local communities will lead to conversion of Natural Habitat only in landscape with significant amounts of Natural Habitat. The assessment of habitats within the landscape is conducted applying a 10 km buffer around the concession area and identifying the proportion of Natural and Modified Habitat in the buffer using Copernicus land cover map[9]. If more than 30% of the landscape[10] is classified as Natural Habitat, then this is considered as the threshold for where impacts are likely to be significant, and the impact of displacement is included as part of the footprint to be precautionary.
- We assumed that the footprint of displacement of local communities would equal the infrastructure footprint. This assumption is based on a review of public documentation for extractive projects on the IFC website to estimate the percentage value of infrastructure footprint that should be taken as a proxy to assess the potential footprint of displacement of local communities. Since values vary widely depending on the project development, a precautionary approach was taken, and we assumed that the footprint of displacement of local communities would equal the infrastructure footprint.
- Displacement of local communities is assumed to mostly lead to habitat conversion clearance for agriculture (the biodiversity loss coefficient for agriculture, i.e., 0.9, will therefore be applied on that footprint). No direct impact buffer was considered around the footprint of displacement of local communities.
- Economic displacement of local communities is assumed to occur within a buffer around the site concession estimated to be 10 km. This defines the biodiversity importance radius for the impacts from economic displacement.

The approach described above encompasses a range of assumptions. The output value should be considered as a high-level estimate; the true value for individual sites is likely to differ. Therefore, companies may decide to use this estimate only to understand if this component is possible and would be significant but not report it if they disclose publicly their estimated land-occupancy footprint.

[7]Although some offshore sites contain onshore associated infrastructure elements, these have not been included in the calculation of displacement impacts for the current iteration of the methodology.

[8]Whilst there are examples of this rule not applying (see https://www.breakingnews.ie/world/climate-activists-occupy-giant-digger-at-german-coal-mine-1419029.html), the need for an easily applicable approach was considered as justification for this simplification of where displacement is likely to occur.

[9]The Copernicus land cover layer was selected to provide consistency in the method (as it is used to identify natural and modified habitat – see Section 2.3.3) and as it is used by scientists to identify Area of Habitat for species (Lumbierres et al 2022). Modified habitat is considered to be the cropland and built-up land cover categories, in alignment with IFC PS6 definition. Modified habitat is considered to be the cropland and built-up land cover categories. Modified habitat is considered to be the cropland and built-up land cover, in alignment with IFC PS6 definition.

[10]A 30% threshold was chosen as it is an accepted threshold to minimise species extinction risk from Natural Habitat loss in a landscape (van der Hoek et al., 2015). Landscapes with less than 30% of Natural Habitat are assumed to be already degraded and therefore displacement of local communities would be unlikely to lead to clearance of Natural Habitat.

Indirect impacts

Box 6: Indirect impacts (influx)

All sites are screened for the potential indirect impacts associated with the influx of economic migrants based on operation type, the OECD status of the country, and protected area designation.

Where screening criteria are met, workforce size is used to estimate migrant numbers, land demand, and the resulting buffer area. This example illustrates that calculation for a refinery site.

Petroleum refinery

Worked example

Company input: ***1,000 workers***

Inclusion of indirect impacts in the footprint

Question	Example answer
What is the operation type?	Refinery
Is site located in OECD country?	No
Is the site located within a IUCN Category I or II Protected Area?	No

Indirect impacts **should** be included

Influx calculation

Number of Migrants

1,000 workers

X 6 (medium project)

= 6,000 migrants

Land needed for food

6,000 migrants

X 0.3 ha (per migrant per year)

= 1,800 ha

Buffer calculation

Agricultural land required

1,800 ha

X 10 (precautionary spread)

= 18,000 ha

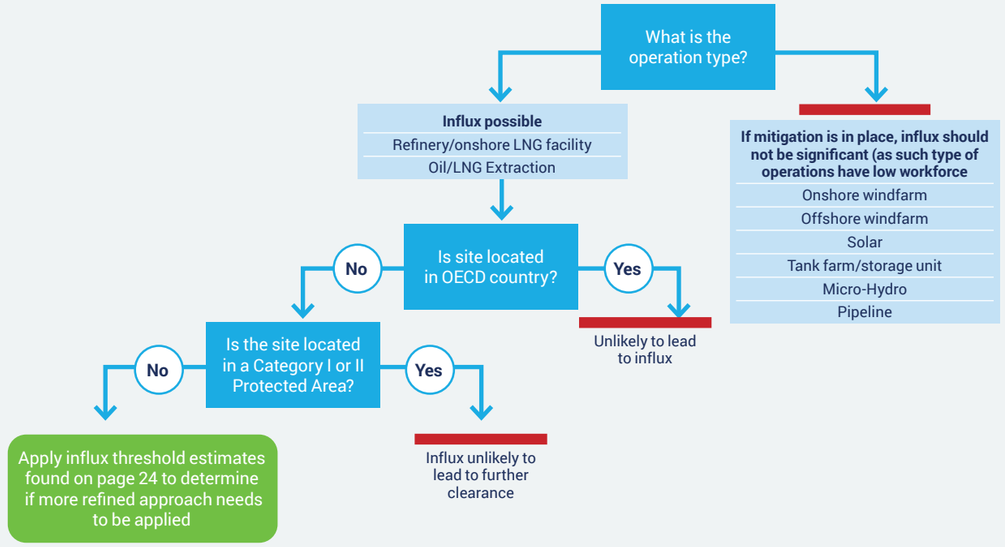
Indirect impacts buffer = 180 km² | Indirect impacts buffer radius ≈ 7.6 km

The likelihood of influx of economic migrants is assessed using a decision tree (see Figure 5) which makes the following assumptions:

- Only operation types with a large workforce (including contractors) are considered to lead to significant influx (e.g., a Petroleum Refinery, Onshore oil and gas extraction site) and therefore are included in BFIS.
- Influx is more likely to occur in non-OECD countries. This was based on the same justification as impacts from economic displacement.
- Impacts are more significant for biodiversity in landscapes with Natural Habitat. As per the approach for economic displacement of local communities, the assessment of habitats within the landscape is conducted applying a 10 km buffer around the concession and identifying the proportion of natural and modified habitat in the buffer using Copernicus land cover map. If more than 30% of the landscape[11] is classified as Natural Habitat, then this is considered as the threshold for where impacts are likely to be significant, and the impact of influx is included as part of the footprint to be precautionary.

[11]A 30% threshold was chosen as it is an accepted threshold to minimise species extinction risk from Natural Habitat loss in a landscape (van der Hoek et al., 2015). Landscapes with less than 30% of Natural Habitat are assumed to be already degraded and therefore displacement of local communities would be unlikely to lead to clearance of Natural Habitat.

Figure 5: Decision tree to identify if indirect impacts should be included in the direct operation footprint



Indirect impact calculation is based on the following assumptions:

- Migrants will settle in proximity to the project development, but not within the concession boundary. A large buffer is therefore applied to define the area in which impacts could occur, but with the assumption that impacts won't happen everywhere within this buffer.
- Migrants will occupy land and will require food that will lead to land use from agriculture, either in the immediate vicinity by producing it themselves, or outsourced to other areas.
- IFC guidance (A Handbook for Addressing Project-Induced In-Migration (ifc.org)) suggests estimating migrant numbers based on the number of workers at peak workforce (either construction or operational phase)[12] and applying a multiplier 3, 6 or 10 based on different in-migration scenarios. The approach here considers in-migration rates will be based on the size of the project development workforce, and to consider a multiplier of 3 for projects with a workforce below 500 people, a multiplier of 6 for projects with a workforce between 500 and 1500 people, and a multiplier of 10 for projects with a workforce above 1500 people.
- The amount of land needed to feed 1 person over one year is equivalent to an average of 0.3 ha (previous TBC experience shows that a household usually requires around 1 ha to feed the family during a year. We consider here a family of three people to be precautionary).
- Although some migrants may leave the area after a certain number of years, it is assumed that the land converted will remain converted and used by other people.

Indirect impacts are estimated applying the following:

- Estimate (or use if known) the number of workers (contractors and employees) at peak workforce.
- Multiply the number of workers by 3, 6 or 10 to get the number of migrants, e.g., if the number of workers is 100, the number of migrants will be 300.
- Estimate the land occupancy for agriculture multiplying the number of migrants by 0.3 ha, e.g., if the number of migrants is 300, the land occupancy for agriculture is 300 * 0.3ha = 90 ha. Assume a biodiversity loss of 0.9 for agriculture under that footprint.

[12]BFIS is usually used for operational sites and can therefore use the workforce at peak to estimate influx impacts. For project in development, the estimate would have to be updated annually.

- Estimate the buffer area in which land is likely to be converted by multiplying the land occupancy for agriculture by 10, e.g., if the land occupancy for agriculture is 90 ha, the buffer area is 900 ha (9 km^2). The radius of this buffer is 1.7 km.

- Assume the buffer, excluding the land occupancy for agriculture, will be used for extraction of natural resource (wood, hunting, collection of non-wood forestry products), e.g., if the buffer area is 9 km^2, 900 - 90 = 810 ha (8.1 km^2) is used for extraction of natural resource. Assume a biodiversity loss of 0.15 under that footprint.

For sites with a large workforce, it is recommended to use information from site documentation to obtain estimates of influx impacts rather than model estimates as the approach described above encompasses a range of assumptions. The output value should be considered as a high-level estimate; the true value for individual sites is likely to differ. Therefore, companies may decide to use this estimate only to understand if this component is possible and would be significant but not report it if they disclose publicly their estimated land-occupancy footprint.

2.2.3.2 Condition

The "condition" of biodiversity represents the proportion (%) of biodiversity lost through different activities and land use types/intensities. For the BFIS method, it is represented through a series of Biodiversity Loss Coefficients (BLCs) based on different activity types.

BLCs were identified based on a combination of literature review, GLOBIO published coefficients[13] and consultations with TBC and TotalEnergies experts. The full list of biodiversity loss coefficients and the reference they are derived from is provided in Table 5.

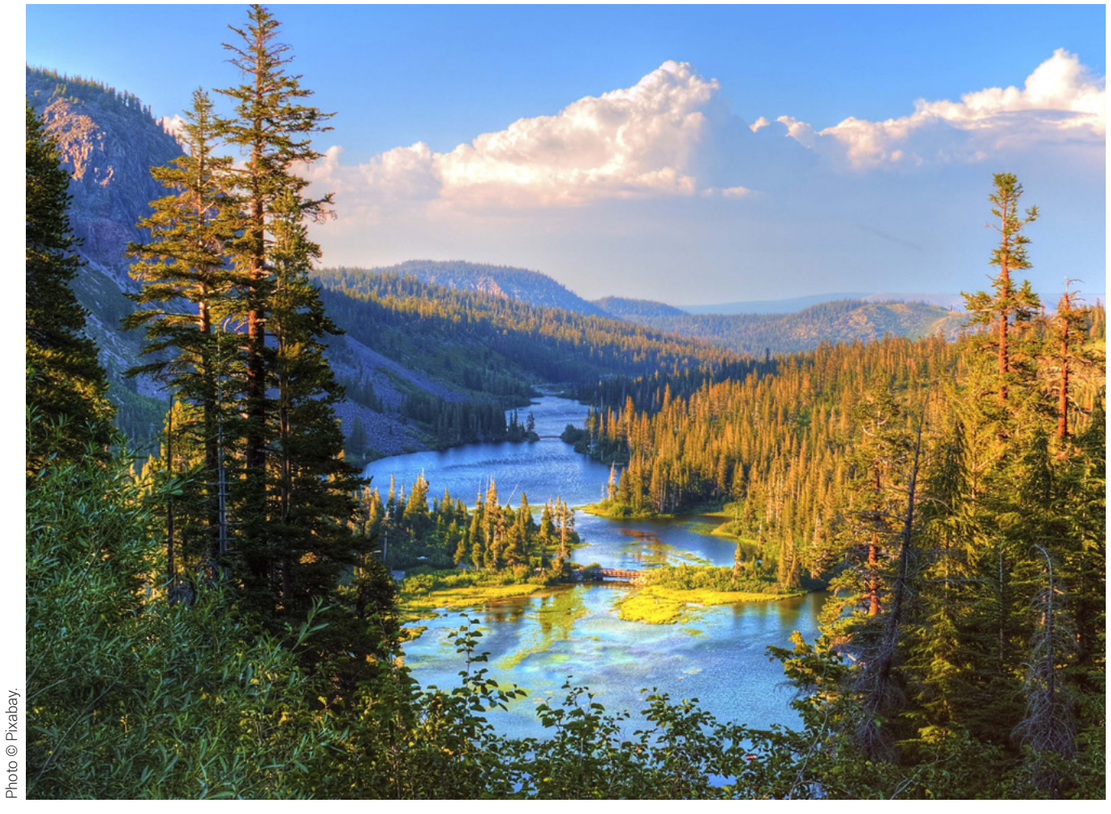


Photo © Pixabay.

[13]Available at https://onlinelibrary.wiley.com/doi/10.1111/gcb.14848

Box 7: Biodiversity loss coefficients

BFIS applies biodiversity loss coefficients to convert land occupancy into an impact-adjusted biodiversity footprint.

Coefficients vary by activity type and intensity; full definitions and sources are provided in Section 2.2.3.2. The example below illustrates this for an offshore oil and gas extraction site.

Offshore oil and gas extraction site

Well head direct impact buffer
For offshore oil and gas sites the well head extraction buffer biodiversity loss decreases with distance from the site.

Distance-based coefficients applied to wellhead buffers.

Distance from well head (m)	Biodiversity Loss Coefficients (%)
0 – 50	100
50 – 150	50
150 – 250	25
250 – 500	10

Total = 13 impact-adjusted_L.ha per well head

Total biodiversity footprint
Calculated by summing the biodiversity loss adjusted areas for each footprint component.

Footprint component	Land Occupancy Footprint (ha)	Biodiversity Loss Coefficients (%)	Biodiversity land occupancy footprint (impact-adjusted_L.ha)
Infrastructure footprint	118	100	118
Direct impact buffer (FPSO)	110	35	38.5
Direct impact buffer (Well heads)	235.61 (3 well heads)	Distance based	39
Associated infrastructure: road and powerline direct footprint	3	100	3
Associated-infrastructure direct-impact buffer: road only	1	35	0.35
Economic displacement	0	0	0
Indirect Impacts	0		
Total	**467.61**		**198.85**

Table 5 Biodiversity loss coefficients for different types of footprint

Type of footprint	Biodiversity loss coefficient	Source
Infrastructure footprint (except for solar operation type, see Appendix 3)	100%	Built infrastructure leads to 100% of biodiversity loss
Agriculture	90%	GLOBIO 3.5 model for agriculture
Extraction of natural resources for food	15%	GLOBIO 3.5 model for human encroachment
Degradation for noise and light pollution – onshore. Considered in a land occupancy context.	35%	Defined based on review of Senzaki *et al*, 2020, Herrera-Montes and Aide, 2011, Laurance, 1997, Dantas de Paula *et al*, 2011, Francis *et al*, 2009, Bayne *et al*, 2008, Reijnen *et al*, 1995
Sedimentation from dredging of nearshore areas	20%	Defined based on review of Erftemeijer *et al*, 2012
Noise and light from offshore activities	35%	Defined based on discussion with TotalEnergies experts
Disturbance from vessels going to and from buoys	15%	Defined based on discussion with TotalEnergies experts

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2.3 State of Nature

2.3.1 Area of influence

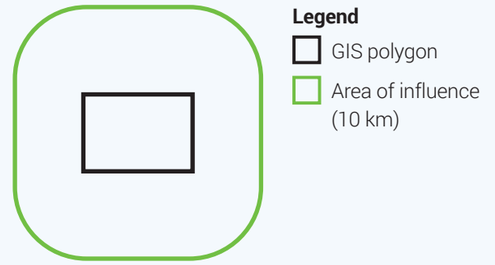
Box 8: Area of influence

To account for incomplete or unavailable geo-spatial data, multiple buffers are applied to the site location based on different impact pathways.

The **largest applicable buffer** is selected and used as the area of influence.

Buffer	Radius (km)
Associated infrastructure	10
Displacement of local communities	10
Influx of economic migrants	7.6
Area of influence	10

Buffer sizes are calculated in previous footprint assessment steps and therefore vary between sites.



Company provided GIS polygon shown for reference

To assess the State of Nature in the area impacted by a site, locations need to be assigned to the different impact sources included under the Pressures on Nature components. However, geo-spatial data are often incomplete or unavailable at the corporate level. A proxy approach was therefore developed to identify the potential location of the impacts:

1. The GIS polygon provided by the company usually represents a concession area or a fence line and will define the area of influence for the direct infrastructure and the direct impact buffer. For some operation types, the footprint of these components may be larger than the GIS polygon. This can occur when the GIS polygon does not include components that are included in the calculation of the infrastructure footprint, such as seabed components for offshore oil and gas. This is however, not an issue since the overall area of influence will be larger (see below).

2. A buffer is applied around the GIS polygon to consider the area of influence of associated infrastructure. It is calculated by applying a radius equivalent to the length of the associated infrastructure applicable to the site (See Appendix 4 for length of the associated infrastructure).

3. A buffer is applied around the GIS polygon to consider the area of influence for displacement of local communities when applicable. It is calculated by applying a radius of 10 km (see details in Section 2.2.3.1).

4. A buffer is applied around the GIS polygon to consider the area of influence for influx when applicable. It is calculated by applying a radius calculated based on the estimated footprint of influx (see details in Section 2.2.3.1).

5. The largest of the buffer calculated above provides the final area of influence for each site.

6. In the situation where the final area of influence has a radius smaller than 5 km for onshore and 25 km for offshore, a minimal size of 5 km/25 km buffer is applied to the site to extract the data for estimating the overall biodiversity importance (Section 2.3.6), to mitigate the issue of not highlighting potential risks due to limitation in data resolution. The area of influence of the site does not change for the other indicators of the State of Nature.

2.3.2 Potential land for positive actions

Box 9: Land for potential positive actions

The available habitat extent x condition indicator represents the potential opportunity for positive action. It is calculated for the area under direct control of the project (GIS polygon) and the landscape (area of influence).

It estimates the amount of habitat that remains available for biodiversity after site-based impacts are accounted for.

Offshore oil and gas extraction site

Area under direct control (GIS polygon)

Land occupancy footprint = 353.61 ha
Biodiversity land occupancy footprint = 200.5 ha

Potential land for positive actions
= Land occupancy footprint – Biodiversity land occupancy footprint
= 353.61 – 200.5
= 153.11 impact-adjusted_R.ha

Landscape (area of influence)

Land occupancy footprint = 467.61 ha
Biodiversity land occupancy footprint = 198.85 ha

Potential land for positive actions
= Land occupancy footprint – Biodiversity land occupancy footprint
= 467.61 – 198.85 = 268.76 impact_adjusted_R.ha
= 268.76 impact-adjusted_R.ha

The available habitat extent x condition indicator represents the potential opportunity for positive action. It is designed to capture the proportion of intact or partially degraded habitat found within the land occupancy footprint after site-based impacts have been considered. It represents the area that can be maintained for biodiversity at site and in its immediate surroundings, and it can be used as a proxy to estimate opportunity to protect biodiversity by maintaining or restoring habitat. It is calculated for both the area of direct control (GIS polygon, i.e. considering the area where infrastructure and direct impact are occurring) and the wider landscape (area of influence, i.e. also considering associated infrastructure, economic displacement of local communities and influx where relevant for the site).

It uses the same basic concept and metric that is employed for the biodiversity land occupancy footprint, i.e., extent x condition (see Section 2.2.3) to provide the area of habitat remaining (the extent) and the biodiversity 'condition' across those areas, varying depending on the type of impacts and assuming the habitat was in good condition prior to the impact. This is unlikely to be the case (see below more detailed assumptions), especially for sites where impacts outside the GIS polygon are predicted, but global spatial database enabling estimates of habitat condition currently do not exist.

The land for potential positive actions is calculated as follows:
Land for potential positive actions = land occupancy footprint - biodiversity land occupancy footprint

Where the land occupancy footprint is the physical area of land for which impacts are considered, and the biodiversity land occupancy footprint is calculated according to the methodology outlined in Section 2.2.3. This calculation makes several assumptions which should be considered when interpreting and reporting:

- The area of influence is composed entirely of intact habitat prior to the activities of the company in question. There are likely to be areas of already impacted habitat.
- Only the land occupancy component of the footprint affects the condition of the habitat within the area of influence (i.e., that the impacts from other pressures don't have an additional cumulative impact and that there is no impact in the area of influence outside the ones from the company activities).
- The value for the land for potential positive actions can be homogenised across the entire area of influence, rather than represented more discretely.

It is therefore important to consider that the indicator reflects the maximum amount of land for potential positive actions in the area of influence, and significant estimated values should be verified with site data.

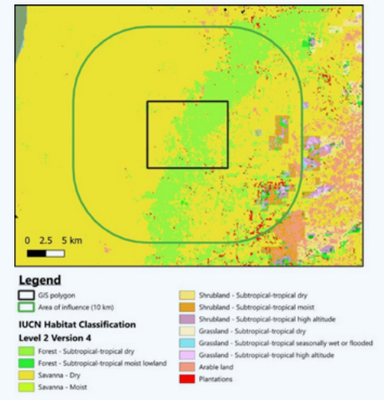
2.3.3 Natural Habitat

Box 10: Natural habitat

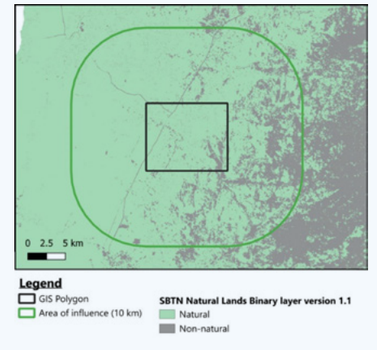
The area of influence is overlapped with IUCN Level 2 Habitat Classification to provide the list of habitats that occur within the footprint, with the area of the footprint covered by each.

Additionally, the SBTN Natural Lands layer is used to determine the proportion of the area of influence that is natural or non-natural. Note that the classification systems of the two layers do not completely correspond to each other.

Habitat type	Area (ha)
2.1. Savanna - Dry	58342
1.5. Forest – Subtropical/tropical dry	19008
3.6. Shrubland – Subtropical/tropical moist	1355
Other likely natural habitats	1164
14.3 Plantations	799
14.1 Arable Land	444
Predominant Habitat	**Savanna**



Habitat type	Area (ha)	Area of influence %
Natural	67048	82.7%
Non-natural	14065	17.3%



The overall biodiversity land occupancy footprint for each operation type is also presented by habitat type, specifically by level 2 habitats from the IUCN Habitats Classification Scheme. This approach enables the identification of which habitats—whether natural or artificial, and across terrestrial, freshwater, and marine realms—are most impacted by various operations. Understanding the impact at the habitat level provides a clearer picture of biodiversity risks and priorities for conservation efforts, as well as helping to align with framework reporting expectations. The habitat information is extracted from the Global Map of Terrestrial Habitat Types, version 004.

The level 2 habitats can be categorised as likely to be natural or non-natural, but this categorisation is imprecise due, for example, to confusion between natural grasslands and modified pastures. To mitigate this, BFIS also uses the SBTN Natural Lands layer. This was developed by the Science Based Targets Network to help companies to assess whether they may be impacting natural lands and draws on a wider range of input datasets to more accurately delineate natural versus non-natural areas.

The final output includes three different sets of metrics from these habitat layers:

- The predominant habitat(s) – the habitat or habitats that cover most of the area of influence, and the percentage of the area of influence that falls within these habitats. If no single habitat covers more than 50% of the area of influence, then a list will be returned with the habitats covering the largest proportion of the footprint.
- The proportion of the footprint that is potentially natural habitat, as defined by the SBTN Natural Lands layer.
- The full list of habitat types that occur within the area of influence, with the proportion of the area covered by each. This is provided as a separate sheet in the output Excel file, with multiple rows for each site, one for each habitat type that its footprint overlaps with

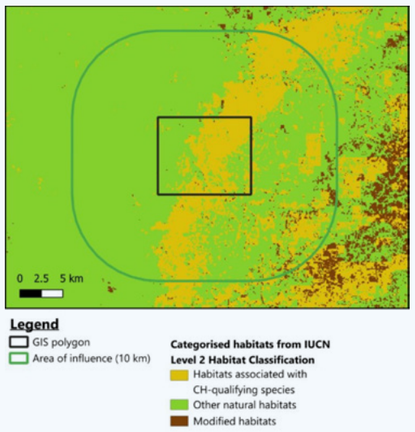
2.3.4 Habitat significance

Box 11: Habitat significance

Habitat significance is based on whether the natural habitat is associated with potentially Critical Habitat qualifying species (Criteria 1 and 2), using habitat types from the IUCN Habitats Classification and species-habitat associations from the IUCN Red List.

In this example, the assessment focuses on an endangered rodent species whose suitable habitats include forest and shrubland. Within the project's area of influence, these habitat types represent 1.5% of the species' known area of occurrence, which meets the threshold for potential Critical Habitat under PS6 Criterion 1.

Natural Habitat associated with Critical Habitat-qualifying species	Area (ha)	Area of influence %
Natural Habitat	55802	72.5%
Natural Habitat associated with CH-qualifying species	21068	26.0%
Modified Habitat	1242	1.5%



The habitat significance State of Nature component is based on whether the area of influence is likely to be Critical Habitat for Natural Habitat associated with threatened or restricted-range species, as defined by Criteria 1 and 2 of the IFC Performance Standard 6 (IFC 2019) on Biodiversity.

This is calculated by joining the list of natural habitats from IUCN Habitats Classification Scheme (indicator in Section 2.3.3) with the list of habitat suitable for the species potentially triggering Critical Habitat criteria (indicator in Section 2.3.6, the list of suitable habitats for species is provided by IUCN Red List) and calculating the area (in hectares and in %) of those Natural Habitats.

2.3.5 Species significance (species extinction risk)

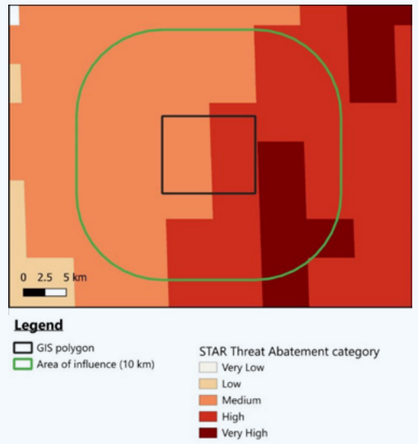
Box 12: Species significance

STAR scores indicate the potential contribution an area can make to reducing global species extinction risk. They reflect the presence of threatened species, their extinction risk, and how much of each species' global distribution lies within the assessed area.

For this example, the total STAR score was calculated by overlaying the concession polygon and its 10 km area of influence with the global STAR grid.

The results show a total STAR value of 0.51 for the concession area and 10.58 for the broader area of influence, indicating that the wider landscape provides a materially greater opportunity for contributing to threat abatement than the concession itself.

Species significance (species extinction risk)	Total STAR value (STAR)
Concession area (GIS polygon)	0.51
Area of influence	10.58



STAR and Marine STAR (see Appendix 5 for descriptions) are used in BFIS as an indicator to evaluate biodiversity risk with a species significance focus and reflecting species extinction risk. Globally, STAR scores are highest where there are many threatened species with small ranges.

Multiple results can be obtained, including total STAR, average STAR, minimum and maximum STAR scores. They are complementary to support understanding of species extinction risk in a specific area.

We decided to use the total STAR score as the main indicator, which is presented for both the concession area (the GIS polygon) and the area of influence (including the buffer zone), because it is the score which is the most meaningful to aggregate at corporate level. The total STAR score represents the total value for opportunities to abate threats and therefore reduce the global species extinction risk in the defined area. It is an additive opportunity score, subject to overlap and calibration rules. Other STAR scores are also reported in the detailed outcomes of BFIS and can be used to complement the understanding of species extinction risk.

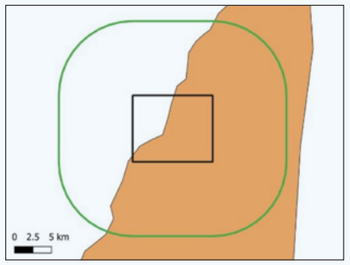
2.3.6 Overall biodiversity importance

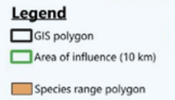
Box 13: Overall biodiversity importance

The overall biodiversity importance score is defined as the highest value among three indicators describing species- and habitat-level importance within the area of influence.

These indicators capture threatened species presence, proximity to areas of recognised biodiversity value, and the maximum STAR threat-abatement score. The thresholds used to categorise each indicator can be seen in Table 6 .

Presence of threatened species

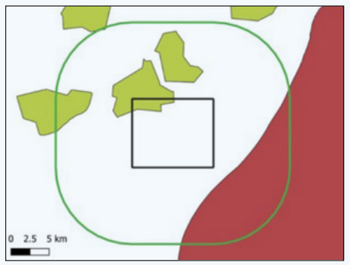


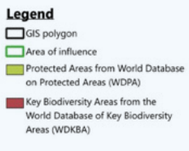


Species	Number
Critically Endangered Species	7
Potential Critical Habitat-qualifying species	1
Score for threatened and potential CH species	**Very High**

The score is Very High due to the presence of a potential Critical Habitat-qualifying species.

Overlap and proximity to areas of biodiversity importance



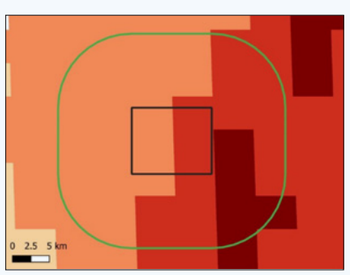


Area of biodiversity importance	Distance to GIS polygon
Forest reserve, IUCN category IV	0 km (direct overlap)
Forest reserve, IUCN category IV	2.2 km
Forest reserve, IUCN category IV	5.3 km
National park, IUCN category II	9.8 km
KBA, designated for 11 bird species	2.0 km
Score for area of biodiversity importance	**Very High**

The score is Very High due to direct overlap of the protected areas with the GIS polygon

Maximum $STAR_T$ score

Maximum Species Threat Abatement and Restoration metric



Area with species of high extinction risk	Max STAR (STAR)
$STAR_T$	2.134
$STAR_R$	0.065
Score for area with species of high extinction risk	**Very High**

The score is Very High due to $STAR_T$ being > 1 within the area of influence

The overall biodiversity importance score is calculated as the highest score across three indicators representing biodiversity importance for both species and habitat. In this example all are Very High and therefore the Site is classed as having Very High Overall Biodiversity Importance

Overall biodiversity importance	Score
Threatened and potential CH species	Very High
Area of biodiversity importance	Very High
Area with species of high extinction risk	Very High
Overall biodiversity importance	**Very High**

The overall biodiversity importance score is calculated as the highest score across three indicators representing biodiversity importance for both species and habitat:

1. The presence of threatened species: the presence of potential Critical Habitat-qualifying species (see below) and the number of Critically Endangered species overlapping with the area of influence.
2. The overlap and proximity to areas of biodiversity importance, i.e., Protected Areas, World Heritage Sites, Key Biodiversity Areas, and Alliance for Zero Extinction Sites.
3. The Maximal Species Threat Abatement and Restoration (STAR) $STAR_T$ or $STAR_R$ metric (see Appendix 5) present within the area of influence. The maximal value of STAR is complementary to the total STAR value provided as a proxy for species extinction risk (see Section 2.3.4). It represents the likelihood that the site overlaps with some areas of high biodiversity importance where impacts should be avoided and where specific measures of protection should be put in place, whilst the total STAR value represents the overall opportunity to reduce threats in a specific area.

Potential presence of Critical Habitat-qualifying species

This is assessed using the IUCN Red List of Threatened Species dataset of species ranges. For each site, the Red List species with ranges overlapping the site's area of influence (or the minimal 5/25km buffer to consider data resolution uncertainties, see Section 2.3.1) are extracted, and then the proportion of each species' range that falls within the area of influence is calculated. This is used to assess whether the location is likely to qualify as Critical Habitat under Criterion 1 (Critically Endangered (CR) and/or Endangered (EN) species) or Criterion 2 (Endemic or restricted-range species) as follows[14]:

Assessed for Criterion 1:

- Species classified as Endangered (EN) or Critically Endangered (CR) and the proportion of its Extent of Occurrence (EOO)[15] within the location is > 0.5%
- Species classified as Vulnerable (VU) and the proportion of its EOO within the location is > 10%.

Assessed for Criterion 2:

- The proportion of the species EOO within the location is > 10%.

This approach provides a preliminary list of potential Critical Habitat-qualifying species. However, it is important to remember that, due to limitations in data resolution (especially the resolution and accuracy of the IUCN species range), it will never replace a proper Critical Habitat Assessment, and site managers should expect discrepancies between their ground or expert-based Critical Habitat Assessment and the list of species from this analysis.

Each indicator score is calculated using the thresholds described in Table 6.

Table 6: Thresholds used to categorise each indicator part of the overall biodiversity importance score

	Species	STAR metric		Area of importance
		STARτ (terrestrial or marine)	STAR$_R$	
Very Low	• No CR Species • No Species potentially qualify for Critical Habitat (criterion 1&2)	STARτ score is <0.001	STAR$_R$ score is <0.001	Not within screening area
Low	• 1 – 6 CR Species • No Species potentially qualify for Critical Habitat (criterion 1&2)	STARτ score is 0.001 – 0.01	STAR$_R$ score is 0.001 – 0.01	> 25% of the radius closest to the location
Medium	• 7 – 12 CR Species • No Species potentially qualify for Critical Habitat (criterion 1&2)	STARτ score is 0.01 – 0.1	STAR$_R$ score is 0.01 – 0.1	10 to 25% of the radius closest to the location
High	• >12 CR Species • No Species potentially qualify for Critical Habitat (criterion 1&2)	STARτ score is 0.1 – 1	STAR$_R$ score is 0.1 – 1	10% of the radius closest to the location
Very High	• Species potentially qualifying for Critical Habitat are present (criterion 1&2)	STARτ score is > 1	STAR$_R$ score is > 1	Direct overlap with the location

[14]The EOO is used as a proxy for the global population and appropriate numbers of reproductive units which are mentioned in the IFC guidance note.

These indicators are provided by running the Biodiversity Risk Screening Kit (BRiSK), a proprietary tool developed by The Biodiversity Consultancy. This provides BFIS users with a suite of 16 biodiversity indicators to help them identify the biodiversity risks potentially present at a site and understanding which mitigation measures would be expected to be in place at the site, if the risk is confirmed.

As part of these indicators, the BFIS users will receive a list of birds and bats sensitive to collision risk with wind turbines and transmission lines for relevant sites. The birds and bats collision risk layer are a spatial dataset developed by TBC to evaluate the vulnerability of birds and bats to wind turbines and transmission lines for BFIS. This layer was designed to address the global lack of data on collision risks and is essential for TotalEnergies operations. It focuses on both wind turbines and transmission lines, assessing each separately to:

i) Identify species at risk based on the structure type,

and

ii) Evaluate the collision risks associated with different operational scenarios.

Collision risk for wind turbines includes both birds and bats, whilst for transmission lines includes only birds. The dataset for both types of risk and the spatial layers generated from them are represented at a resolution of 5x5 km. It includes data for over 4,000 bird and bat species, including marine and soaring species, which exhibit moderate to high sensitivity to wind farms and transmission lines. The sensitivity scores are based on collision vulnerability, derived from literature and expert judgment, combined with the IUCN threat category associated with each species.

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3. Steps 1b c and d – Categorise, Validate and Prioritise

3.1 Step 1b: Categorise

Once the Pre-evaluate stage of BFIS has been completed, the results are used to categorise each site. The b-risk of sites is based on:

- The biodiversity land occupancy footprint (estimated impact identified during step 1a (see Section 2.2.3).
- The overall biodiversity importance score (key biodiversity features identified as potentially present at site see Section 2.3.6).

The following thresholds for the two indicators to define the b-risk categories are recommended (based on analysis of real-life portfolio of sites; however, companies have the freedom to adapt the thresholds based on specificities of their portfolio):

- **Preliminary low b-risk category:** sites with Very Low biodiversity importance score and/or Low biodiversity importance score and a small-medium biodiversity land occupancy footprint (below 1000 impact-adjusted.ha_L).
- **Preliminary medium b-risk category:** sites with a Medium biodiversity importance score and a medium biodiversity land occupancy footprint (less than 1000 impact-adjusted_L.ha) or sites with Low biodiversity importance score and a large to very large biodiversity land occupancy footprint (more than 1000 impact-adjusted.ha_L).
- **Preliminary high b-risk category:** sites with High or Very High biodiversity importance score or sites with a Medium biodiversity importance score and a large biodiversity land occupancy footprint (more than 1000 impact-adjusted_L.ha).

Table 7: Suggested thresholds for BFIS b-risk category

Biodiversity Importance	Biodiversity land occupancy footprint (Impact-adjusted_L.ha)				
	Very Small (<10 ha)	Small (10-100 ha)	Medium (100-1000 ha)	Large (1000-10,000 ha)	Very Large (>10,000 ha)
Very High	High	High	High	High	High
High	Medium	Medium	High	High	High
Medium	Low	Low	Medium	Medium	High
Low	Low	Low	Low	Low	Medium
Very Low	Low	Low	Low	Low	Low

B-risk category	Low	Medium	High

3.2 Step 1c: Validate

Once sites have been assigned a b-risk category, the results go through a validation process (Figure 9). Ideally all sites will go through the validation process to ensure no biodiversity risks are missed. However, it is recommended that the sites in the high b-risk category are validated first, as these are the sites which pose the most risk for the company.

The validation is conducted in 3 stages (inspired from the Biodiversity Indicators for Site-Based Impacts):

Stage 1: **Sense-check – a high-level check** of all results with individuals which hold the knowledge of the sites – e.g. corporate biodiversity team and environment managers at site.

Stage 2: **Deeper dive** by engaging with site managers and reviewing existing site-specific documentation to validate the presence of key biodiversity features and understand if they are significantly impacted by the site activities or infrastructure for high b-risk sites.

Stage 3: **Additional data collection** when gaps are identified and the b-risk category cannot be validated with existing information or knowledge and additional data is required.

The validation step is currently piloted with TotalEnergies. By the end of the pilot, additional guidance and templates will be available to support implementation of the step. This will ensure (1) the validation process is as streamlined as possible to facilitate its implementation (e.g. development of guidance and AI prompts to speed up research of information in site documentation) and (2) findings from the validation steps are transparently documented and BFIS outputs from step 1a are overwritten using an evidence-based approach.

Stage 1: Sense-check

This first stage is aimed to be rapid to provide insights from people with in-depth knowledge of the site. Steps 1a and 1b will likely be conducted by a centralised team (e.g., the sustainability team or the GIS team) who may not be aware of site specificities.

It can be conducted by organising, for example, a workshop to review the outcomes of steps 1a and 1b with the relevant people. Issues such as incorrect or missing input data are identified at this stage and can be corrected before re-running BFIS step 1a.

Stage 2: Deeper dive

The deeper dive involves an investigation of the presence of potential biodiversity features and /or estimated impacts at the site. This step is important due to the assumptions and limitations inherent within the step 1a methodology. For example, the step 1a methodology uses global spatial layers to identify the presence of key biodiversity features at site. However, if a site is flagged as a High category due to the potential presence of a threatened species, this needs to be confirmed with site-based field surveys (as it may be that the range map is not accurate enough to say the species is definitely there). Therefore, additional sources of information are required to ground truth and confirm the features which are flagged during Step 1a.

The sites which fall into the preliminary High b-risk category will require validation before their status can be confirmed. This will be done in two steps:

- Confirming the presence of key biodiversity features.
- Confirming the magnitude of the impacts.

For both steps, the method is the same: through review of documentation. If both factors are confirmed, the site retains its original categorisation. If either of these factors are confirmed as absent, the site is declassified to either medium or low depending on the circumstances of each site. Documentation that can be used to confirm the category status includes:

Key biodiversity features

- Environmental Impact Assessment (EIA)/ Environmental and Social Impact Assessment (ESIA)
- Biodiversity field baseline surveys
- Critical Habitat Assessment
- High resolution mapping

Magnitude of impacts

- EIA/ESIA
- Residual Impact Assessment
- Biodiversity Action Plan (BAP)
- Biodiversity Management Plan (BMP)

This step enables users to verify whether, even if some key biodiversity features may be present in the landscape or close to the site, the site may not impact them and therefore specific actions are not needed mitigate that risk. It ensures b-risk categories are based on real site-based information and provides a transparent evidence-base to justify a category change.

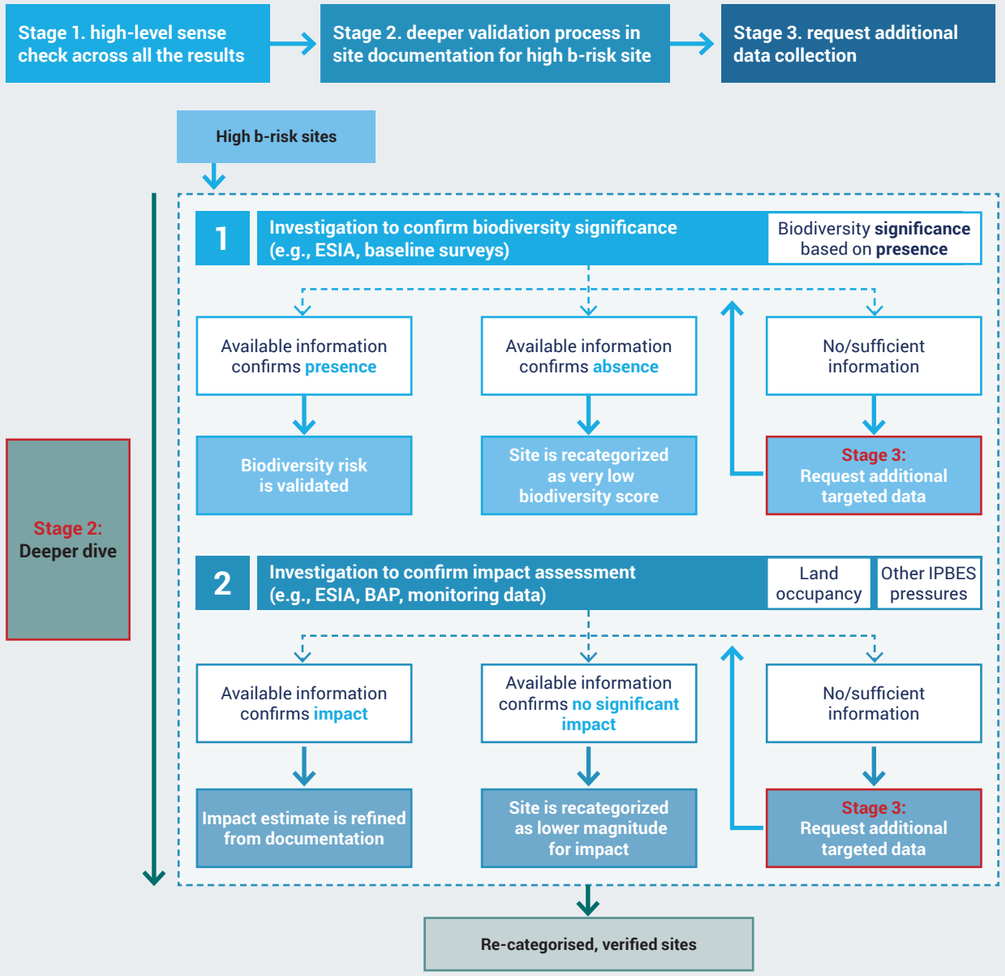
This step also enables identification for site-specific opportunities for conservation action in and around the site area (for example, verify and adjust the 'Potential land for positive actions' indicator, see Section 2.3.2, or gather information on potential conservation actions in or around the site area) and to identify potential local challenges that warrant specific attention to properly manage biodiversity risk.

Stage 3: Additional data collection

If the validation cannot be verified with existing documentation, additional data may need to be collected (for example, targeted baseline surveys on species or habitats, monitoring and mapping of impacts to understand significance of impacts). Site managers may be able to collect additional information with the team, or external consultants may be required.

Depending on how much effort is required for the validate step, validation can be done in a short time frame (a few weeks) or may take 6 months to a year if baseline field surveys are required.

Figure 6: Validation process for High sites from step 1b (Categorisation)



3.3 Step 1d: Prioritise

Once the b-risk and magnitude of impacts have been validated with site-based data, the BFIS output is a validated b-risk category for each site. The b-risk category now reflects the expectation in terms of mitigation activities, monitoring and reporting to track performance, allowing efficient allocation of effort between sites based on their relative risk and opportunities.

In the event that there are a large number of High b-risk category sites, an additional "Priority" category can be developed. This subset can consider other important factors known to the company such as potential reputational risk, alignment with company-specific biodiversity commitment or application of specific lender standards.

Criteria for prioritisation can also differ by operation types if the company has different internal ambition by sub-sector (for example, a company could commit to only operate solar farms in modified habitat and put in place actions to enhance habitat quality within the project fence, whilst this commitment could not be realistically applicable for onshore oil and gas extraction). The objective here is to let the company determine their own criteria for prioritisation but to make sure these criteria are discussed and agreed upon internally to align with the company ambition for biodiversity and properly documented.

There are four b-risk categories. Table 8 summarises the key triggers and expectations for each, it sets what will be the on the ground expectations for each site, based on the level of risk:

Table 8: Summary of site categorisation and expectations for biodiversity risk management and reporting

Site category	Characterisation	Expectation in terms of mitigation measures	Expectation in terms of tracking performance and reporting
Low	• Low impact • No specific biodiversity features of concern	• General environmental good practice	• BFIS tool results sufficient • No ground monitoring specific to biodiversity requested
Medium	• Some impact on nature • No specific biodiversity features of concern	• General environmental good practice • Follow the mitigation hierarchy	• Measured data based on cost-efficient technologies (remote sensing for ecosystem + bioacoustics for species)
High	• Presence of specific biodiversity features of concern • High impact on nature	• General environmental good practice • Follow the mitigation hierarchy • Biodiversity specific mitigation measures	• Measured data based on cost-efficient technologies (remote sensing for ecosystem + bioacoustics for species) • Measured ground data for ecosystem • Monitoring & Evaluation Plan
Priority	• Sites categorized as "High", but which have additional reputational risk, impacts to several key biodiversity features, or require specific standards	*Prioritised sites for risk management and action* • Same as High but may aim to align with specific commitment	* Prioritised sites for risk management and action* • Same as High

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4. Step 2

Step 2 will provide the opportunity to translate the desktop-based impact estimation and site prioritisation of Step 1 into actions and monitoring that will be expected on the ground for each specific site, and for the results of those actions to be integrated into overall reporting. Step 1d (prioritise) provides the framework for pragmatic allocation of investment to different sites, based on their importance for biodiversity (magnitude of impacts and risk for biodiversity) (see Table 8). The guiding principles for how we use the results of step 1 to shape actions, monitoring, and reporting in step 2 are pragmatism, cost-effectiveness, importance for biodiversity, and alignment with international regulations and best practice.

The aim is for step 2 to enable the corporate management team to identify whether the biodiversity actions set at site level are appropriate to manage the level of biodiversity risk and to track if the measures are efficient or not, as well as allow reporting and disclosures. The framework will also provide recommended metrics to enable aggregate reporting across the company portfolio on the biodiversity outcomes of management at site level.

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4.1 Step 2a: Act: biodiversity risk management

In line with best practice recommendations, general environmental good practice should be followed at all sites.

Additionally, the mitigation hierarchy should be followed wherever there are significant impacts (Medium, High, Priority) and sites with features of biodiversity concern (High, Priority) should implement Biodiversity Action Plans to safeguard these features.

4.2 Step 2b: Monitor: tracking of performance

Monitoring of performance will be conducted by calibrating the monitoring intensity with the level of b-risk and will align with the pressure-state-response framework (see Table 9). This framework is commonly used to track biodiversity performance as it enables rapid adaptive management whilst change in biodiversity status takes time to observe.

- **Pressure:** Environmental pressures (e.g., pollution due to chemical use for green spaces maintenance) will be monitored via general good practice. For high and priority sites, specific drivers of pressures on biodiversity (e.g., hunting) will be identified when conducting the baseline surveys, and the action plan would include actions to address those threats. Environmental pressures and specific biodiversity threats are therefore monitored to assess if the actions are effective.
- **Response:** business should monitor that they effectively implement the actions they have identified in their environmental / biodiversity action plans. It is an easy and rapid way to confirm that plans are being implemented.
- **State of biodiversity:** state of biodiversity will be monitored (see Report section hereafter) using four core indicators for Medium to Priority sites but the level of effort for monitoring will vary depending on the b-risk category. For Medium sites (where no key biodiversity features are identified), it makes more sense to deploy cost-effective monitoring systems at scale (e.g., remote sensing for ecosystem and bioacoustics for species) to detect general trends in ecosystem condition. Highest priority sites (High and Priority) with key biodiversity features and high reputational risk need adequate monitoring, including field-based surveys, to detect changes in key biodiversity features and tracking implementation of actions. Specific surveys may be warranted for priority species, for example using camera traps for rare mammals, or targeted field surveys for non-vocalising threatened amphibians. In contrast, Low sites would forego monitoring to save resources for higher priority sites.

4.3 Step 2c: Report: annual reporting

The BFIS framework suggests how reporting conducted at site level could be presented and aggregated across the portfolio. For biodiversity state, a core set of 4 metrics are recommended for Medium to Priority sites (they will be aggregable across sites):

- Extent of lands managed to restore and/or protect biodiversity (e.g., extent of lands set aside in the site for maintaining and restoring biodiversity).
- Ecosystem condition in these lands (e.g., indicators to track ecosystem restoration such as species richness).
- Landscape integrity (e.g., indicators to monitor habitat connectivity).
- Species significance (e.g., number of recorded threatened species).

Metrics specific to key biodiversity features (e.g., monitoring of the abundance of a Critical Habitat-qualifying species) will also be required but won't be aggregable at corporate level.

The recommended metrics are still preliminary and have been developed with an eye on the metrics recommended by the Nature Positive Initiative, noting that this framework is still in piloting phase. They could be refined once the outcomes of Nature Positive Initiative pilots have been released and the implementation of this step is piloted with TotalEnergies.

4.4 Operationalisation of Step 2

Table 9 provides the summary of the metrics that will be reported for each site, based on the b-risk category, and describes how the metrics will be aggregated. Step 2 will be led by the same team in charge of the validation (step 1c) and the prioritisation (step 1d). Step 2 is an opportunity for the corporate team to review that the right level of actions or data exists, flag to the site team if some data are missing and collate the information in a consistent format. For example:

- For the Act step, the team will extract information from systems already in place for general good practice implementation. For High and Priority sites, Biodiversity Action Plans will be reviewed to confirm that they include actions for all key biodiversity features of the site.
- The Monitor step will be the opportunity for the team to review the existing monitoring in place and identify opportunities to cost-effectively monitor ecosystem and species across sites. For High and Priority sites, Biodiversity Monitoring and Evaluation Plans will be reviewed to confirm they align with the Pressure-State-Response Framework and monitor all key biodiversity features of the site.
- The Report step is the opportunity to develop an internal system to gather all information in place for annual reporting. This can be done in system already in place, adding a biodiversity component, or by developing a reporting system specific to biodiversity, to facilitate annual input from all site managers.

Step 2 is currently still in development, but we aim to develop a one page outline providing key principles and concepts for each step. Additional development could be envisaged, depending on the business needs, for example, developing reporting templates or database of mitigation actions.

Table 9 provides a summary of the metrics that will be reported for each site, based on the b-risk category, and describes how the metrics can be aggregated.

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Table 9: Pressure-state-response framework

	Pressure			Response	State of Nature					
B-risk category	**Biodiversity land occupancy footprint (Impact-adjusted_L. ha)**	**Other pressures (metrics to be determined)**	**Threat specific to key biodiversity features**	**Site actions**	**Potential land for positive actions (Impact.adj_R. ha)**	**Extent of lands managed to restore or maintain biodiversity at site**	**Condition of lands managed to restore or maintain biodiversity at site**	**Landscape integrity**	**Species significance**	**Key biodiversity features**
Low	Estimated in BFIS Step 1		N/A	General best practice measures	Estimated in BFIS Step 1	N/A	N/A	N/A	N/A	N/A
Medium	Estimated in BFIS Step 1		N/A	General best practices measures, application of the mitigation hierarchy	Estimated in BFIS Step 1	Cost-effective monitoring, e.g. through remote sensing	Cost-effective monitoring, e.g. passive acoustic monitoring to estimate ecosystem condition	Cost-effective monitoring, e.g. through remote sensing	Cost-effective monitoring, e.g. passive acoustic monitoring to monitor species occurrence	N/A
High / **Priority**	Estimated and Validated in BFIS Step 1		Threats to biodiversity identified through BAP and monitoring	Same as Medium + actions specific to key biodiversity features	Estimated and Validated in BFIS Step 1	Cost-effective monitoring, with ground data validation as required.	Mix of cost-effective monitoring and more targeted surveys as required	Cost-effective monitoring, e.g. through remote sensing	Mix of cost-effective monitoring and more targeted surveys as required to monitor species occurrence	Additional targeted monitoring
Reporting metric	Impact-adjusted_L.ha	Metric to be determined	For each threat, % reduction in threat level	% of identified actions implemented	Impact-adjusted_R.ha	ha	Condition score (0-1)	Condition score (0-1)	STAR category of site, threats and occurrence of threatened species[15]	Will depend on the key biodiversity features
Opportunity for aggregation	Yes, if estimated vs. validated values are presented separately	Yes, if estimated vs. validated values are presented separately	Yes, as a global % of threat reduction	Yes, as a global % of action implemented	Yes, if estimated vs. validated values are presented separately	Yes	Yes	Possible, but not a priority	Yes, when calibrated and realized STAR metric will be used. In the meantime, global % of threat reduction will be used	No

[15]Calibrated and Realised STAR could be calculated, in the future, once guidance for implementation is further developed.

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5. Implementation

5.1 Data collection sheet and guidance document

BFIS requires the collection of some basic information for each site. The type of data will vary for each operation type, but BFIS has been designed to rely on the minimal amount of information necessary to reduce the demand on site managers.

To ensure a smooth data collection process, two documents are provided to end users: a data collection sheet and accompanying guidance. The guidance document supports the users in the principles of data gathering and practical concerns for filling in the data collection form, with clear explanations of the various data fields.

The data collection form itself is an Excel workbook, with a separate tab corresponding to each of the different operation types. Users will need to complete a separate row for each individual site. Required inputs include GIS files (e.g., of site boundaries), number of repeat features (e.g., wind turbines), as well as operational capacity (e.g., the number of workers at peak capacity).

5.2 R Package

In the current version of BFIS, the Pressures on Nature and the State of Nature are run in two separate processes.

- For the Pressures on Nature, the tool is coded using the R programming language, in the form of an R "package" containing functions to implement each step of the analysis. The company fills the data collection sheet, and, upon availability of data, the code reads it and automatically generates results. By designing the tool as an R package, TBC can retain control of the major functions of the tool, pushing any updates to end-users and preventing accidental modification of the script, giving it a degree of robustness. This reduces the technical burden on end-users. End-users will receive access to the R package on an annual basis, with some associated time for supporting implementation.
- For the State of Nature, the tool is not yet available as an R package[16]. Therefore, the company needs to provide to TBC the spatial data outputs from the Pressures on Nature component. TBC runs the technical analysis and provides the outcomes back to the company. They can next combine all data together with a script available in the R package.

[16]The tool to run the State of Nature is owned by TBC and is not part of the co-ownership agreement for BFIS between TTE and TBC. However, TBC aims to make that tool available for all companies interested in running BFIS. The tool has not been built as a R package, but TBC will investigate opportunities to make the tool easier to access in the future.

5.3 Data dependencies

The tool references several external datasets which are used to inform some of the decision trees that assess which pressure components are relevant for each site. These datasets need to be downloaded by the end user of the tool, and their file paths can then be provided to the functions within the R package that reference them. The required datasets are:

- World Database on Protected Areas – This is used to assess whether displacement of local communities is likely to result in conversion of natural habitats. It requires an IBAT subscription for commercial use.
- STAR Threat abatement – This is used to assess the species significance component of the State of Nature. It is available from IBAT and also requires a subscription for commercial use.
- Marine STAR – This is an extension of the STAR threat abatement metric to the marine realm, developed by TBC in partnership with IUCN for BFIS, and funded by TotalEnergies. This layer will be made available through IBAT, but in the meantime can be requested from TBC and also requires an IBAT subscription.
- ESA CCI Land Cover – This is used to assess landscape land cover types around solar sites, which are used to refine the biodiversity loss coefficient used (see Appendix 3 for more details).
- Global Human Settlement Layer – Used to assess the distance from a site to a population centre, which is used in the decision tree for associated infrastructure length.
- Global Map of Terrestrial Habitat Types – Used to identify the habitat types present in the area of influence around a site.

6. Output format

The output is provided in an Excel file consisting of four tabs: a "Read Me" tab, a "Summary Results" tab, a "Detailed Results" tab and a "Habitats" tab. The Summary Results tab includes a minimal set of columns, focusing on the key values of the overall results. The Detailed Results tab contains the same columns as the summary accompanied by additional columns that provide a comprehensive breakdown of all values considered, including buffers and other relevant details.

The Habitats tab gives a more detailed breakdown of the different habitats present in the area of influence of each site. In addition, a future update to the R package will add the ability to generate standardised summary graphs to help users interpret the key outputs and results.

7. Peer review of BFIS approach

The development of BFIS was based on information from pilot sites (one pilot site per operation type), literature review and consultations with TotalEnergies staff to try and ensure a balance between pragmatism and rigour in the outputs. However, to ensure transparency and robustness during methodological development, an independent peer review committee was convened. The group was engaged in late 2021, with the purpose of reviewing and commenting on the developing methods. The process of peer review was included to add transparency to the process, prevent bias and provide external expert input. The committee members were selected to provide impartial and learned advice regarding the BFIS approach and has included or currently includes staff from the Wildlife Conservation Society (Hugo Rainey, replaced by Ray Victurine, and further replaced by Hugo Costa and Kendall Jones), UNEP-WCMC (Jacob Bedford), IUCN (Stephen Edwards, replaced by Annie Dakmejian, and further replaced by Rachel Asante), Biodiversity Disclosure Protocol (Joel Houdet – part of the committee for the first year only), Global Balance (Annelisa Grigg) and Fauna and Flora International (Sophia Raithel, replaced by Julie Dimitrijevic). The group is likely to expand in the future to include a more diverse and representative group of individuals, to assess specific components of the approach or for the possibility of a formal audit of the approach.

The peer review committee has been closely involved throughout the development of the BFIS methodology. They reviewed the technical approach and provided constructive feedback to improve its robustness. As part of this process, the committee conducted a detailed review of Version 1.0 of the methodology. Their input has directly contributed to strengthening several key components:

- Ensuring that BFIS supports external disclosure and aligns with evolving regulations, standards, and frameworks pertinent to the energy sector has been a priority from the beginning. Technical discussions early in the process highlighted the importance of enabling BFIS to track changes in performance over time and assess the effectiveness of mitigation measures. In response, TBC conducted a review to evaluate BFIS's alignment with TNFD and CSRD, resulting in updates and clarifications to the methodology. Throughout development, TBC has closely monitored regulatory and framework developments to maintain BFIS's relevance for disclosure and reporting purposes and is committed to continue to do so.
- Several indicators in BFIS step 1a were developed through discussions with the peer review committee.
  - One key outcome from these discussions was the recognition of the need to present the biodiversity footprint according to ecosystem type. In response, the methodology reports on the Natural Habitat (defined as per IFC PS6) that overlaps with the biodiversity land occupancy footprint (see Section 2.3.3). This ensures more transparent and ecosystem-specific reporting within the BFIS framework.
  - A bird and bat collision risk layer was developed to identify species particularly vulnerable to collisions with transmission lines and wind turbines. This addresses the lack of a global database and enables a more effective assessment of risks associated with specific types of operations.
  - The land occupancy footprint is now presented including an indicator representing where positive biodiversity actions could be implemented, the "potential land for positive actions" – the inverse of the biodiversity land occupancy footprint.
- The peer review committee provided valuable guidance to clarify the scope, intent and purpose of the BFIS tool, ensuring these aspects are well defined and easily understood. In collaboration with the committee, further refinements were made to distinguish between permanent and temporary impacts, as well as direct and indirect impacts, and to ensure these distinctions are clearly represented throughout the methodology. Following the peer review committee's recommendations, additional drivers of biodiversity loss—such as climate change, pollution, and water use—as well as operational dependencies on nature, are being developed for integration into a future BFIS version.

8 Next iteration of BFIS

8.1 On-going development

8.1.1 Other pressures on biodiversity

To better align with emerging framework requirements (see section 1.1), the BFIS approach could also include, in a future iteration of BFIS, an estimation of impacts from most other pressures[17] , including:

- Pollution (ozone formation, acidification, ecotoxicity and eutrophication)
- Resource exploitation (water consumption)
- Climate change

Note: Invasive species would remain out of scope in this future iteration of the tool, as there are currently no reliable methods for quantifying the impact of invasive species from site activities.

The other pressure impacts (climate change, pollution, resource exploitation) will be estimated on the infrastructure footprint, degradation and disturbance and associated infrastructure only (excluding economic displacement of local communities and indirect impacts).

The suggested approach will be derived from the principles of Life Cycle Analysis (LCA). Although LCA was designed predominantly to assess the environmental impact over the lifecycle of a particular product or process, the modelling assumptions can be adapted to less conventional analyses. The benefits of LCA include:

- The ability to capture multiple different pressures on biodiversity with one approach.
- The ability to present results in two formats:
  - *Midpoints* – units specific to individual pressure categories that describe the magnitude of a particular pressure resulting from an activity, allowing refinement with ground data for priority sites.
  - *Endpoints* – a single fungible unit that estimates the impact on biodiversity from the different pressures through the loss of species, allowing comparison and aggregation across different pressures, which can further be used to guide identification of the priority actions to be taken to reduce impacts at sites.

LCA data are built to provide estimated pressures associated with activities carried out in a site. Pressures are directly proportional to the capacity of the site and represent activities conducted in the infrastructure footprint, the buffer capturing direct impact around the infrastructure, and associated infrastructure (impacts from the economic resettlement of local communities and influx are excluded here). For each operation type, TBC LCA experts have identified the most appropriate LCA data, representing the specificities of the activities conducted for that operation (data extracted for each operation type are available and will be included in the appendices of a future iteration of this document).

Due to how LCA models are built, estimated pressures will be presented as the aggregated impacts from all activities conducted at the site, proportional to the capacity of the site, and cannot be disaggregated by activity. For example, GHG and non GHG emissions due to oil and gas extraction are proportional to the annual volume extracted; water use to clean solar panels is proportional to area of panels itself proportional to site capacity to produce energy. The activities needed for the proper functioning of the operation are covered. For example, transport for maintenance of wind turbine, energy consumed for oil and gas extraction and cooling water for CCGT are covered. The approach can however be broken down by each of the different pressure categories, to understand which of the other pressures has the greatest contribution to the overall impact. The breakdown of other pressures can be seen in Table 10.

Table 10: Mapping of LCA impact categories to pressure categories

Pressure category	LCA impact category for disaggregation
Climate Change	Global warming, Terrestrial ecosystems Global warming, Freshwater ecosystems
Pollution	Ozone formation, Terrestrial ecosystems Terrestrial acidification Freshwater eutrophication Marine eutrophication Terrestrial ecotoxicity Freshwater ecotoxicity Marine ecotoxicity
Resource Exploitation	Water consumption, Terrestrial ecosystem Water consumption, Aquatic ecosystems

[17]Main pressures on biodiversity have been defined by IPBES, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

8.1.2 Dependencies on Nature

A future planned development is to integrate dependencies on nature into the BFIS tool. Understanding dependencies on nature is important to enable businesses to identify risks that they may be exposed to resulting from changes in the state of nature, and the resulting reduction or loss of ecosystem services.

Information on dependencies on nature for different operation types will be drawn from the UNEP ENCORE tool. This provides estimates of the level of dependency of different business activities on 26 different ecosystem services, using a 5-point, qualitative scale (Very Low – Very High). BFIS operation types will be mapped against the business activities in ENCORE (based on the International Standard Industrial Classification of All Economic Activities (ISIC)), so that dependency information can be returned as part of the BFIS results.

8.2 Future opportunities

BFIS has been designed to enable opportunities for further development and customisation to specific needs of companies. For example, a future iteration of BFIS could offer the options for several types of data entry. If companies have GIS datasets covering each component of the infrastructure, they could be used to estimate impacts instead of using the models built in BFIS.

As mentioned in Section 1.2, BFIS could easily be adapted to serve as a tool to inform decision-making. Additional development could enable, for example, scenario modelling to compare design and understand how b-risk would vary, as well as implication for investment.

BFIS currently focuses on impact assessment and will enable, in the short-term future, to identify key dependencies to ecosystem services. These two outputs would enable companies to determine risks and opportunities, as well as financial materiality. A future iteration of BFIS could include specific guidance and concrete examples to guide companies in this process.

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Appendix 1: Glossary

The description of BFIS entails the use of several key words, for which it is important to establish a shared understanding of definitions. This section provides definitions for a common set of terms and their recommended translation in French.

Table 11: BFIS Glossary

Name in English	Name in French	Definition in the context of BFIS
Area of influence	Aire d'influence	Each component of the footprint (infrastructure footprint, direct impact buffer, associated infrastructure, economic displacement of local communities, influx) will occur in an area within or around the perimeter of the site. For each site, BFIS assesses if the component is likely to occur and estimates the buffer area in which the impact would likely happen. The Area of influence is the largest buffer for the site, determined based on the components described above, and represents the area under which the State of Nature is assessed.
Associated infrastructure	Infrastructure associée	Associated infrastructure is usually built to support connection of a development project to existing infrastructure, and should there be included as part of the footprint. The relevant types of associated infrastructure will vary by operation type (road, rail, pipeline, powerline). The approach uses an average width for each type of associated infrastructure and a decision tree, which takes the site location into account, to estimate the lengths of the associated infrastructure. Direct impact buffer is also considered around associated infrastructure.
Biodiversity features	Caractéristiques de biodiversité	'Biodiversity features' is another term to describe the biodiversity components (species, ecosystems, habitats) that can be used to identify potential biodiversity value in the area and are used as indicators of biodiversity risk to determine the overall biodiversity importance score.
Biodiversity land occupancy footprint	Empreinte biodiversité d'occupation des terres	The biodiversity land occupancy footprint represents the pressure-adjusted impact on biodiversity from site activities. It is equivalent to the land occupancy footprint in which 100% of land is no longer available for biodiversity. It recognises that each type of activity / component of the footprint generates a different pressure on biodiversity. For example, concrete infrastructure will reduce the original biodiversity by 100%, whilst noise or pollution would only reduce it by 35%. A specific metric is used, the Impact-adjusted_L.ha, to reflect that the value can be conceptualised as the equivalent area where 100% of biodiversity would be lost. Note that the conceptualised impact of the biodiversity land occupancy footprint is in terms of land occupied by the site infrastructure and/or activities and therefore not available for biodiversity restoration. It does not estimate the impact of the site as we cannot determine the quality of the habitat before the site was built for all existing and operational sites – the habitat could already have been degraded, and the development of the activities may not have led to additional biodiversity loss. This cannot be assessed with a modelled approach but can be understood when validating the footprint with site data.
Biodiversity risk (b-risk)	Risque biodiversité (b-risk)	There are many uses of the word 'risk' in the context of company impact assessment. It can refer to risk to biodiversity or to risk to businesses from biodiversity loss (e.g., physical, systemic, reputational and transition risks as defined by TNFD. In BFIS, the word 'risk' always refers to risk to biodiversity, i.e., the risk of business activities negatively impacting biodiversity features of significant conservation value. To avoid any confusion, we always refer to biodiversity risk (or b-risk).
Biodiversity-risk (b-risk) category	Catégorie de risque biodiversité	Each site is assigned to a biodiversity-risk category based on the magnitude of impacts and the risk of impacting biodiversity features of conservation value. Biodiversity importance has five classes; preliminary/validated b-risk has three classes; Priority is an optional management prioritisation applied to selected High sites. The b-risk is first defined using estimated impacts and potential biodiversity risk (from step 1a) and is further validated with site-based data in step 1c.
Condition	Condition	TNFD defines ecosystem condition as the quality of an ecosystem measured by its abiotic and biotic characteristics. Ecosystem condition can be represented by a variety of different metrics and is typically scaled from 0 to 1, with 0 representing a totally degraded state and 1 representing a totally intact state. Ecosystem condition can be estimated from pressures, under the assumption that ecosystem condition will be lower when higher levels of pressure are present (in the context of BFIS step 1, values for ecosystem condition have been defined based on the type of activities. The annex of the methodology report provides the values, how they have been defined, and the full list of references). Ecosystem condition can also be directly measured through field or remote monitoring (which will be done in BFIS step 2). These two approaches for estimating condition need to be distinguished and typically use different metrics.
Direct impact buffer	Zone tampon d'impact	In addition to the immediate impacts from the presence of infrastructure ('infrastructure footprint'), a direct impact buffer is considered for each site. This buffer represents the impacts from place-specific sources of pollution such as noise, light or sedimentation, and is represented as an impact to biodiversity using the extent x condition framework. For each site type, a buffer zone around the infrastructure footprint is delineated, and within this area a certain biodiversity loss coefficient (i.e. "condition") value is assigned, based on the impact source in question.
Economic displacement of local communities	Déplacement économique des communautés locales	Economic displacement of local communities often occurs in large development projects that rely on a specific resource being available in a specific location (e.g., oil or gas extraction) and therefore require displacing local communities. A decision tree has been developed in BFIS to assess the likelihood of economic displacement of local communities due to project development. Displacement of local communities is assumed to mostly lead to habitat conversion clearance for agriculture, and a model has been developed to estimate its impact in BFIS.

Table 11 continued: BFIS Glossary

Name in English	Name in French	Definition in the context of BFIS
Estimated impact	Impact estimé	BFIS step 1 provides the estimated impact from the pressures on biodiversity generated by activities on site. Currently, it only models estimated land occupancy. Other pressures will be modelled in the future. We always refer to 'estimated' impacts because measured impacts from the actual site are not used.
Ecosystem extent by condition	Etendue/aire par condition de l'écosystème	The Ecosystem "Extent x Condition" framework is a standard and well-tested measurement framework for estimating the state of biodiversity in a certain ecosystem. This framework was adopted by the United Nations (UN) Experimental Ecosystem Accounting (EEA) protocol of the System of Environmental-Economic Accounting (SEEA) and has seen widespread use in corporate biodiversity assessments (TNFD, 2023). The extent is the physical area over which the state of biodiversity, or impacts on it, are measured or estimated. The condition represents the quality of an ecosystem; it can be estimated using referenced values from the scientific literature or measured by monitoring abiotic and biotic characteristics on the ground. The footprint is estimated or measured by multiplying extent and condition to produce a weighted measure of biodiversity impact–the area over which the impact is happening weighted by the severity of the impact on ecosystem condition across the area. For example, paving Natural Habitat with infrastructure will reduce the original biodiversity by 100%, while applying noise or pollution over the same area would reduce biodiversity by 35%. In this framing, 100 hectares of land being impacted by noise at 35% loss would be the equivalent of 35 impact-adjusted_L.ha (i.e., the area being impacted, adjusted by the estimated magnitude of that impact) whilst 100 hectares built with infrastructure would be the equivalent of 100 impact-adjusted_L.ha. In BFIS, we call the weighted.hectare metric the "Impact-adjusted hectare – Losses (Impact-adjusted_L.ha)".
Footprint	Empreinte	Footprint refers to the land occupancy impacts generated by the activities at the site. Footprint can be used to describe both estimated and measured impacts, so we always specify which one we refer to (in this case of step 1 it is estimated). The footprint can either refer to a quantified value of land occupancy (in hectares) or to the area of land unavailable for biodiversity (in Impact-adjusted hectares).
Framework	Cadre / approche	BFIS is conceptualized as a framework that defines good practice and expectation of effort based on levels of impact and biodiversity risk, estimated via a tool (step 1a). The framework includes action setting, monitoring and reporting using a step-by-step approach to facilitate implementation (step 2).
Guidance	Guidance	BFIS step 2 will provide guidance, i.e., a set of pre-defined principles to guide management actions, monitoring and evaluation and reporting that are recommended following international good practice. The level of detail in the guidance is still under development. There is also an opportunity to customize the guidance based on company policy and/or needs.
Habitat significance (Critical Habitat)	Importance de l'habitat	Critical Habitat is defined as areas with high biodiversity value that meet one or more of five criteria with thresholds (i.e., CR/EN species; endemic/restricted-range species; migratory/congregatory species; threatened and unique ecosystems; key evolutionary processes) (IFC PS6 Guidance, IFC 2012). The concept of Critical Habitat is grounded in the principles of vulnerability (threat level) and irreplaceability (rarity or restricted distribution). It is used to guide decision-making in project development, especially in areas where biodiversity values are exceptionally high and where impacts may be irreversible or difficult to mitigate.
High b-risk category	Catégorie de risque biodiversité élevée	Priority sites are those with high impact, likely presence of critical habitat, and/or biodiversity features of concern. This category calls for the highest expectations for mitigation measures and biodiversity monitoring. For example, in addition to following the mitigation hierarchy, species-specific mitigation measures may be needed for the biodiversity features of highest concern. These sites warrant a detailed monitoring and evaluation plan including direct field measurement and monitoring of ecosystem condition. This may need to be supplemented by monitoring of species-specific indicator.
Impact-adjusted hectare – Losses (Impact-adjusted_L.ha)	Hectare pondéré par l'impact - perte d'habitat pour la biodiversité	The Impact-adjusted_L.ha is the metric used to represent the biodiversity land occupancy footprint. It provides a unit to integrate the impacts (different pressures on the footprint) to biodiversity and the total land area impacted. For example, paving Natural Habitat with infrastructure will reduce the original biodiversity by 100%, while applying noise or pollution over the same area would reduce biodiversity by 35%. In this framing, 100 hectares of land being impacted by noise at 35% loss would be the equivalent of 35 Impact-adjusted_L.ha (i.e., the area being impacted, adjusted by the estimated magnitude of that impact). It does not represent the value or the significance of the biodiversity (habitat and/or species) on the land. This is assessed separately via the other indicators (habitat significance, species significance, and overall biodiversity importance score).

Table 11 continued: BFIS Glossary

Name in English	Name in French	Definition in the context of BFIS
Impact-adjusted hectare – Remaining for action (Impact-adjusted_R.ha)	Hectare pondéré par l'impact - habitat disponible pour la biodiversité	This metric is very similar to the Impact-adjusted_L.ha. It is used to represent the area remaining for biodiversity and potentially available for positive actions. It is the opposite value of the Impact-adjusted hectare–Losses within the land occupancy footprint. In the same example as above, 100 hectares of land being impacted by noise at 35% loss would be the equivalent of 35 Impact-adjusted_L.ha (i.e., the area being impacted, adjusted by the estimated magnitude of that impact). The impact-adjusted_R.ha in this case would be 65 (i.e., the area remaining for potential gains through conservation actions such as restoration or protection).
Indirect impacts	Impacts indirects	Large development projects often induce an influx of economic migrants. The likelihood of influx is assessed using a decision tree in BFIS. Impacts from influx considered in BFIS include pressures associated with additional subsistence agriculture and extraction of natural resource. A model has been built to estimate the scale of the impacts based on the number of workers employed by the project development.
Infrastructure footprint	Empreinte de l'infrastructure	It represents the permanent infrastructure required to operate each site. This could include buildings, well heads, pipelines, wind turbines, solar panels, etc., and will vary from site type to site type. The calculation of the infrastructure footprint is based on a combination of geospatial data provided for each site, along with site-specific supplementary information e.g. number of wind turbines. 100% of biodiversity is usually lost under these components.
Key biodiversity features	Caractéristiques de biodiversité importantes	'Key biodiversity features' is a term used to describe the indicators of biodiversity risk used to determine the overall biodiversity importance score that have a score of High or Very High and therefore contribute to highlight the site as of potential biodiversity risk.
Land occupancy footprint	Empreinte d'occupation des terres	The land occupancy footprint is the total physical area occupied by direct and/or indirect site activities. The land occupancy footprint does not yet consider how much the activities will impact biodiversity and lead to a loss of available areas for biodiversity (this is considered in the biodiversity land occupancy footprint).
Low b-risk category	Catégorie de risque biodiversité faible	Sites with low impacts and no biodiversity features of concern. As it is more cost-effective to prioritise expenditure on mitigation measures and biodiversity monitoring on sites with higher impacts and biodiversity features of concern, no specific biodiversity mitigation measures or biodiversity monitoring is required at these sites. However, as at all sites, general environmental good practice, e.g. care in handling potentially toxic materials to avoid unnecessary spills, should be always followed.
Magnitude of impacts	Magnitude des impacts	The magnitude of impacts is used to determine the b-risk category of the site. For each site, the biodiversity land occupancy footprint is estimated. The footprints of all sites are ranked to understand how they contribute to the overall portfolio footprint and to understand the magnitude of impacts of each specific site compared to the others.
Medium b-risk category	Catégorie de risque biodiversité modérée	These are sites where there are large land occupancy impacts to monitor, but no specific biodiversity features of concern. Management practices at these sites should follow the mitigation hierarchy, in addition to general environmental good practice. These sites should also monitor biodiversity to track impacts over time, but as there are no biodiversity features of concern, the monitoring should rely on cost-effective passive monitoring techniques such as remote sensing and bio-acoustic monitoring instead of more expensive direct field monitoring.
Natural Habitat	Habitat naturel	Natural Habitats (NH) are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition (IFC PS6 Guidance (IFC 2012).
Overall biodiversity importance score	Score global de l'importance de la biodiversité	The overall biodiversity importance is assessed using a combination of biodiversity indicators which represents both the significance for species and for habitats: (1) the number of threatened species and the presence of species that would potentially make the site qualify for Critical Habitat, (2) the maximum value of the STAR metric (Abatement or Restoration components) within the area (representing the likelihood that some areas of high importance for species with significance extinction risk are present within the area of influence), and (3) the proximity to areas of biodiversity importance (Protected Areas, World Heritage Sites, Key Biodiversity Areas, and Alliance for Zero Extinction Sites) (representing the areas where species of biodiversity importance are more likely to be present in higher abundance and where their habitat is likely less degraded than elsewhere and therefore in priority to protect). Each indicator receives a score categorised from very low to very high, and the overall score of the site is the highest score of the indicators.
Potential land for positive actions	Terrain potentiel pour des actions positives	The potential land for positive actions represents the area within the land occupancy footprint that remains available for habitat protection and restoration after site impacts have been accounted for. The opportunity for habitat protection or restoration, if the estimated value is significant, can be validated by site-based data to assess the opportunities, and develop appropriate conservation actions.

Table 11 continued: BFIS Glossary

Name in English	Name in French	Definition in the context of BFIS
Priority b-risk category	Catégorie de risque biodiversité prioritaire	Priority sites are those with high impact, likely presence of critical habitat, and/or biodiversity features of concern. They are the subset of 'High' sites with elevated reputational risk due to biodiversity features, additional regulatory standards, or other local considerations. This category calls for the highest expectations for mitigation measures and biodiversity monitoring, but may align with specific additional commitments, e.g. demonstration of net gains for Critical Habitat-qualifying species.
Significance	Importance	The relative importance of biodiversity features within the context of national or global biodiversity conservation goals. For example, to meet global goals to halt and reverse species extinction risk, conservation activities that protect species threatened with extinction are more significant than conservation actions that protect species that are not threatened with extinction.
Species significance	Importance des espèces	The species significance is assessed using the threat abatement component of the Species Threat Abatement and Restoration (STAR) metric. We use the total STAR score value within the Area of Influence; it represents the total value for opportunities to abate threats and therefore reducing the global species extinction risk in the defined area. It is an equivalent of the 'land occupancy footprint' for the habitat; it does not assess how the activities impact the species extinction risk.
Step 1: Evaluate and prioritise	Evaluer et prioritiser	Step 1 of BFIS is divided into 4 sub-steps that enable (1) an evaluation of the impact and b-risks (estimated in step 1a and categorised in step 1b through the tool and subsequently verified with site-based data in step 1c for sites with potentially large impacts and b-risk) and (2) a prioritisation of sites based on the b-risk category (step 1d). The b-risk category determines the level of expected effort for management actions, monitoring and reporting. The word 'Evaluate' aligns with the TNFD 'LEAP' (Locate, Evaluate, Assess, Prepare) approach designed to support business to estimate impacts and understand their interface with Nature. As BFIS does not include a comprehensive review of physical and transition risks outlined in the LEAP approach of TNFD, nor opportunities, we do not consider that BFIS corresponds to the 'Assess' step of LEAP.
Step 1a: Pre-evaluate	Pré-évaluer	Step 1a provides a preliminary estimate of the impacts and identification of the potential b-risks, based on modelled global biodiversity datasets. It acts as a preliminary screening, before validation of results in step 1c.
Step 1b: Categorise	Catégoriser	Step 1b categorises sites based on the magnitude of the estimated impact and the potential presence of biodiversity features of conservation value. It provides a rubric to guide which sites to verify with site-based data in the validation step.
Step 1c: Validate	Valider	Step 1c provides guidance on how to validate the estimated impact and b-risk, specifically regarding the actual presence of, and impacts on, biodiversity features of interest on site. Outcomes from step 1a and 1b are then adjusted using expert knowledge, site documentation and, when necessary, additional data collection to provide a refined assessment of the impact and the b-risks.
Step 1d: Prioritise	Prioriser	Step 1d provides the final b-risk category for each site: the validation in step 1c are used to update the b-risk category output from step 1b for each site. The validated categorisation of sites enables prioritisation of the highest b-risk sites, based on validated large magnitude of impacts or confirmed presence of key biodiversity features. This will guide where to prioritise effort and action for the company.
Step 2: Corporate reporting framework	Cadre de reporting de l'entreprise	Step 2 is divided in three steps and provides guidance on how companies can prepare reporting on biodiversity. The level of expectation of effort and alignment with key principles is determined based on the b-risk category validated in step 1d. The accompanying materials to support the implementation for each step are under development and can be customized based on company needs.
Step 2a: Act	Agir	Step 2a is focused on the actions that the company could take to mitigate impacts on biodiversity. It will provide guidance on the key principles for developing and/or reviewing existing actions.
Step 2b: Monitor	Suivi – Surveillance	Step 2b will provide guidance on the type of monitoring (type of approaches, type of features) to be conducted at site, the level of effort determined by (or "based on") the b-risk category.
Step 2c: Report	Reporter	Step 2c will provide guidance on the type of indicators used to report for each site with recommendations on how to aggregate indicators at portfolio level to give an overview of company progress to reduce impacts. This can also be tailored to the company level of ambition for biodiversity (e.g. a reduction of impacts to as low as possible, achieving no net loss or net gain).
Tool [Preliminary assessment of biodiversity impacts and risks]	Outil [d'évaluation préliminaire des impacts et des risques biodiversité]	BFIS step 1a includes an analytical tool, i.e., an automated model using verified global datasets to estimate physical impacts to biodiversity (termed 'footprint') and level of biodiversity risk. The tool has been developed using in-depth analysis, research and expertise on common impacts specific to different operation types (e.g. solar and wind). The tool requires minimal data input per site and provides a preliminary estimated impact and list of potential biodiversity risks. The tool output requires verification with site-specific data and information for sites with large, estimated impacts or potentially significant biodiversity risks. The impact estimate tool is available as a package in the R statistical programming language, freely accessible to companies.

Appendix 2: BFIS alignment with the LEAP framework (TNFD) and how BFIS enables responses to ESRS E4 datapoints

Table 12 is adapted from the TNFD document "Guidance on the Identification and Assessment of Nature Related Issues: The LEAP Approach." For each stage of the LEAP process, we indicate how BFIS supports the generation of the relevant information.

Because BFIS focuses exclusively on direct operational impacts, the alignment presented here assesses only the correspondence between BFIS outputs and the LEAP steps as they apply to direct operations.

Table 12: BFIS alignment with the LEAP framework from TNFD

Locate The interface with nature	**Evaluate** Dependencies & impacts	**Assess** Risks & opportunities	**Prepare** To respond & report
L1 Span of the business model and value chain	**E1 Identification of environmental assets, ecosystem services and impact drivers**	**A1 Risk and opportunity identification**	**P1 Strategy and resource allocation plans**
What are our organisation's activities by sector and value chain? Where are our direct operations?	What are the sectors, business processes or activities to be analysed? What environmental assets, ecosystem services and impact drivers are associated with these sectors, business processes, activities and assessment locations?	What are the corresponding risks and opportunities for our organisation?	What risk management, strategy and resource allocation decisions should be made as a result of this analysis?
Yes BFIS is focused on direct operations but will support the company in assessing all their assets. The assessment is location-specific.	**Partially** BFIS is designed to cover all the activities in the direct operations of a company but focused on drivers of land-use impact it its current version.	**Partially** BFIS provides most information relevant to define risk and opportunity, and define expectations in terms of risk mitigation, but it does not include guidance to identify and list risk and opportunity specifically.	**Partially** By setting expectations on the level of actions and monitoring required for each site, BFIS outputs will enable the company to identify if they are allocating the appropriate level of resourcing for managing biodiversity risk.
L2 Dependency and impact screening	**E2 Identification of dependencies and impacts**	**A2 Adjustment of existing risk mitigation and risk and opportunity management**	**P2 Target setting and performance management**
Which of these sectors, value chains and direct operations are associated with potentially moderate and high dependencies and impacts on nature?	What are our dependencies and impacts on nature?	What existing risk mitigation and risk and opportunity management processes and elements are we already applying? How can risk and opportunity management processes and associated elements (e.g. risk taxonomy, risk inventory, risk tolerance criteria) be adapted?	How will we set targets and define and measure progress?
Partially BFIS steps 1a and b enables the estimation of impacts and categorises sites based on the magnitude of impacts. Current version of BFIS does not include dependencies.	**Partially** BFIS enables identification of the drivers of impacts. It provides a breakdown of main contributors of impacts (direct infrastructure, direct impact, associated infrastructure, economic resettlement of local communities, influx). Current version of BFIS does not include other pressures on nature and dependencies.	**Partially** In a future version of BFIS, it would include recommendations in terms of mitigation measures. This will enable the company to review if they have the right level of mitigation measures in place at their site and identify potential gaps.	**Partially** BFIS does not include guidance to determine targets (but this could easily be integrated in a future version of the tool). It does however, provide guidance for monitoring indicators and techniques.

Locate The interface with nature	**Evaluate** Dependencies & impacts	**Assess** Risks & opportunities	**Prepare** To respond & report
L3 Interface with nature	**E3 Dependency and impact measurement**	**A3 Risk and opportunity measurement and prioritisation**	**P3 Reporting**
Where are the sectors, value chains and direct operations with potentially moderate and high dependencies and impacts located? Which biomes and specific ecosystems do our direct operations, and moderate and high dependency and impact value chains and sectors, interface with**?**	What is the scale and scope of our dependencies on nature? What is the severity of our negative impacts on nature? What is the scale and scope of our positive impacts on nature?	Which risks and opportunities should be prioritised?	What will we disclose in line with the TNFD recommended disclosures?
Yes BFIS is location-specific and includes land-use maps that enable identification of biomes and ecosystems in which each site is located.	**Partially** BFIS provides an estimation of land-use impacts and one indicator provides an estimate for potential lands for positive actions. Step 1b, by categorising site based on the magnitude of impacts and the sensitivity of the location, enables scaling of the severity of the impacts. The current version of BFIS does not include other pressures on nature and dependencies.	**Partially** BFIS prioritises sites based on the magnitude of impacts and the risk for biodiversity (significance of biodiversity at site location) only. It does not prioritise sites based on the risk and opportunity for the company.	**Partially** BFIS provides guidance on how to report on biodiversity indicators to demonstrate progress through time.

Locate The interface with nature	**Evaluate** Dependencies & impacts	**Assess** Risks & opportunities	**Prepare** To respond & report
L4 Interface with sensitive locations	**E4 Impact materiality assessment**	**A4 Risk and opportunity materiality assessment**	**P4 Presentation**
Which of our organisation's activities in moderate and high dependency and impact value chains and sectors are located in ecologically sensitive locations? And which of our direct operations are in these sensitive locations?	Which of our impacts are material?	Which risks and opportunities are material and therefore should be disclosed in line with the TNFD recommended disclosures?	Where and how do we present our nature-related disclosures?
Yes BFIS includes a set of indicators to identify ecologically sensitive areas in step 1a. Step 1b enables categorisation of sites based on ecologically sensitive features.	**Partially** BFIS ranks site by on the magnitude of the impacts (land-use impacts only for now) and recommends thresholds to categorise site between low vs. significant impacts. Companies can adapt these thresholds (and document the process) to ensure they include all site with material impacts.	**No** BFIS does not include guidance to define risk and opportunity and therefore does not include an assessment on which ones are material.	**Partially** BFIS will provide template on how to report on biodiversity indicators and which indicators can be aggregated to provide an overview of company performance.

Table 13: How BFIS enables responses to ESRS E4 datapoints

Disclosure requirement	Paragraph	In scope CSRD Disclosure requirement text	BFIS alignment
E4-1 Transition plan and consideration of biodiversity and ecosystems in strategy and business model	11	The undertaking shall disclose how its ***biodiversity*** and ***ecosystem impacts***, ***dependencies***, ***risks*** and ***opportunities*** originate from and trigger adaptation of its strategy and ***business model***.	BFIS enables the estimation of impacts on biodiversity and ecosystem (currently focusing on land-use impacts). It does not include for now identification of dependencies, or guidance to determine risks and opportunities, but following the full process of BFIS (step 1a to step 2c) will support company in identifying what needs to be adapted in their strategy to properly manage biodiversity risk.
	12, 13, 14, 15	Strategy resilience and alignment with relevant policy.	Out of Scope of BFIS to provide guidance on strategy or policy development.
SBM 3 Material impacts, risks and opportunities and their interaction with strategy and business model	16	The undertaking shall disclose:	
	16 (a)	a list of material sites in its own operations, including sites under its operational control, based on the results of paragraph 17(a). The undertaking shall disclose these locations by:	Yes, BFIS analysis occurs at site-level and should include all sites in operational control.
	16 (a) i	specifying the activities negatively affecting **biodiversity sensitive areas** (*);	Yes, BFIS provides several indicators enabling to identify biodiversity sensitive areas within the area of influence of the project.
	16 (a) ii	providing a breakdown of **sites** according to the **impacts** and **dependencies** identified, and to the **ecological** status of the areas (with reference to the specific ecosystem baseline level) where they are located; and	Partially, BFIS provides estimated impacts for each component of the footprint and provides the ecosystem in which the site is located. It does not include an assessment of the ecosystem condition prior to the activities. *Dependency analysis is currently out of scope.*
	16 (a) iii	specifying the biodiversity-sensitive areas impacted, for users to be able to determine the location and the responsible competent authority with regards to the activities specified in paragraph 16(a) i	Yes, BFIS specifies the biodiversity sensitive features located within the area of influence of the site.
	16 (b)	whether it has identified material negative ***impacts*** with regards to ***land degradation***, ***desertification*** or ***soil sealing*** (*); and	BFIS provides an estimation of land-occupancy and not land degradation per se, but the validation step will enable to confirm the magnitude of impacts and its significance in terms of land degradation, desertification or soil sealing.
	16 (c)	whether it has operations that affect ***threatened species*** (*).	Yes, the list of threatened species present in the area of influence of the site is provided. The validation step enables assessment of whether these species are affected by the operations.
ESRS 2 IRO-1 Description of processes to identify and assess material biodiversity and ecosystem-related impacts, risks, dependencies and opportunities	17 17 (a)	The undertaking shall describe its process to identify material ***impacts***, ***risks***, ***dependencies*** and ***opportunities***. The description of the process shall include whether and how the undertaking:	Partially, BFIS methodology report describes the process but dependencies, risks and opportunities is currently not included in BFIS.
		identified and assessed actual and potential ***impacts*** on ***biodiversity*** and ***ecosystems*** at own ***site*** locations and in the upstream and downstream ***value chain***, including assessment criteria applied;	BFIS estimates land use impacts for all significant drivers of land use impacts. The validation step enables verification of the occurrence and magnitude of each impact. *Value chain analysis is out of scope.*
	17 (b)	identified and assessed dependencies on ***biodiversity*** and ***ecosystems*** and their services at own ***site*** locations and in the upstream and downstream ***value chain***, including assessment criteria applied, and, if this assessment includes ***ecosystem services*** that are disrupted or likely to be;	*Dependency screening is in development and currently out of scope.*

Disclosure requirement	Paragraph	In scope CSRD Disclosure requirement text	BFIS alignment
	19	The undertaking shall specifically disclose:	
	19 (a)	whether or not it has ***sites*** located in or near ***biodiversity***-sensitive areas and whether activities related to these sites negatively affect these areas by leading to the deterioration of ***natural*** habitats and the habitats of species and to the disturbance of the species for which a ***protected area*** has been designated; and	Yes, BFIS uses a set of indicators to identify the potential presence of biodiversity sensitive features in the areas of influence (including protected areas).
	19 (b)	whether it has been concluded that it is necessary to implement ***biodiversity*** mitigation measures, such as those identified in: **Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds; Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora**; an Environmental ***Impact*** Assessment ***(EIA)*** as defined in **Article 1(2), point (g)**, of **Directive 2011/92/EU of the European Parliament and of the Council** (*) on the assessment of the effects of certain public and private projects on the environment; and for activities located in third countries, in accordance with equivalent national provisions or international standards, such as the **International Finance Corporation (IFC) Performance Standard 6**: Biodiversity Conservation and Sustainable Management of Living ***Natural Resources***.	BFIS aligns with the key principles and concepts of the IFC PS6. Magnitude of impacts and the presence of biodiversity features of importance sets expectation in terms of mitigation measures.
	17 (d)	Systemic risks	*All currently out of scope for BFIS.*
	17 (e)	Consultations with affected communities	
	18	Biodiversity and ecosystems scenario analysis	

Disclosure requirement	Paragraph	In scope CSRD Disclosure requirement text	BFIS alignment
E4-2 Policies related to biodiversity and ecosystems	20	The undertaking shall describe its adopted ***policies*** to manage its material ***impacts***, ***risks***, ***dependencies***, and ***opportunities*** that are related to ***biodiversity*** and ***ecosystems***.	BFIS currently focused on land-use impacts. It provides relevant data to help identifying the need to specific policies but does not provide guidance on which policy should be adopted or on how to develop the policies.
	21	The objective of this Disclosure Requirement is to enable an understanding of the extent to which the undertaking has ***policies*** that address the identification, assessment, management and/or ***remediation*** of its material ***biodiversity*** and ***ecosystem*** - related ***impacts***, ***dependencies***, ***risks*** and ***opportunities***.	BFIS provides a framework to guide companies identifying and managing risk on biodiversity but it does not provide guidance on which policy the company should adopt.
	23 23 (a)	In addition to the provisions of **ESRS 2 MDR-P** the undertaking shall describe whether and how its ***biodiversity*** and ***ecosystems*** -related ***policies***: relate to the matters specified in **ESRS E4 AR 4**;	BFIS provides relevant data to help identifying the need to specific policies but does not provide guidance on which policy should be adopted or on how to develop the policies: **ESRS E4 AR 4** refers to the appendix which describes how materiality assessments should be reported. BFIS helps to provide data across the required metrics to be used in this reporting.
	23 (c)	relate to its material ***biodiversity*** and ***ecosystems***-related ***impacts***;	BFIS provides (1) estimated land-use impacts and (2) a set of indicators describing biodiversity sensitivity in the area of influence. It enables prioritisation of sites based on risks for biodiversity.
	24 (a)	The undertaking shall specifically disclose whether it has adopted: ***biodiversity*** and ***ecosystem*** protection ***policy*** covering operational ***sites*** owned, leased, or managed in or near a ***biodiversity sensitive area***;	BFIS reports proximity to biodiversity sensitive areas across sites.
	24 (b)	***policies*** to address ***deforestation***.	BFIS includes forest loss at each site which can be used to guide policy and disclosure.

Disclosure requirement	Paragraph	In scope CSRD Disclosure requirement text	BFIS alignment
	22 23 (c, d, e, f)	Policies and how they relate to dependencies, transition risks, whole value chain and social consequences.	*Out of scope for BFIS.*
	24 (b, c)	Disclosure about sustainable land / agriculture / oceans / seas practices or policies.	
E4-3 Actions and resources related to biodiversity and ecosystems	25	The undertaking shall disclose its ***biodiversity*** and ***ecosystems***-related ***actions*** and the resources allocated to their implementation.	BFIS defines b-risk categories to each site, related to magnitude of impacts and biodiversity sensitivity. It sets expectations in terms of actions and monitoring and therefore helps the company to level of resource allocation.
	26	The objective of this Disclosure Requirement is to enable an understanding of the key ***actions*** taken and planned that significantly contribute to the achievement of ***biodiversity*** and ***ecosystems*** -related ***policy*** objectives and ***targets***.	Step 2 of BFIS will include guidance for the development of Biodiversity Action Plans for sites with features of biodiversity concern.
	27	The description of key ***actions*** and resources shall follow the mandatory content defined in ESRS 2 MDR-A Actions and resources in relation to material sustainability matters.	BFIS provides the guidance and technical information to enable a company to follow this.
	28 (a)	In addition, the undertaking: may disclose how it has applied the mitigation hierarchy with regard to its ***actions*** (avoidance, minimisation, restoration/ rehabilitation, and compensation or offsets);	BFIS has a clear method for assigning biodiversity-risk at each site within a portfolio. For Medium, High and Priority sites the mitigation hierarchy should be followed (more details in Table 8).
	28 (b)	Offsets	*Out of scope for BFIS.*
	28 (c)	Local & Indigenous knowledge	
E4-4 Targets related to biodiversity and ecosystems	29	The undertaking shall disclose the ***biodiversity*** and ***ecosystem***-related ***targets*** it has set.	BFIS provides the data and the framework to facilitate definition of biodiversity targets, but it does not provide guidance to set biodiversity targets for now.
	30	The objective of this Disclosure Requirement is to allow an understanding of the ***targets*** the undertaking has adopted to support its ***biodiversity*** and ***ecosystems policies*** and address its material related ***impacts***, ***dependencies***, ***risks*** and ***opportunities***.	*Target setting is currently out of scope for BFIS.*
	31	The description of the ***targets*** shall follow the mandatory content defined in **ESRS 2 MDR-T Tracking effectiveness of policies and actions through targets**.	*Target description is currently out of scope for BFIS.*
	32	The disclosure required by **paragraph 29** shall include the following information:	BFIS methodology report includes all the ecological thresholds used in BFIS, including the rationale to define them.
	32 (a)	whether ***ecological thresholds*** and allocations of ***impacts*** to the undertaking were applied when setting ***targets***. If so, the undertaking shall specify:	
	32 (a) ii	whether or not the thresholds are entity-specific and if so, how they were determined; and	
	32 (a) iii	how responsibility for respecting identified ***ecological thresholds*** is allocated in the undertaking;	
E4-5 Impact metrics related to biodiversity and ecosystems change	33	The undertaking shall report ***metrics*** related to its material ***impacts*** on ***biodiversity*** and ***ecosystems***.	BFIS provides estimated impacts on ecosystems and significance for biodiversity.
	34	The objective of this Disclosure Requirement is to enable an understanding of the performance of the undertaking against ***impacts*** identified as material in the ***materiality*** assessment on ***biodiversity*** and ***ecosystems*** change.	

Disclosure requirement	Paragraph	In scope CSRD Disclosure requirement text	BFIS alignment
	35	If the undertaking identified ***sites*** located in or near ***biodiversity***-sensitive areas that it is negatively affecting (**see paragraph 19(a)**), the undertaking shall disclose the number and area (in hectares) of sites owned, leased or managed in or near these ***protected areas*** or key biodiversity areas.	The overlap and proximity to areas of biodiversity importance, i.e., Protected Areas, World Heritage Sites, Key Biodiversity Areas, and Alliance for Zero Extinction Sites are reported for each site along with the impact footprint (ha).
	36	If the undertaking has identified material ***impacts*** with regards to land-use change, or impacts on the extent and condition of ***ecosystems***, it may also disclose their land-use based on a Life Cycle Assessment.	For each site land use impacts are estimated using "extent x condition", a globally recognised framework. BFIS currently does not use LCA.
	37	For datapoints specified in paragraphs 38 to 41, the undertaking shall consider its own operations.	BFIS assessment should include all own operations.
	38	If the undertaking has concluded that it directly contributes to the ***impact drivers*** of land-use change, ***freshwater*** -use change and/or sea-use change, it shall report relevant ***metrics***. The undertaking may disclose metrics that measure:	BFIS considers land occupancy across terrestrial and marine realms (in 2 dimensions). It does not include metrics specific to the freshwater or marine realms.
	38 (a)	the conversion over time (e.g. 1 or 5 years) of land cover (e.g. ***deforestation*** or mining);	BFIS provides indicators of land change in the area of influence (Land Cover Change, Forest Loss & Cropland Expansion); it could be used to determine habitat conversion and potential deforestation over time.
	38 (b)	changes over time (e.g. 1 or 5 years) in the management of the ecosystem (e.g., through the intensification of agricultural management, or the application of better management practices or forestry harvesting);	*Out of scope for BFIS.*
	38 (c)	changes in the spatial configuration of the landscape (e.g. fragmentation of habitats, changes in ecosystem connectivity);	BFIS uses The Forest Landscape Integrity Index (II) as a metric to measure forest integrity and Ecoregion Intactness to capture habitat loss, quality and fragmentation to give a measure of ecosystem health, or intactness, (Beyer et al. 2020).
	38 (d)	changes in ecosystem structural connectivity (e.g. habitat permeability based on physical features and arrangements of habitat patches); and	
	38 (e)	the functional connectivity (e.g. how well genes or individuals move through land, freshwater and seascape).	*Out of scope of BFIS.*
	39	If the undertaking concluded that it directly contributes to the accidental or voluntary introduction of ***invasive alien species***, the undertaking may disclose the ***metrics*** it uses to manage pathways of introduction and spread of invasive alien species and the ***risks*** posed by invasive alien species.	*Invasive species are out of scope for BFIS, as there are currently no reliable methods for quantifying the impact of invasive species from site activities.*
	40	Reporting of metrics related to single species (population size, number of individuals, species at extinction risk).	BFIS will recommend reporting on species of specific concern for high and priority b-risk sites only.
	41	If the undertaking identified material ***impacts*** related to ***ecosystems***, it may disclose:	
	41 (a)	with regard to ***ecosystems extent***, ***metrics*** that measure area coverage of a particular ***ecosystem*** without necessarily considering the quality of the area being assessed, such as ***habitat*** cover. For example, forest cover is a measure of the extent of a particular ecosystem type, without factoring in the condition of the ecosystem (e.g., provides the area without describing the species diversity within the forest).	BFIS provides land use impacts using an extent by condition metric. It provides guidance on ecosystem monitoring indicator, including an extent and condition indicator.
	41 (b)	regard to ***ecosystems*** condition:	
	41 (b) i	***metrics*** that measure the quality of ***ecosystems*** relative to a pre-determined reference state;	

Disclosure requirement	Paragraph	In scope CSRD Disclosure requirement text	BFIS alignment
	41 (b) ii	***metrics*** that measure multiple species within an ***ecosystem*** rather than the number of individuals within a single species within an ecosystem (for example: scientifically established species richness and abundance indicators that measure the development of (native) species composition within an ecosystem against the reference state at the beginning of the first reporting period as well as the targeted state outlined in the **Kunming-Montreal Global Biodiversity Framework**, or an aggregation of species' conservation status if relevant); or	The species significance is assessed using the threat abatement component of the Species Threat Abatement and Restoration (STAR) metric and is calculated as the sum of STAR values within the Area of Influence. It represents the total value for opportunities to abate threats and therefore reducing the global species extinction risk in the defined area. Additionally, for each site, the IUCN Red List of Threatened Species dataset of species ranges is utilised to assess Red List species with ranges overlapping the site's area of influence.
	41 (b) iii	***metrics*** that reflect structural components of condition such as ***habitat*** connectivity (i.e., how linked habitats are to each other).	BFIS includes Terrestrial Connectivity as a metric for each site.
E4-6 Anticipated financial effects from material biodiversity and ecosystem-related risks and opportunities	42 - 45	The undertaking shall disclose its ***anticipated financial*** effects of material ***biodiversity***- and ***ecosystem***-related ***risks*** and ***opportunities***.	*Out of scope for BFIS.*

Appendix 3: Bespoke approach to assess extent and condition components of infrastructure footprint and direct impact buffer for each operation type

Appendix 3.1: Onshore oil and gas extraction

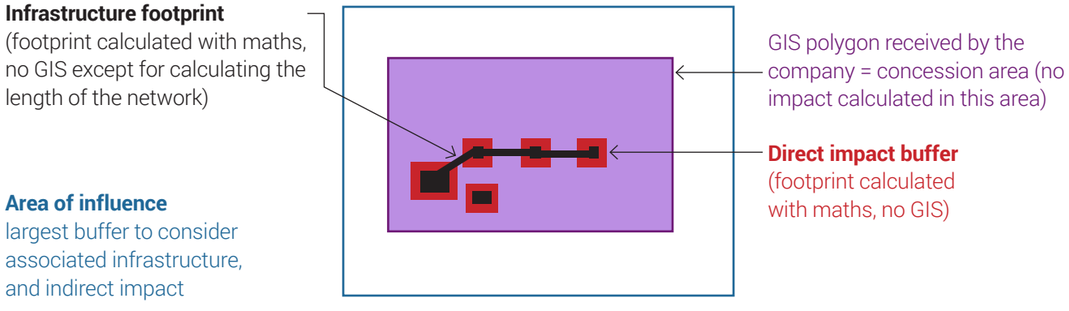
Information required for each site from the company:

- GIS polygon of the concession area
- Number of well pads
- Presence of an airstrip (Y/N)
- Presence of a heliport (Y/N)
- Heliport surface area (ha)
- Industrial area footprint (ha)
- Base camp footprint (ha)
- Number of construction workers

Table 14: Approach for estimating the footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient	Rationale and key references
Infrastructure footprint	Industrial area including • CFP • Well pads • Pipelines • Airstrip • Base camp	**Standardised approach to calculate the footprint:** • Footprint of industrial area = average size of industrial area = 310ha • Footprint of well pads = Number of well pads * 2ha • Footprint of production/injection network = length of network (for gas operation type, use the length of the concession area; for oil operation type, use the length + the width of the concession area) * average width of 30m in non-OECD countries and 10m in OECD countries • Footprint of airstrip = average value based on size of airstrip from TotalEnergies sites = 48ha (only applicable for sites in non-OECD countries) • Footprint of base camp = 5ha **Formula:** 310ha + Number well pads * 2ha + length (+width) of concession *10m for OECD and 30m for non-OECD countries + 48ha + 5ha	100%	Width of pipeline and right of way was estimated from previous experience. All other areas are based off measured impacts (extent) from pilot site. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Direct impact buffer	Degradation from noise and light pollution	500m buffer for noise and light pollution around the industrial area, the well pads, the airstrip and the base camp	35%	Biodiversity loss coefficient derived from literature review of impacts on species abundance from noise and light pollution, combined with interpretation by the TBC team on an appropriate value within the range found

Spatial representation of the approach:



Limitations:

- BFIS currently only covers land use impacts. However, given the operation type, it is anticipated that pollution would also be a significant pressure on biodiversity.

Appendix 3.2: Offshore oil and gas extraction site

Information required for each site from the company:

- GIS polygon of the concession area
- GIS layer of the pipeline(s) to the coast
- Presence of FPSO (Y/N)
- Number of FPSO
- Presence of floating platforms (Y/N)
- Number of floating platforms
- Presence of fixed platforms (Y/N)
- Number of fixed platforms
- Number of well heads
- Footprint onshore component (ha)

Spatial representation of the approach:

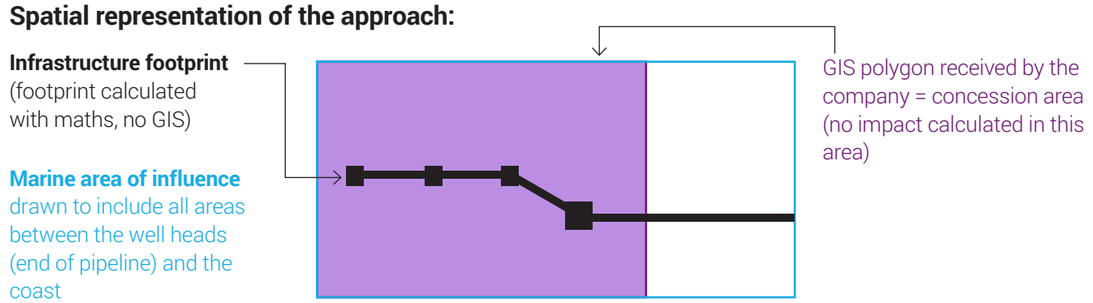


Table 15: Approach for estimating the footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient	Rationale and key references
Onshore Infrastructure footprint	All onshore infrastructure	All onshore components of the offshore oil extraction will be considered as a separate type and will not be calculated here	N/A	
Nearshore infrastructure footprint	Pipelines	**Standardised approach to calculate the footprint:** • For FPSO operation type, 1 pipeline to the coast; for non-FPSO operation type, Number of pipeline = Number of platform • Offshore FPSO = nearshore pipeline width (130m) * length to be calculated with the distance from the coast to up to 15m depth • Offshore platforms = nearshore pipeline width (130m) * length to be calculated with the distance from the coast to up to 15m depth * number of floating and fixed platforms **Formula:** straight distance from the coast to up to 15m depth * 130m (*Number of platform for non FPSO-operation type)	100%	Width of pipeline and dredge zone was estimated from previous experience. 15m depth was considered threshold between nearshore and offshore zones. All other areas are based off measured impacts (extent) from pilot site. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Offshore infrastructure footprint	The oil rig/FPSO, pipelines and well heads	**Require the number of FPSO/platform, the number of well heads, and the straight distance to the coast where relevant** **Standardised approach to calculate the footprint:** • Footprint of oil rig/FPSO (estimated based on FPSO averaged footprint) = 10 anchor points per FPSO * 5m2 = 50m2 • Footprint of the well heads = Number of well head * 30m2 • Network to platform/FPSO = Number of well head * 15km * 10m • Pipeline = 10m * length to be calculated with the distance to the coast up to 15m depth • For FPSO operation type, 1 pipeline to the coast; for non-FPSO, Number of pipeline = Number of platform **Formula:** Number FPSO/platform * 50m2 + Number well heads * 30m2 + straight distance from the concession to the coast up to 15m depth * 10m (*Number platform for non FPSO-operation type)	100%	Width of pipeline and dredge zone was estimated from previous experience. 15m depth was considered threshold between nearshore and offshore zones. All other areas are based off measured impacts (extent) from pilot site. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Offshore direct impact buffer	Noise and light	**Standardised approach to calculate the footprint:** • 500m buffer around each FPSO/platform • Impact from well head drilling and dump site – standard value based on work conducted on TotalEnergies sites - 13 impact-adjusted_L.ha (circle of dump area, with decreasing impact outwards: 0-50m = 100% loss, 50-150m = 50%, 150-250 = 25%, 250-500 = 10%) **Formula:** 500m buffer * Number of FPSO + 13 impact-adjusted_L.ha * Number of well heads	35% for FPSO and standardised approach for well head drilling	Biodiversity loss coefficient for noise and light derived from literature review of impacts on species abundance from noise and light pollution, combined with interpretation by the TBC team on an appropriate value within the range found Biodiversity loss coefficient for well head drilling and area of impact was based on expert judgement from discussions between TotalEnergies and TBC experts. Impact was assumed to spread out in concentric circles of decreasing severity, with the greatest extent of disturbance occurring closest to drilling activities.

Limitations: \

Appendix 3.3: Gas and oil pipeline

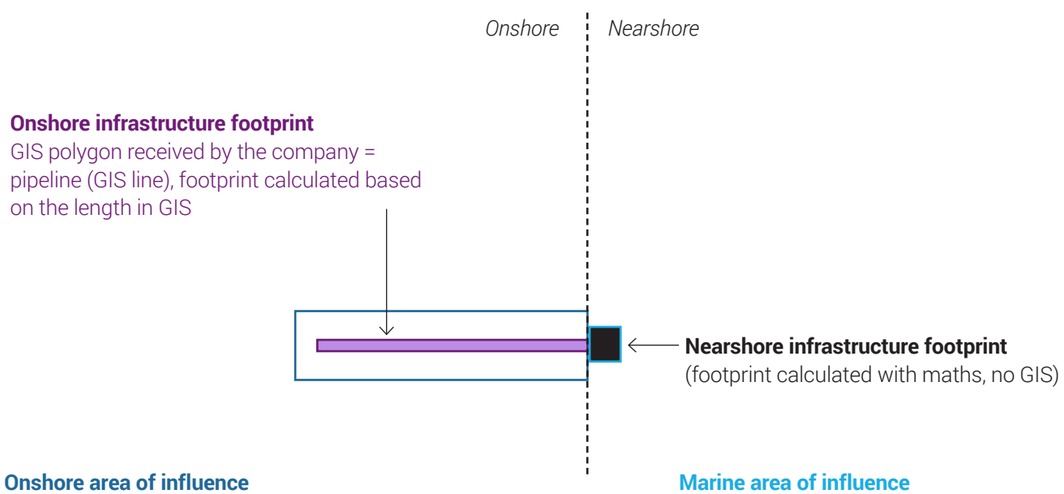
Information required for each site from the company:

- GIS line of the pipeline
- Marine Storage Terminal footprint (ha)

Table 16: Approach for estimating the footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient	Rationale and key references
Infrastructure footprint	Permanent RoW Camps Marine Storage Terminal (MST)	**Standardised approach to calculate the footprint:** • RoW footprint = Length of pipeline will be multiplied by average width of 30m in non-OECD countries and 10m in OECD countries. • Camp/pipe yard footprint = 20ha per 100km of pipeline (standard value based on the pilot site; 50% of that for site in OECD countries) • MST footprint = 50ha (standard value based on the pilot site) **Formula:** pipeline length * 30m (10m in OECD countries) + 20ha * pipeline length / 100km + 50ha	100%	Width of pipeline and right of way was estimated from previous experience. All other areas are based off measured impacts (extent) from pilot site. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value

Spatial representation of the approach:



Limitations:

- BFIS currently only covers land use impacts. However, given the operation type, it is anticipated that pollution would also be a significant pressure on biodiversity.

Appendix 3.4: Oil tank farm / Fuel farm

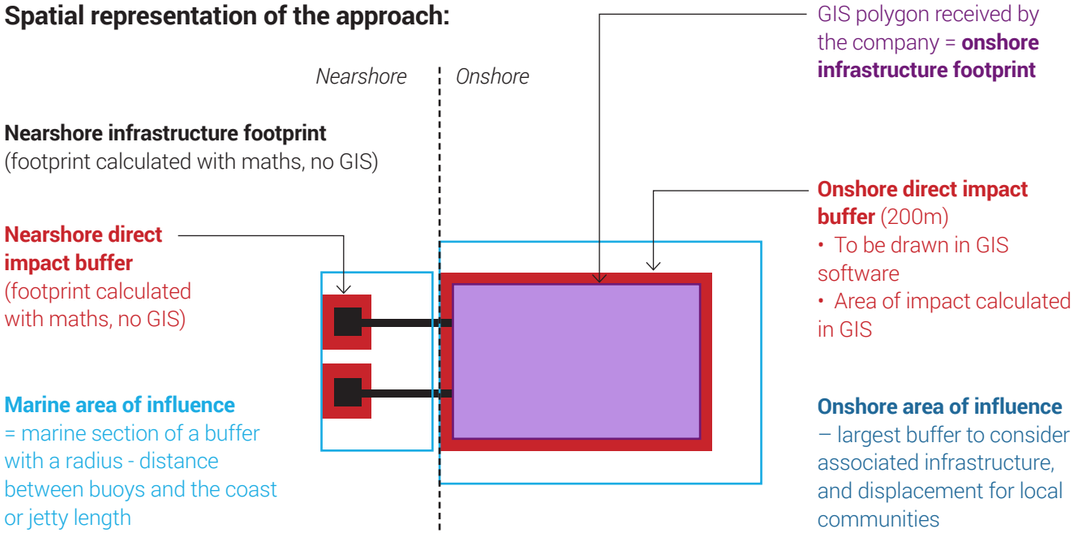
Information required for each site from the company:

- GIS polygon on onshore component and its area
- Confirm if the site has a jetty or buoys
- Number of buoys or jetties
- Straight distance between buoys and onshore (m)

Table 17: Approach for estimating the footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient	Rationale and key references
Onshore Infrastructure footprint	Footprint of the site infrastructure – sites are always fenced	Footprint = polygon drawn by TotalEnergies	100%	Considered that everything within the polygon is tank farm infrastructure. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Onshore direct impact buffer	Noise and light pollution	200m buffer	35%	Biodiversity loss coefficient for noise and light derived from literature review of impacts on species abundance from noise and light pollution, combined with interpretation by the TBC team on an appropriate value within the range found
[17]**Nearshore** infrastructure footprint	Pipelines to buoys (and dredging)	**Require the straight distance between buoys and onshore** **Standardised approach to calculate the footprint:** • Jetty footprint (standard value = half of the jetty of an LNG extraction) = 1ha • Pipeline = standard value based on pilot site = 20 ha **Formula:** 20 ha + 1 ha	100%	All areas are based off measured impacts (extent) from pilot site. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Nearshore direct impact buffer	Disturbance from vessels going to and from the buoys	500m buffer	15%	Biodiversity loss coefficient and extent of impact were based on expert judgement from discussions between TotalEnergies and TBC experts

Spatial representation of the approach:



Limitations:

- BFIS currently only covers land use impacts. However, given the operation type, it is anticipated that pollution would also be a significant pressure on biodiversity.

[17]For tank farms / fuel farms (defined as fuel storage facilities associated with ports or airports, or storage depots used as a distribution hub for fuel for filling stations), no nearshore infrastructure or impact buffers are assumed, as these facilities are often inland.

Appendix 3.5: Petroleum Refinery

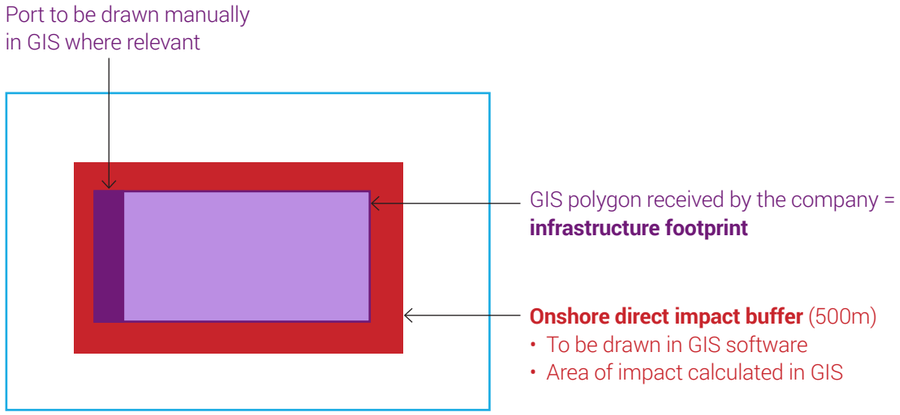
Information required for each site from the company:

- GIS polygon of the fence line
- Confirm/exclude the presence of a port (optional) – if yes, provide a drawn polygon of the port location
- Number of construction workers

Table 18: Approach for estimating the footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient	Rationale and key references
Infrastructure footprint	Refinery and storage area infrastructure - site defined by a fence line Port infrastructure	Refinery footprint = GIS polygon Port footprint = polygon drawn by the company (where applicable)	100%	All areas are based off measured impacts (extent) from pilot site. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Direct impact buffer	Avoidance/ degradation due to noise and light from site operations	500m buffer	35%	Biodiversity loss coefficient for noise and light derived from literature review of impacts on species abundance from noise and light pollution, combined with interpretation by the TBC team on an appropriate value within the range found

Spatial representation of the approach:



Area of influence
– largest buffer to consider associated infrastructure, and displacement for local communities and indirect impact

Limitations:
- BFIS currently only covers land use impacts. However, given the operation type, it is anticipated that pollution, water use and climate change would also be significant pressures on biodiversity.

Appendix 3.6: Onshore wind farm

Information required for each site from the company:

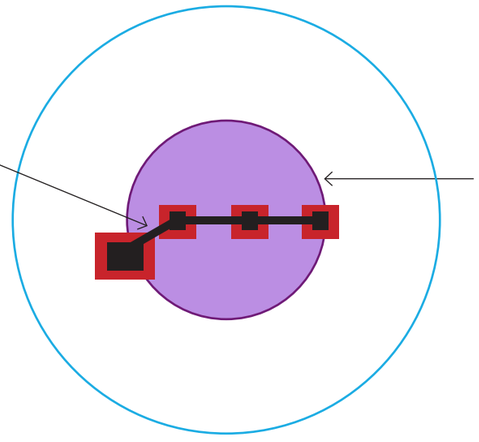
- Middle point of the GIS circle
- Total capacity (MW)
- Model of turbine (MW) *(optional)*
- Number of turbines *(optional)*

Table 19: Approach for estimating the footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient	Rationale and key references
Infrastructure footprint	Turbines, 50m-buffer around turbines under the company control, internal network between turbines (e.g. powerline or cable), infrastructure (e.g. power station)	**Require the straight distance between buoys and onshore** **Standardised approach to calculate the footprint:** • Add an additional turbine - used as a proxy to consider infrastructure footprint • Turbine footprint = π * r2 = 7854m2 (r = 50m) • Internal network = 10m* 500m between each turbine **Formula:** (n+1) * 7854m2+ n * 10m * 500m	100%	Radius of turbines based on discussions with TotalEnergies experts for sites, reflecting most common size of turbines within portfolio. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Direct impact buffer	Avoidance due to noise and light	200m buffer around turbines and power station (defined based on reference about bird avoidance of windfarm)	35%	Biodiversity loss coefficient for noise and light derived from literature review of impacts on species abundance from noise and light pollution, combined with interpretation by the TBC team on an appropriate value within the range found

Spatial representation of the approach:

Infrastructure footprint
(footprint calculated with maths, no GIS)



Direct impact buffer
(footprint calculated with maths, no GIS)

GIS polygon received by the company = area based on power provided by the project (no impact calculated in this area)

Area of influence
– largest buffer to consider associated infrastructure and displacement for local communities

Limitations: \

Appendix 3.7: Offshore wind farm

Information required for each site from the company:

- Middle point of the GIS circle
- Total capacity (MW)
- Model of turbine (MW) *(optional)*
- Number of turbines *(optional)*

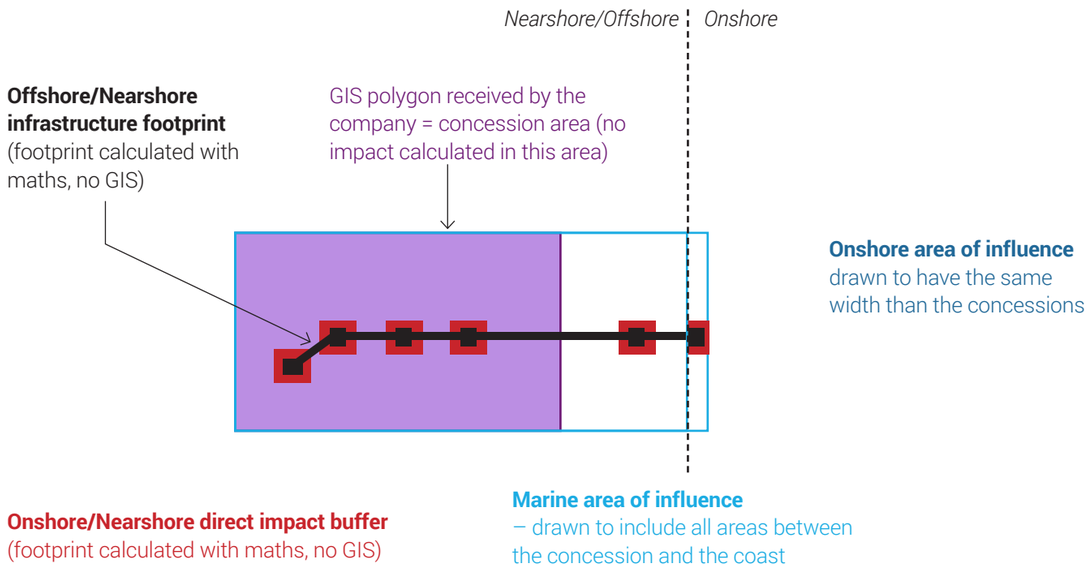
Table 20: Approach for estimating the offshore footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient	Rationale and key references
Offshore Infrastructure footprint	Turbines, an average of 5 anchor points per turbine, substation in the sea, power cable, onshore station	**Require the number of turbines (n) and straight distance to the coast** **Standardised approach to calculate the footprint:** • Add an additional turbine - used as a proxy to consider substation in the sea • Anchor sites have an average footprint of 5m2, and anchor can be dredged up to 200m • Turbine footprint = 5 * 5m2 * 200 = 5000m2 • Cable = 10m width * straight distance to the coast + 10m* 500m between each turbine **Formula:** (n+1) * 5000m2 + n * 10m * 500m + 10m * distance to onshore	100%	Radius of turbines based on discussions with TotalEnergies experts for sites, reflecting most common size of turbines within portfolio. Size of dredging areas is a worst-case scenario, used as a precautionary approach. Width of pipeline and dredge zone was estimated from previous experience. 15m depth was considered threshold between nearshore and offshore zones. All other areas are based off measured impacts (extent) from pilot site. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Offshore Direct impact buffer	Avoidance due to noise and light of turbines	Offshore: 200m buffer (to be consistent with onshore windfarm)	35%	Biodiversity loss coefficient for noise and light derived from literature review of impacts on species abundance from noise and light pollution, combined with interpretation by the TBC team on an appropriate value within the range found
Onshore Infrastructure footprint	Onshore station	Onshore = 7854m2 (i.e. power station footprint as assessed for onshore windfarm) Assumed to be located in coastal area the closest to the offshore component	100%	All areas are based off measured impacts (extent) from pilot site. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Onshore Direct impact buffer	Avoidance due to noise and light of the power station	Onshore: 20m-buffer	35%	Biodiversity loss coefficient for noise and light derived from literature review of impacts on species abundance from noise and light pollution, combined with interpretation by the TBC team on an appropriate value within the range found.

Table 21: Approach for estimating the nearshore footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient	Rationale and key references
Nearshore Infrastructure footprint	Turbines, a concrete area of 10m radius per turbine, substation in the sea, power cable, onshore station	**Require the number of turbines (n) and straight distance between site and onshore** **Standardised approach to calculate the footprint:** • Add an additional turbine - used as a proxy to consider substation in the sea • Turbine footprint = π * r2 = 314m2 (r = 10m) • Cable = 10m width * straight distance between site and onshore + 10m* 500m between each turbine **Formula:** (n+1) * 314m2 + n * 10m * 500m + 10m * distance to onshore	100%	Radius of turbines based on discussions with TotalEnergies experts for sites, reflecting most common size of turbines within portfolio. Size of dredging areas is a worst-case scenario, used as a precautionary approach. Width of pipeline and dredge zone was estimated from previous experience. 15m depth was considered threshold between nearshore and offshore zones. All other areas are based off measured impacts (extent) from pilot site. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Nearshore Direct impact buffer	Avoidance due to noise and light of turbines	Offshore: 200m buffer (to be consistent with onshore windfarm)	35%	Biodiversity loss coefficient for noise and light derived from literature review of impacts on species abundance from noise and light pollution, combined with interpretation by the TBC team on an appropriate value within the range found
Onshore Infrastructure footprint	Onshore station	Onshore = 7854m2 (i.e. power station footprint as assessed for onshore windfarm) Assumed to be located in coastal area the closest to the offshore component	100%	All areas are based off measured impacts (extent) from pilot site. Biodiversity loss coefficient assumes close to 100% of biodiversity will be lost in areas where infrastructure is directly built. This is a precautionary value
Onshore Direct impact buffer	Avoidance due to noise and light of the power station	Onshore: 20m-buffer	35%	Biodiversity loss coefficient for noise and light derived from literature review of impacts on species abundance from noise and light pollution, combined with interpretation by the TBC team on an appropriate value within the range found

Spatial representation of the approach:



Limitations: \

Appendix 3.8: Onshore solar farm

Information required for each site from the company:

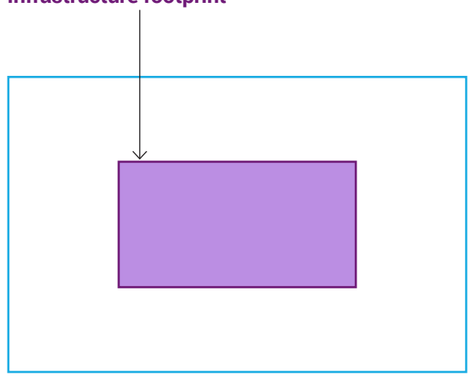
- GIS polygon of the fence line

Table 22: Approach for estimating the footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient	Rationale and key references
Infrastructure footprint	Solar panels, infrastructure (e.g. power station) Note that sites are always fenced	Footprint = GIS polygon	Different biodiversity loss coefficients will be applied depending on the initial Natural Habitat* in the area - Forested habitat (85%) - Shrubland (70%) - Grassland (20%) - No vegetation (5%) - Agriculture (25% gain)	It is assumed that where non-Natural Habitats are present prior to project development, a marginal increase in biodiversity condition will occur. This is assumed due to the reduction in disturbance from the replacement of agriculture with solar. The gain value is based off a literature review.
Direct impact buffer	No anticipated direct impact for this type of operation	N/A	N/A	

Spatial representation of the approach:

GIS polygon received by the company =
Infrastructure footprint



Area of influence
– largest buffer to consider associated infrastructure and displacement for local communities

Limitations: \

Appendix 3.9: Biogas plant

Information required for each site from the company:

- GIS polygon of the fence line
- Is the digestate site part of the concession area? (Yes/No) If no, provide the GIS polygon of the digestate site

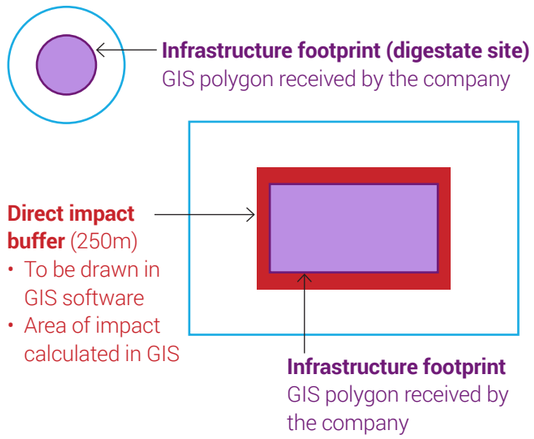
Table 23: Approach for estimating the footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient
Infrastructure footprint	Biogas plant and/or digestate site - site defined by a fence line	Scenario 1: GIS polygon of the concession area = Biogas plant footprint + digestate site footprint Scenario 2: GIS polygon of the concession area = Biogas plant GIS polygon of the digestate site = digestate site footprint	100%
Operational area	N/A	N/A	N/A
Direct impact buffer	Avoidance/degradation due to noise and light from site operations	250m buffer	35%

Limitations: \

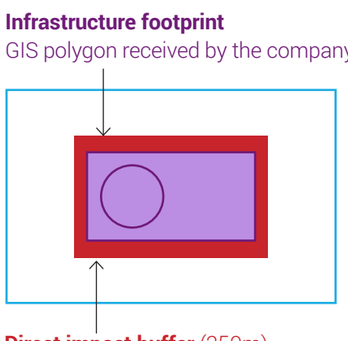
Spatial representation of the approach:

Scenario 1: If the digestate site is out of the concession area



Area of influence
– largest buffer to consider associated infrastructure and displacement for local communities

Scenario 2: If the digestate site is within the concession area



Area of influence
– largest buffer to consider associated infrastructure and displacement for local communities

Appendix 3.10: Combined Cycle Gas Turbine (CCGT) power plant

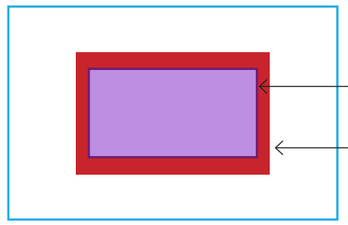
Information required for each site from the company:

- GIS polygon of the fence line

Table 24: Approach for estimating the footprint

Footprint component	Description	Calculation method	Biodiversity loss coefficient
Infrastructure footprint	CCGT infrastructure - site defined by a fence line	CCGT power plant footprint = GIS polygon	100%
Operational area	N/A	N/A	N/A
Direct impact buffer	Avoidance/degradation due to noise and light from site operations	350m buffer	35%

Spatial representation of the approach:



Infrastructure footprint
GIS polygon received by the company

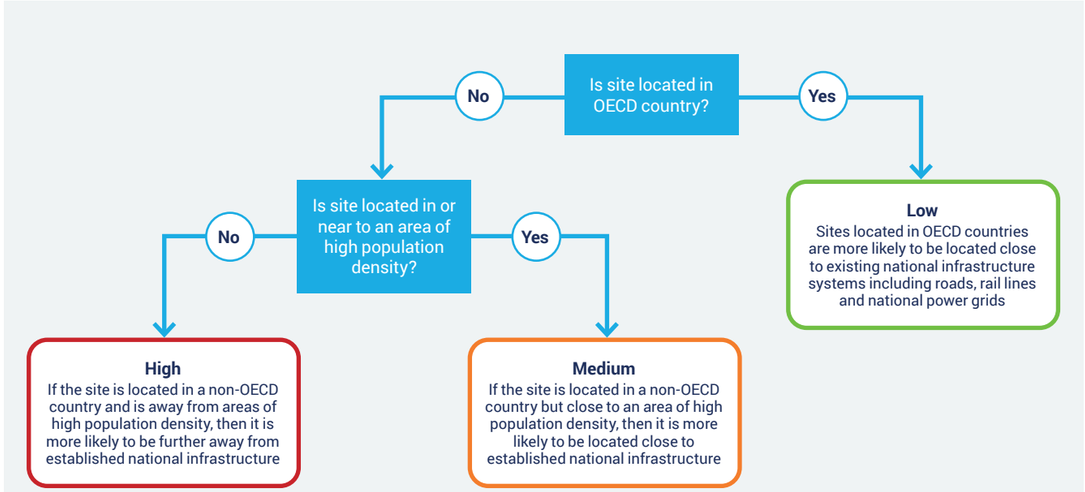
Direct impact buffer (350m)
- To be drawn in GIS software
- Area of impact calculated in GIS

Area of influence
– largest buffer to consider associated infrastructure and displacement for local communities

Limitations: \

Appendix 4: Associated infrastructure

Length estimates are provided for the operation types where it is assumed that associated infrastructure is likely to exist. For each operation type, a high/medium/low value is assigned, indicating the length of associated infrastructure for that site.



Appendix 4.1: Road

Length estimates are provided in km.

100% of biodiversity is assumed to be lost under the associated infrastructure. In addition to that, a direct impact buffer of 10 m width is applied within which 35% of biodiversity is assumed to be lost.

Table 25: Length estimates for road (in km)

Operation type	High	Medium	Low	Rationale
Offshore oil and gas extraction	20 km	10 km	1 km	Based on evidence from TBC projects. Based on the assumption that the extent of additional road can be quite high if not located near existing infrastructure or areas of high population density.
Onshore oil and gas extraction	20 km	10 km	1 km	Based on evidence from TBC projects. Based on the assumption that the extent of additional road can be quite high if not located near existing infrastructure or areas of high population density.
Gas and oil pipeline	20 km	5 km	0.5 km	Based on the assumption that for pipeline operation type, several access roads are required for each pipeline construction camp. The number of camps is used as an indicator of the number of roads required.

Table 25 continued: Length estimates for road (in km)

Operation type	High	Medium	Low	Rationale
Oil tank farm	5 km	1 km	0.1 km	Based on consultation with TotalEnergies expert on storage sites. Based on the assumption that tank farms tend to be located close to existing infrastructure as there is a lot of traffic coming to and from sites, and because their location is not resource-dependent.
Petroleum Refinery	5 km	1 km	0.1 km	Based on evidence from TBC projects. Based on the assumption that refineries tend to be located close to existing infrastructure as there is a lot of traffic coming to and from sites, and because their location is not resource-dependent.
Onshore wind farm	20 km	10 km	0.5 km	Based on evidence from TBC projects. Based on the assumption that wind farms are often located further away from areas of high population density and therefore further from existing road infrastructure.
Offshore wind farm	20 km	10 km	0.5 km	Based on evidence from TBC projects. Based on the assumption that wind farms are often located further away from areas of high population density and therefore further from existing road infrastructure.
Onshore solar farm	20 km	5 km	0.5 km	Based on evidence from TBC projects and expert estimates.
Tank farm / fuel farm	N/A	N/A	N/A	This operation type is typically located either as part of a transport infrastructure site (e.g. airport, port), or close to existing road networks for fuel distribution depots.
CCGT	5 km	1 km	0.1 km	Based on evidence from TBC projects and expert estimates.
Biogas	5 km	1 km	0.1 km	Based on evidence from TBC projects and expert estimates.

Appendix 4.2: Rail

Values are applicable only in cases where railways lines are confirmed as present at a site by the company. 100% of biodiversity is assumed to be lost within the immediate footprint of the associated infrastructure. In addition to that, a direct impact buffer of 10 m width is applied within which 35% of biodiversity is assumed to be lost.

Table 26: Length estimates for rail (in km)

Operation type	High	Medium	Low	Rationale
Oil tank farm	100 km	50 km	0.5 km	Based on consultation with TotalEnergies expert on storage sites.
Petroleum Refinery	100 km	50 km	0.5 km	Based on similar locations for tank farms and refineries, and therefore similar values.

Appendix 4.3: Powerline

The company should confirm if operations have their own power sources on site on a case-by-case basis. 100% of biodiversity is assumed to be lost under the associated infrastructure (Powerline leads to a 100% loss only in forested habitat but we apply this in any habitat as a precautionary approach because information on the location and therefore habitat type under the footprint of the powerline is currently not available). No direct impact buffer is considered.

Table 27: Length estimates for powerlines (in km)

Operation type	High	Medium	Low	Rationale
Offshore Oil and Gas Extraction	20 km	10 km	1 km	Based on the assumption that extent of additional power lines can be quite high if not located near existing infrastructure or areas of high population density. NB may have own power plant onsite.
Onshore oil extraction	20 km	10 km	1 km	Based on the assumption that extent of additional power lines can be quite high if not located near existing infrastructure or areas of high population density. NB may have own power plant onsite.
Oil tank farm	5 km	1 km	0.1 km	Based on consultation with TotalEnergies expert on storage sites. Based on the assumption that tank farms tend to be located close to existing infrastructure as their location is not resource-dependent.
Petroleum Refinery	5 km	1 km	0.1 km	Based on the assumption that tank farms tend to be located close to existing infrastructure as their location is not resource-dependent. NB may have own power plant onsite.
Onshore wind farm	20 km	10 km	0.5 km	Based on lengths of power line from TBC projects. Based on the assumption that wind farms are often located further away from areas of high population density and therefore further from existing infrastructure. They are dependent on locations of high wind which may not be suitable for other types of infrastructure.
Offshore wind farm	20 km	10 km	0.5 km	Based on the assumption that connections from the coast (i.e., where export cables make landfall) are roughly twice as far from main grid as onshore wind farms.
Onshore solar farm	20 km	10 km	0.5 km	Based on the assumption that solar farms are not as dependent on location as onshore wind (i.e., sun is ubiquitous) and therefore can be sited closer to the main grid/ infrastructure.
Tank farm / fuel farm	N/A	N/A	N/A	These sites are typically closely associated with existing infrastructure, or in urban areas.
CCGT	5 km	1 km	0.1 km	Based on evidence from TBC projects and expert estimates.
Biogas	N/A	0.5 km	0.1 km	Based on evidence from TBC projects and expert estimates.

Appendix 4.4: Pipeline

100% of biodiversity is assumed to be lost under the associated infrastructure. No direct impact buffer is considered.

Table 28: Length estimates for pipelines (in km)

Operation type	High	Medium	Low	Rationale
Onshore Oil and Gas Extraction	N/A	N/A	N/A	Value will be included within overall footprint.
Offshore oil extraction	Straight line to the coast/ estuary	Straight line to the closer coast/ estuary	Straight line to the coast/ estuary	Based on the assumption that export will be done by boats with a pipeline to the closest coast/estuary.
	N/A	N/A	N/A	Based on the assumption that export is done with barge – there will be pipelines to link the extraction sites but will be considered within the direct footprint
Oil tank farm – reception	N/A	0.1 km	0.1 km	Based on the assumption that tank farm will only be connected in OECD countries (potentially in non-OECD countries if close to existing infrastructure) – N/A for others
Oil tank farm – emission	N/A	N/A	0.1 km	Based on the assumption that tank farm will only be connected in OECD countries – N/A for others
Petroleum Refinery – import	N/A	0.1 km	0.1 km	Based on the assumption that refinery would not be located in areas far away from national infrastructure
Petroleum Refinery – export	N/A	N/A	0.1 km	Based on the assumption that in non-OECD countries, pipelines are not used for export (only truck).
Tank farm / fuel farm	N/A	N/A	N/A	Transfers to and from these sites are typically done by road tankers, or ships for tank farms associated with port facilities.
CCGT	N/A	0.1 km	0.1 km	Based on evidence from TBC projects and expert estimates

Appendix 5: Species Threat Abatement and Restoration (STAR) metric

Species Threat Abatement and Restoration Metric

The Species Threat Abatement and Restoration (STAR) metric is a spatially explicit, quantified and additive measure of species richness, species endemism, and species threat status. It is based on the IUCN Red List of Threatened Species[18] and is currently developed including 3 taxa: mammals, amphibians and birds. The STAR metric indicates the contribution that interventions in a specific area can make to reducing species extinction risk by abating specific threats and/or through habitat restoration.

STAR can be used to set targets and assess opportunities for biodiversity-positive interventions.

As a metric of biodiversity importance, it can also be used to inform assessments of potential risk from developments. Actions can then be taken by businesses to pursue opportunities for biodiversity conservation or avoid risks. Outcomes from interventions to reduce existing threats or restore habitat can be measured as STAR gains.

The global dataset of STAR scores is currently mapped at 5*5 km resolution, with layers showing values for threat abatement ($STAR_T$) and for restoration ($STAR_R$) (Figure 7).

$STAR_T$

$STAR_T$ scores represent the threat abatement effort required for a species to be downgraded, in terms of extinction risk, to the Least Concern (LC) IUCN category. Higher $STAR_T$ scores indicates that an area contains one or a combination of: relatively high numbers of threatened species, a large proportion of individual species' range, and/or species that are severely threatened. These locations provide a good opportunity for actions to abate threats where positive interventions could make a large contribution to reducing global species extinction risk and impact on biodiversity should be carefully mitigated.

STAR threat abatement ($STAR_T$) scores for a given location are based on the number of threatened species and the proportion of their area of habitat[19] that occurs within the location boundaries (Figure 7). For a given cell, the following is calculated for each threatened species identified as present:

- The percentage (P) of the species' total area of habitat that is within the cell,
- Weighting factor (W) based on the species' IUCN Red List category (Near Threatened = 1; Vulnerable = 2; Endangered = 3; Critically Endangered = 4),
- The relative contribution (C) of each threat (t) to the extinction risk of the species[20],
- Ns is the total number of species at location (i)

This means that the START score (T) for a cell (i) and threat (t) is calculated among all species (s) present as:

$$T_{t,l} = \sum_{s}^{N_s} P_{s,l} W_s C_{s,t}$$

$STAR_T$ scores are disaggregated between each specific threat (t) in the IUCN threat classification scheme[21]. This allows for the identification of actions to abate specific threats to contribute to species conservation goals within a particular geographic region. This allows the user to focus on actions that will have the greatest contribution to the abatement of extinction risk for species in that area.

[18]IUCN. The IUCN Red List of Threatened Species. Version 2019-3. (2019). https://www.iucnredlist.org

[19]In STAR, proportion of area of habitat is used as a proxy for proportion of a species' population at a location. The species 'area of habitat' is a subset of the species range (shown on the IUCN Red List) where suitable habitat for the species is present. Area of habitat is mapped by combining information on species elevational limits and habitat associations with land cover maps. Area of habitat maps for species included in the STAR global layer were compiled by IUCN but are not currently available for separate use.

[20]Based on the individual intensity of that threat, and the distribution of that threat across the species' habitat range. Derived from each species' IUCN Red List assessment.

[21]https://www.iucnredlist.org/resources/threat-classification-scheme.

Figure 7: Global STAR scores for (top) $STAR_T$ threat-abatement. Quantitative STAR scores are placed into categories from Very Low to Very High.

Source: IBAT Business User Guidance (2021).

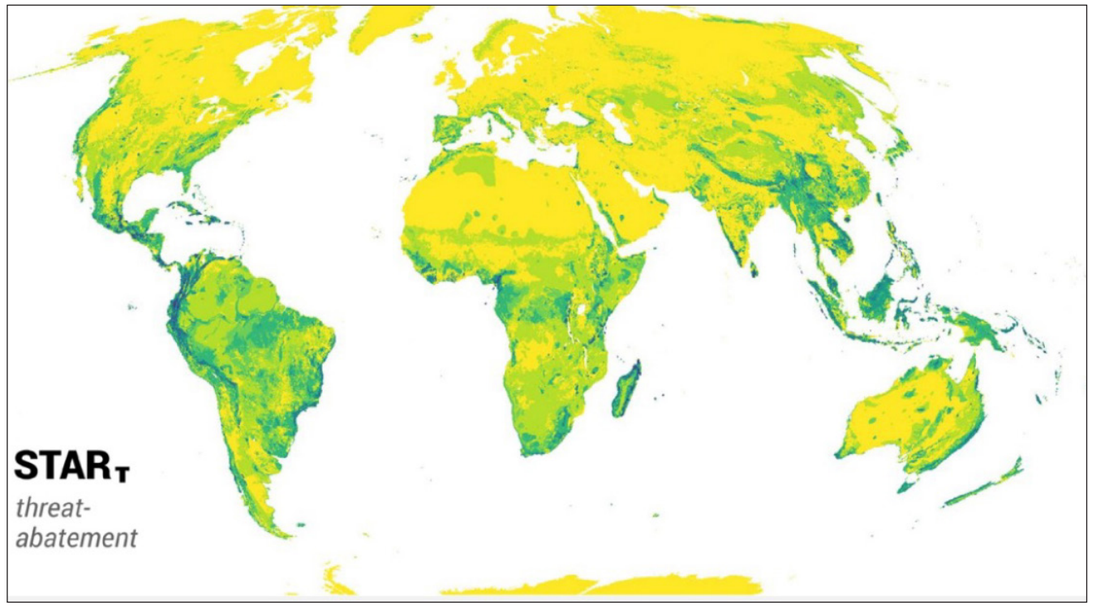
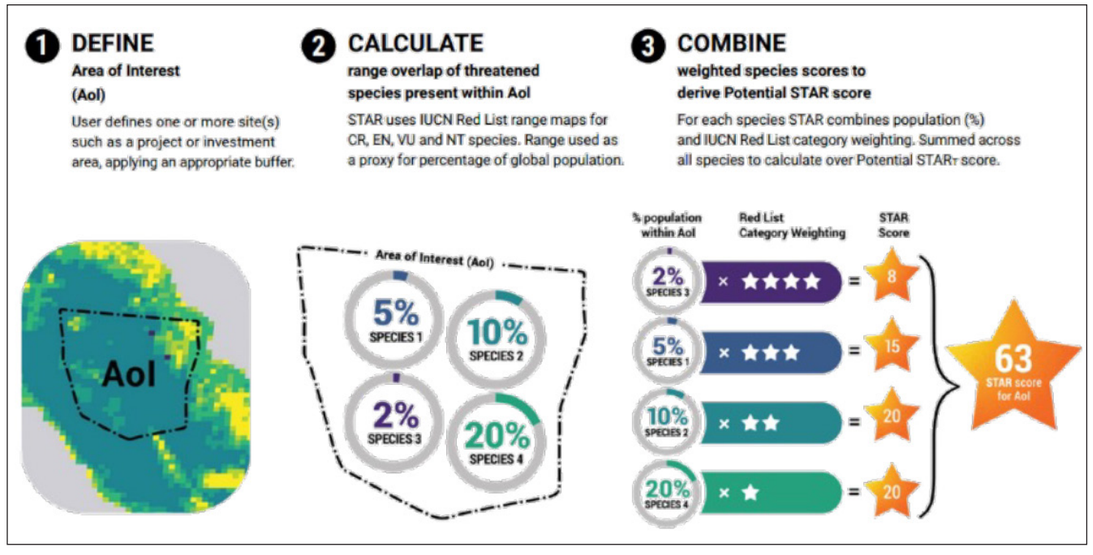


Figure 8: Process used to calculate $STAR_T$ values. Taken from the IBAT STAR Business User Guidance (2021). In the context of BFIS, the AoI is considered equivalent to the landscape area buffer (see section 2.3.1 for definition of landscape area)



The $STAR_T$ layer has been developed for the terrestrial realm by the IUCN (Mair et al., 2021), and TBC developed a marine $STAR_T$ layer. The suggested approach will only use $STAR_T$ layers to allow comparison of results between terrestrial and marine sites.

Marine STAR

Marine STAR (Figure 9) was designed to be comparable and complementary to terrestrial STAR (Figure 9), using the same data sources and methodology to enable users of the metric to account for marine areas as well as terrestrial in their reporting and target-setting. The key differences, due to the challenges of working in the marine environment, are as follows:

(1) the selection of species for inclusion

(2) refinement of species ranges based upon Area of Habitat (AoH), and

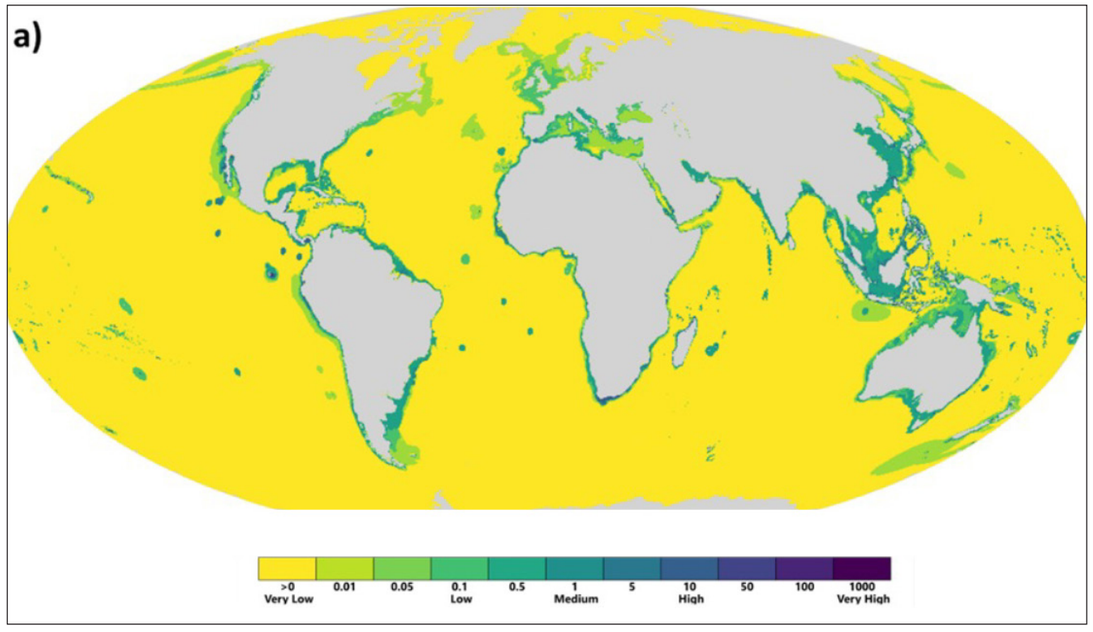
(3) calculation of $STAR_T$ scores and disaggregation by threat

Marine STAR covers species from more than 500 genera at all trophic levels. Most species included are only present in marine environments, although some occur in both marine and terrestrial realms and marine and freshwater realms. The main groups studied are:

- Sharks and rays
- Reef-building corals
- Bony fishes
- Birds
- Mammals

These species were selected as they all were designated Threatened to Near-Threatened by the IUCN Red List, had been comprehensively assessed, and had polygons covering their range. Here, focus was placed on developing a marine STAR Threat Abatement layer ($STAR_T$) – the restoration layer ($STAR_R$) will bring a new suite of challenges.

Figure 9: Global Marine STAR scores for the START threat-abatement layer. Quantitative STAR scores are placed into categories from Very Low to Very High.
Source: Turner et al. 2024.



Appendix 6: Biodiversity Risk Screening Kit

The Biodiversity Risk Screening Kit (BRiSK), a proprietary tool developed by The Biodiversity Consultancy (TBC)
.
BRiSK helps companies to screen their locations for potential risks to biodiversity caused by business activities in their operations and value chain across terrestrial, freshwater, and marine ecosystems. BRiSK incorporates a wide spread of indicators based on the most appropriate available biodiversity data layers. BRiSK has been designed to align with the reporting requirements of all major frameworks and legislative drivers (Table 29).

Table 29: Alignment of BRiSK with major reporting and disclosure frameworks

TNFD Taskforce on Nature-related Financial Disclosures	Assess your interface with nature in the **Locate** step of the **LEAP** process.
SCIENCE BASED TARGETS NETWORK GLOBAL COMMONS ALLIANCE	Identify the State of Nature in different geographic areas in **step 1b of "Assess"** with the relevant indicators for **step 2 "Prioritise"**.
EU Corporate Sustainability Reporting Directive CSRD	Identify potential impacts and opportunities (**SBM-3**) using a clear process (**IRO-1**) and appropriate metrics (**E4.5**) for ESRS **E4 – Biodiversity and Ecosystems**.
GRI Global Reporting Initiative™	Identify the (potential) biodiversity impacts (**101-4**) and the locations where they may occur (**101-5**)
IFC International Finance Corporation WORLD BANK GROUP	Identify areas that may qualify as Critical Habitat under **Performance Standard 6**

BRISK includes a series of up to 30 different datasets to support its indicators and the different requirements of different frameworks. More than one dataset may be used to support any single indicator. The indicators themselves are grouped into broad categories to aid in the identification of priority locations according to each of those categories. They include:

- **Biodiversity Importance:** Areas that are important for threatened species and ecosystems and are scientifically recognised as important for biodiversity.
- **Ecosystem Integrity (High Integrity Locations):** Areas that should be safeguarded due to their composition, structure, and function that likely support local and global ecosystem services.
- **Ecosystem Integrity (Areas of Rapid Decline):** Areas that may be at risk of ecological tipping points due to a decline in their condition.
- **Water Physical Risk:** Areas of high physical water risk may include those where the availability of water may be scarce or that are prone to flood risk.
- **Ecosystem Service Delivery Importance:** Areas that are important for delivering services to people, such as supporting livelihoods.

The full breakdown of indicators for each of these groups is displayed in Table 30.

Table 30: Full list of BRiSK indicators, their descriptions and sources

Indicator Category	Indicator	Description	Source	Terrestrial	Freshwater	Marine
Infrastructure footprint	**Threatened Species**	The number of threatened (Critically Endangered, Endangered, and Vulnerable) and restricted range species that may inhabit each location is identified. Higher numbers of these species at a location carry significant risks and any impacts to these species may result in additional stakeholder scrutiny and their possible extinction.	IUCN Red List of Threatened Species (IUCN 2024)	Yes	Yes	Yes
	Areas of Biodiversity Importance (Protected Areas, KBAs, and OECMs)	Target 3 of the GBF aims to conserve 30% of land, waters, and seas. These areas can be designated through official government legislation (e.g., Protected areas) or scientific evidence and local actions (e.g., Key Biodiversity Areas (KBAs) and Other effective area-based conservation measures (OECMs)) and are more likely to harbour higher biodiversity significance. Any impacts to these areas carry significant risks and so proximity to these areas is assessed and a risk score is provided.	World Database of Protected Areas (WDPA), World Database of Key Biodiversity Areas, World Database of Other Effective area-based Conservation Measures (OECMs)	Yes	Yes	Yes
	Species Threat Abatement and Restoration (STAR) Metric	The STAR metric (Mair *et al*. 2021) uses a combination of the threat status (Critically Endangered, Endangered, and Vulnerable) and the proportion of the area of the globe a species inhabits to highlight areas of the world where removing threats or restoring habitats can contribute most to reducing the extinction risk of species. This has relevance to Targets 2 (restore 30% of all degraded ecosystems) and 4 (halt species extinctions) of the GBF and will enable the identification of locations to contribute to these targets.	Terrestrial STAR layer Marine STAR layer	Yes	No	Yes
	Vulnerable Marine Ecosystems and Marine Habitats	We use global datasets to identify the potential overlap of operations with important marine habitats that may be classified as "Critical Habitat" as per IFC guidance (IFC 2019) through Criterion 4 "Highly threatened and/or unique ecosystems" which carry significant risks should they be impacted.	Allen Coral Atlas (includes Seagrass), Ocean+ Habitats, Global Mangrove Watch, Global Extent of Tidal Wetlands, Important Marine Mammal Areas (IMMAs), Ecologically or Biologically Significant Marine Areas (EBSAs)	No	No	Yes
	Terrestrial Connectivity	Ecosystem connectivity is assessed where areas that have greater levels of connectivity are likely to be critical to wider ecosystem function, and any impacts could have significant effects on nature.	Brennan et al., 2022 - Functional connectivity of the world's protected areas	Yes	No	No
Ecosystem Integrity (High Integrity Locations)	**Ecoregion Intactness**	This is a metric that captures habitat loss, quality and fragmentation to give a measure of ecosystem health, or intactness, and enables the identification of high integrity ecosystems (Beyer *et al*.. 2020) as requested by the likes of TNFD in its Locate step and as a State of Nature indicator for SBTN steps 1. Assess and 2. Interpret and prioritise. This enables the identification of higher risk areas (indicated by high intactness) or potential opportunities, i.e., if intactness is low but could be improved following appropriate interventions.	Beyer et al (2020) - Substantial losses in ecoregion intactness highlight urgency of globally coordinated action	Yes	No	No
	Forest Landscape Integrity	The Forest Landscape Integrity Index (FLII) (Grantham et al. 2020) is a global measure of integrity specific to forest ecosystems. This can be used to highlight areas where forests are currently intact or degraded to help to identify the most appropriate actions to maintain or improve the integrity of forests that overlap with business operations. High integrity forests should be safeguarded, and impacts should be avoided, while interventions to improve condition of degraded areas could be set up and monitored over time to prove their effectiveness.	Grantham et al (2020) - Anthropogenic modification of forests means only 40% of remaining forests have high ecosystem integrity	Yes	No	No

Table 30 continued: Full list of BRiSK indicators, their descriptions and sources

Indicator Category	Indicator	Description	Source	Terrestrial	Freshwater	Marine
Ecosystem Integrity (High Integrity Locations)	**Marine Habitat Condition**	The two previous indicators do not consider the marine environment. BRiSK uses the Ocean Health Index's (Halpern *et al.* 2012) measure of marine habitat condition to give an indication of the condition of marine areas which may be impacted by operations. This enables the incorporation of marine ecosystems into biodiversity action plans, where, as per the terrestrial indicators impacts to areas of high intactness should be avoided while efforts to increase the condition of degraded areas should be made.	The Ocean Health Index	No	No	Yes
Ecosystem Integrity (Areas of Rapid Decline)	**Land Cover Change**	Land cover change is a key driver of ecosystem loss. Tracking recent changes in land cover can help to identify areas of potential conversion. The high-resolution (10 m) ESRI Land Cover data is used to help track post-2020 changes in land cover classes which is required for SBTN target setting and for TNFD disclosures.	ESRI Sentinel-2 10 m Land Cover	Yes	No	No
	Forest Loss	Forests are highly important ecosystems for biodiversity and the provision of ecosystem services. Many companies are now setting zero deforestation targets and so identifying any areas of forest loss at locations is a useful risk screening exercise. We use the Global Forest Watch datasets which enables high resolution (30 x 30 m) analysis of locations where forest loss has recently occurred (Hansen *et al.* 2013). This information can be used to target further investigation to identify the cause of any forest loss as it may not necessarily be directly caused or associated with the activities of the company.	Global Forest Watch (Forest Loss), Harris, N. L. et al (2017) - Using spatial statistics to identify emerging hot spots of forest loss	Yes	No	No
	Cropland Expansion	Expansion of croplands (Potapov *et al.* 2022) indicates a shift towards areas with less natural land cover. Even if operations of the company may not be directly linked to cropland use (e.g., not an agricultural company), operating in a landscape that is experiencing higher levels of cropland expansion could mean that any further habitat conversion could have exacerbated impacts to nature and biodiversity.	Potapov et al (2022) - Global maps of cropland extent and change show accelerated cropland expansion in the twenty-first century	Yes	No	No
Water Physical Risk	**Water Availability (Baseline Water Stress and Water Depletion)**	This indicator is based on the current and future baseline water stress and water depletion variables in the Aqueduct dataset (Kuzma *et al.* 2023). This helps to identify areas of significant water stress in line with requirements such as TNFD and in CSRD ESRS E3. If a location is in an area of low water availability, then risks to the company will be higher if operations are dependent on water.	Aqueduct 4.0	Yes	Yes	No
	Water Pollution (Coastal Eutrophication Potential)	This indicator is based on the coastal eutrophication potential variable in the Aqueduct dataset (Kuzma *et al.* 2023). This helps to identify areas of significant water pollution in line with requirements such as TNFD and in CSRD ESRS E3. If a location is in an area of higher water pollution, then any additional inputs could lead to significant shifts in the ecosystem. Similarly, any impacts to more natural areas (of lower water pollution) should be avoided even if these areas could theoretically tolerate higher loads.	Aqueduct 4.0	Yes	Yes	No
	Marine Nutrient and Chemical Pollution	BRiSK uses the Ocean Health Index (Halpern *et al.* 2012) pollution indicators to identify areas where nutrient and/or chemical pollution is high or low. Similarly to terrestrial water pollution, if a location is in an area of higher water pollution, then any additional inputs could lead to significant shifts in the ecosystem. Similarly, any impacts to more natural areas (of lower water pollution) should be avoided even if these areas could theoretically tolerate higher loads.	Ocean Health Index	No	No	Yes

Table 30 continued: Full list of BRiSK indicators, their descriptions and sources

Indicator Category	Indicator	Description	Source	Terrestrial	Freshwater	Marine
Water Physical Risk	**Flood and Drought Risk**	This indicator provides values for Riverine Flood Risk, Coastal Flood Risk, and Drought Risk from the Aqueduct dataset (Kuzma *et al.* 2023). This helps to identify areas of significant water risk in line with requirements such as TNFD and in CSRD ESRS E3. If a location is in an area of higher flood or drought risk, then there may be greater chances of impacts to the supply chain.	Aqueduct 4.0	Yes	Yes	No
Ecosystem Service Delivery Importance	**Critical Natural Assets**	Nature's contribution to people have been mapped as "critical natural assets" (Chaplin-Kramer et al. 2023; Neugarten *et al.* 2024). This layer is used to identify areas that are particularly important for both global and local contributions to people from nature. This can be used to prioritise areas of "Ecosystem service delivery importance" as per TNFD and as a State of Nature indicator for Nature's contributions to people for SBTN steps 1. Assess and 2. Interpret and prioritise. Any impacts from operations in areas critical to the delivery of ecosystems services could cause both local and/or global level disruption in ecosystem services (e.g., pollination, flood regulation) that could have financial implications for companies if they are dependent on these ecosystem services.	Chaplin-Kramer et al (2023) - Mapping the planet's critical natural assets. Neugarten et al (2024) – Mapping the planet's critical areas for biodiversity and nature's contributions to people	Yes	Yes	Yes

Appendix 7: Data Confidence Levels

Appendix 7.1: Rationale

The BFIS approach is designed to provide a portfolio-level aggregable metric for corporate reporting and is therefore based on a number of assumptions and information from global databases. To ensure transparency of methodology, it is important to report on the confidence in the results.

The level of confidence in the results is directly related to the quality of the data. Data quality is measured in this case using several specific criteria to give a broad evaluation. Criteria were designed based on a review of several standards, metrics and tools (Table 31). For each component related to the footprint estimation, a confidence level score is calculated. A high score indicates high-quality data, which means that the company is working with robust information and results are likely to be trustworthy. In contrast, a low score helps users to identify areas where better quality data should potentially be sought.

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Appendix 7.2: Approach

Evaluation criteria

Development of criteria

The set of seven criteria were derived from a combination of expert advice and a literature review of other published data quality evaluation mechanisms. They cover several dimensions (Table 29).

Table 31: Set of seven data quality criteria developed for the BFIS approach

BFIS criterion	Description	Sources for criterion
Reliability	The extent to which the data is measured and verified, appropriate to the context of the site	• Kahn et al, 2002[1] • Align project[2] • Pre Sustainability[3]
Completeness	How representative is the data for the whole of the company portfolio	• BD Protocol[4] • GBS[5] • Align project[2] • Pre Sustainability[3]
Timeliness	How recently data were compiled	• PBAF[6] • Kahn et al, 2002[1] • Align project[2] • Pre Sustainability[3]
Geographic correlation	To what extent the data represent the same geographic area	• TBC Expertise • Align project[2] • Pre Sustainability[3]
Validity	The appropriateness of a measurement/piece of data for what it is supposed to be describing or measuring	• TBC Expertise • Align project[2]
Consistency	Degree to which numerous measurements taken successively, under identical conditions, agree in an outcome value. For BFIS, this includes estimated values used in the building of the approach could vary if repeated.	• BD Protocol[4] • GBS[5] • Align project[2]
Accuracy	Correctness of a measurement–linked to the type of data used, primary vs secondary data	• PBAF[6] • CBF[7] • BD Protocol[4] • GBS[5] • Align project[2]

Sources:

[1]Beverly K. Kahn, Diane M. Strong, and Richard Y. Wang. 2002. Information quality benchmarks: product and service performance. Commun. ACM 45, 4 (April 2002), 184–192. https://doi.org/10.1145/505248.506007.

[2]UNEP-WCMC, Capitals Coalition, Arcadis, ICF, WCMC Europe (2022) Recommendations for a standard on corporate biodiversity measurement and valuation, *Aligning accounting approaches for nature*

[3]PRé Sustainability B.V. (2020) - SimaPro and LCA: Essentials, p.234

[4]Endangered Wildlife Trust (2020). The Biological Diversity Protocol (BD Protocol) (2020). National re Biodiversity and Business Network - South Africa, 123p

[5]Global Biodiversity Score (GBS) – Report for the review committee: Quality Assurance, May 2020

[6]Partnership for Biodiversity Accounting Financials (PBAF) – The PBAF Standard v 2022

[7]Corporate Biodiversity Footprint (CBF) – Iceberg Data Lab – Methodological guide

Alignment with the "Align project"
Criteria for data quality levels show some consistency across different frameworks. Following the suggestion from the peer review committee to try and better align with the Align project "Aligning accounting approaches for nature", a comparison between their criteria and the BFIS criteria was made to demonstrate how those used by TBC are appropriate for aligning with the recommendations of Align (Table 32).

Table 32:
Set of criteria from the Align project and comparison with BFIS criteria

"Align project" criterion terminology	"Align project" principle	Relevant BFIS criteria
Rigour	Refers to the use of technically robust (from a scientific and economic perspective) information, data and methods that are up to date, accurate, complete and reduce uncertainty as far as possible	• Reliability • Completeness • Timeliness • Geographic correlation • Validity • Consistency • Accuracy
Accuracy	Measures reflect actual, ground truthed presence of/ impacts on species & ecosystems	• Accuracy
Replicability	All assumptions, estimates, data, caveats, and methods used are transparent, traceable, fully documented, and repeatable. This allows for eventual verification or audit, as required	• Consistency
Relevance	The most relevant biodiversity impacts, risks and opportunities are considered including those impacts that are material for society and the business or the financial institution and their stakeholders	• Validity
Feasibility	Be able to apply for screening at multiple sites	• /
Spatial precision	Captures species and ecosystems at site level	• Geographic correlation
Consistency	All data and methods used for an assessment are compatible with each other and within the scope of the analysis, which depend on the overall objective and expected business application	• Consistency • Reliability • Completeness
Responsiveness	Reflects effects of site-level mitigation measures	• /

Source:
UNEP-WCMC, Capitals Coalition, Arcadis, ICF, WCMC Europe (2022) Recommendations for a standard on corporate biodiversity measurement and valuation, *Aligning accounting approaches for nature*

Application of criteria and scoring thresholds

A score from **1 to 5** was applied to each component for each criterion:

- **5** being the highest value that can be assigned, it corresponds to data that fully meet the requirement of the criterion
- **1** being the lowest value that can be assigned, it corresponds to data that hardly meet the requirement of the criterion.

An exception was made for the "Geographic correlation" criterion, which was only found to be applicable for some of the components. For each component, the confidence level scores for applicable criteria were averaged. Thus, each component was given a final score out of **5**. A minimum score **threshold of 2.5** was applied to each component. This means that any component which scored less than 2.5 may require further validation. 2.5 was used as a precautionary value.

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Table 33: Data quality criteria scoring descriptions

Data quality criterion	5	4	3	2	1	Example
Reliability - the extent to which data is measured and verified, appropriate to the context of the site	Verified data based on measurements	Verified data partly based on assumptions or non-verified data	Non-verified data partly based on qualified estimates	Qualified estimates e.g. by industry expert	Non-qualified estimates	*Biodiversity loss coefficient for sedimentation from dredging of nearshore areas around jetty and MOF is 20%* Score: 2 Rationale: The value of 20% was derived from conversations between TotalEnergies and TBC experts on an appropriate loss figure for this impact. Interpolation of other BLCs also contributed to the derivation.
Completeness – how representative is the data for the whole of the company portfolio	Representative data from all sites relevant for the company considered	Representative data from >50% of the sites relevant for the company considered	Representative data from only some sites <50% relevant for the company considered	Representative data from only one site relevant for the company considered	Representativeness unknown	*Buffer applied for influx is 10 x the area required for the agricultural land of influx migrants* Score: 1 Rationale: This figure was derived from a TBC estimate – it was not based on representative data from any of the sites in the pilot
Timeliness - how recently were data compiled	Data is less than 3 years old	Data is less than 6 years old	Data is less than 10 years old	Data is less than 15 years old	Data is over 15 years old, or age is unknown	*GLOBIO BLCs used for all standard land use types* Score: 4 Rationale: Most recent iteration (GLOBIO 4) was published in 2019
Geographic correlation - does the data represent the same geographic area. This criterion is only applied to components where geography is relevant	Data from area under study	Data from area within 50km buffer	Data from same ecoregion/an area with similar production conditions	Data from same biome/an area with slightly similar production conditions	Data from unknown or distinctly different area	*Extent of Modified habitat vs Natural Habitat determined via spatial layers* Score: 5 Rationale: Spatial layers for modified vs Natural Habitat have a fine enough resolution to be applicable at the scale of the area under study
Validity - the appropriateness of a measurement/piece of data for what it is supposed to be describing or measuring	Direct measurement of variable of interest	Measure is well correlated and representative of variable of interest	Measurement is weakly correlated but representative of variable of interest	The relationship between the measurement and variable of interest is based on a subset of data/information and there is information gap about correlation	No correlation between measurement/data and variable of interest	*BLC for agricultural land of each migrant is 90% based on GLOBIO land use types* Score: 4 Rationale: anticipated land use type (i.e. agriculture) is well represented by GLOBIO land use categories, and therefore value is well correlated
Consistency - degree to which numerous measurements taken successively, under identical conditions, agree in an outcome value. For BFIS, this includes estimated values used in the building of the approach could vary if repeated.	Repeat measures are unlikely to produce different results	Repeat measures may produce some variability in result	Repeat measures produce some variability in results, but not to a large degree	Repeat measures are likely to produce different results	Repeat measures are likely to produce different results across a range of values	*500m buffer is applied for noise and light pollution around refineries* ***Score: 3*** ***The size of the buffer for refineries may vary from this figure, but it is unlikely to be to a large degree***
Accuracy - correctness of a measurement – linked to the type of data used, primary vs secondary data	Primary data: Environmental/ field data including source(s), year(s) and means of verification	Primary data: Revenue or other general primary data per sector and country or region	Secondary data: Data from databases, country specific sector average data	Secondary data: Data from databases, global sector average data	Secondary data: Data collected and published for another purpose or a different assessment (i.e., from literature, scientific studies,)	*BLC for noise and light pollution is 35%* Score: 1 Based on a literature review of impacts of noise and light on abundance, not related to types of sites operated by TotalEnergies

Appendix 7.3: Results

The criteria were applied to a total of 63 components. Each of these hypotheses was given a final score out of 5:

- 55 components have a final score equal or greater than the minimum score threshold of 2.5. As 55/63 (87.3%) of the data is considered reliable, the results are likely to be trustworthy.
- 8 components had a final score below the minimum score threshold of 2.5, components which focus on:
  - "Biodiversity Loss Coefficient" (BLC) estimated for different operation type direct impacts (i.e., Onshore wind farm, hydro and micro-hydro, tank farm and LNG extraction site)
  - Extent of impact for influx from migrants
  - Extent of associated infrastructure for sites

For each of these components, additional recommendations are available to provide context.

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