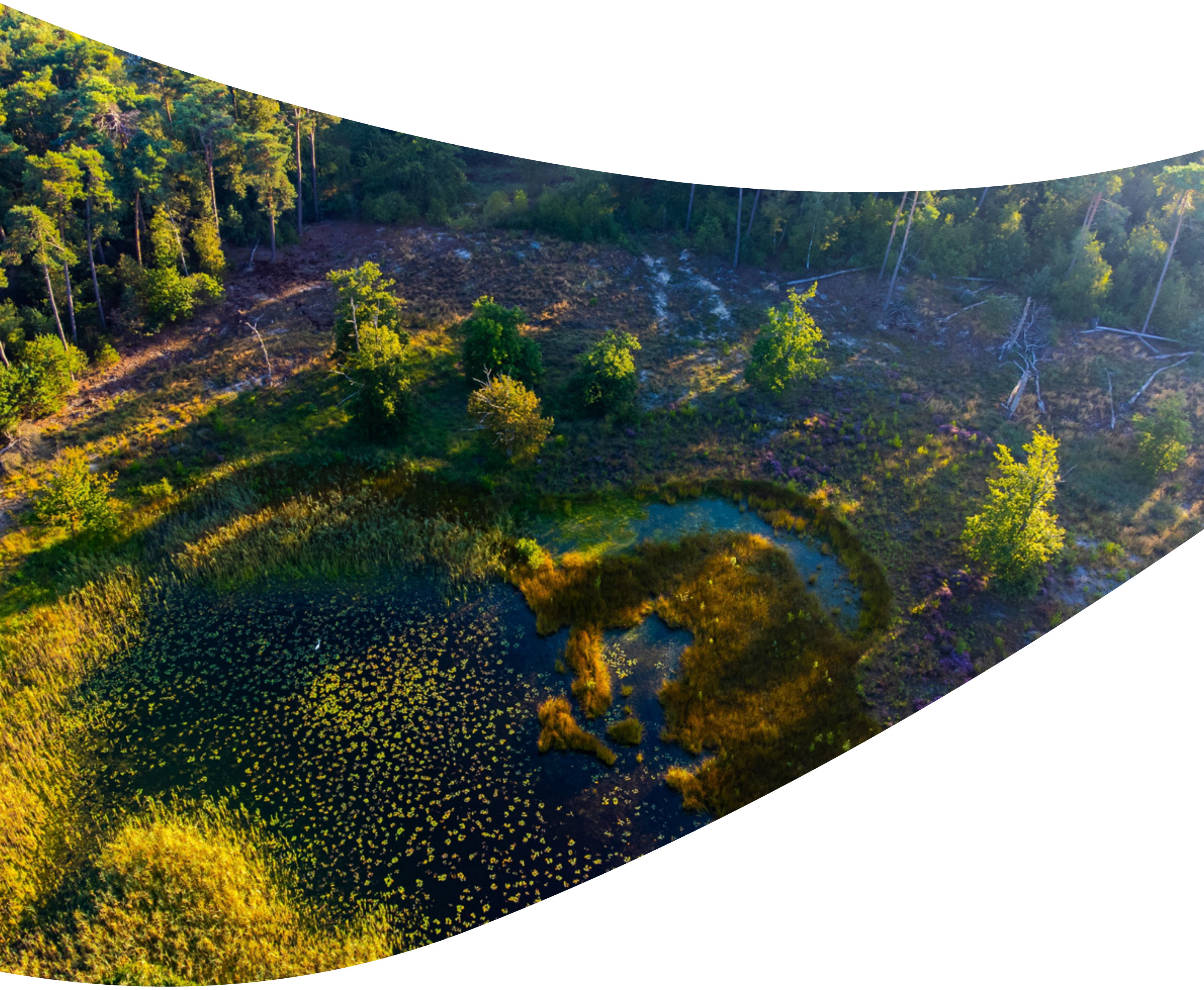

Building narratives through nature data

Handbook for applying spatial datasets and metrics to assess locations and tailor nature strategies

May 2025

a-track.info

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A-Track

The overall goal of A-Track is to consolidate and mainstream activities to accelerate transformation in organisations, such that, by end of project, a critical mass of businesses, financial institutions, and governments, integrate the value of natural capital in their decision-making, helping to halt and reverse biodiversity loss.

This report forms deliverable 4.2 under Work Package 4, which aims to 'Mainstream and advance natural capital assessment and accounting in businesses and their integration in decision-making across key sectors and business functions'. It forms one of the training materials offered as part of the developing 'embed nature' capacity building programme.

Scope and audience for this handbook

This handbook is aimed at sustainability professionals within or supporting companies when designing nature strategies or approaches, including setting targets and designing action plans, whether related to specific operations and/or supply-chains. It covers both users tasked with planning and undertaking analysis, and those wanting to understand and interpret results of analysis to support decision making.

The aim of this handbook is to provide detailed, practical information on a selection of key spatial datasets and metrics for assessing state of nature, risks and opportunities at locations and how they can be applied in operational and/or strategic decisions. The handbook does not serve as a guide for collecting or using primary data through on the ground survey or remote sensing. It also focuses on using spatial data for initial screening and then characterizing of locations, rather than using data to build more detailed inventories and account for changes in stocks and flows of ecosystem assets and services that an organisation interacts with.

1 Introduction

Nature (the living things inhabiting the natural world, and the environment they interact with) displays huge levels of diversity across the planet. From tropical rainforests to arid grasslands and deserts, and from coral reefs to saltmarshes, different locations across your corporate value chain will interface with different ecosystems and by extension, different species, and groups of people relying on nature in different ways.

Some of your company's impacts and dependencies on nature can be addressed without consideration for the location they are occurring in, such as reducing consumption of raw materials and reducing carbon emissions. Many impacts and dependencies, however, will be highly context specific and depend upon the nature present at specific locations. This requires tailored action. For example, an ecosystem service you depend upon, such as water quality regulation, may be provided in one location, but be at risk in another because the ecosystems that filter water there are highly degraded. Similarly, the land use associated with your company's operations may be the main driver of extinction risk and impacts on local people's livelihoods in one location, but water pollution may be the priority to address in another. Many of the decisions involved in designing and implementing a robust and effective nature strategy therefore must be 'location-focused' and be built on an understanding of the occurrence, state and trends in nature at different locations. It is important, in turn, that this understanding of nature risks and opportunities is complemented with an understanding of social context and risks to people, including Indigenous Peoples and local communities (IP and LCs), women and girls, youth, and other groups considered vulnerable.

1.1 Emphasis on locations in assessment and reporting frameworks

This emphasis on location-specific decision-making is reflected in voluntary and mandatory assessment and disclosure frameworks. For example, the recommended disclosures from the Taskforce on Nature Related Financial Disclosures (TNFD) (2023) state that *"the consideration of the geographic location of the organisation's interface with nature should be integral to the assessment of nature-related issues".* Similarly, aligned with TNFD, the application requirements of European Sustainability Reporting Standards Environment 4 (ESRS E4) include developing a list of locations that interface with nature, the biomes they interact with, and the integrity, biodiversity, and ecosystem importance at each site in order to assess materiality (European Commission, 2023).[1] This allows organisations to further prioritise sites that are in or near biodiversity-sensitive areas. The Global Reporting Initiative (GRI) biodiversity standard also encourages companies to investigate the location of activities that have moderate and high dependencies and impacts on nature in its sector and supply chain, and at the same time considering factors such as the sensitivity of the local ecosystem, the presence of threatened species, or people's reliance on a natural resource (Global Reporting Initiative, 2024). Lastly, Science Based Targets Network (SBTN) (2023) acknowledges that impacts on nature are location specific, and that spatial (i.e. with latitude and longitude) information is needed for companies to set effective science-based targets.

Many spatial datasets and metrics have been developed in the form of spatial data layers to support decision making by different actors (Burgess *et al.,* 2024). However, the high volume of spatial metrics developed with broad users and use cases in mind means that applying spatial metrics to support strategy design can seem overwhelming.

1 For more information, please refer to https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202302772

1.2 Aims and objectives

This guidance is designed to help you navigate the challenges of assessing locations where there are multiple potentially useful datasets and metrics, each with their own nuances and limitations. We provide guidelines on using these datasets and metrics, highlighting key points to think about when interpreting results. Where previous guidance focuses on scientific review of the metrics themselves, or prescriptive methods of how to use scores from metrics within prioritization processes (e.g. SBTN step 1), here we focus on **interpretation** and **complementarity** i.e. how does a spatial metric work, what information it tells you and how you can use that information. We will also focus on how you can use complementary spatial metrics together to 'build a narrative' of what is happening at priority (business activity) locations and how that affects strategy design, focusing on two contexts – one at site level and one at the level of sourcing landscapes.

Key terms – spatial data, metrics, indicators, assessment, mitigation hierarchy, landscape

2 Introduction to spatial nature datasets and metrics

2.1 Sources of spatial data

Data to inform your decision-making around nature can come from a variety of sources:

- **Primary data –** this is data that you collect yourself (or is collected by a third party on your behalf) in the field. These 'raw' measurements will likely need further processing, transformation and analysis to gain insights from them. Some applications of nature data will likely need some form of primary data collection, and it is often associated with getting the most granular and highly detailed assessments of impacts and dependencies at priority locations. For example, you may collect water and riverbed samples at a site over time, to monitor water quality and the species communities that are present.
- **Secondary data –** this is data collected (and often aggregated and packaged) by others, often for a different purpose than the one you will end up using it for. Here, the focus is on the data that you will collate and apply, rather than collect. For example, instead of collecting water quality samples, you may access publicly available spatial data on water quality, and often this data is already processed and transformed. However, it is very important to understand whether a given secondary data source has the right characteristics to suit your needs, before applying it for a particular purpose.

2.2 Forms of spatial data

Secondary spatial data (the main focus of this handbook) often comes packaged in the form of spatial data layers (data describing certain characteristics of geographic locations that can be overlaid with locations of operations). These data layers can range from global layers to ones that are more local.

The simplest form of spatial data is **point data.** This will be series of points, each consisting of two co-ordinates (latitude, longitude) marking their geographic location. An example could be a dataset on species sightings or camera trap locations.

Another simple data form is **polygon data** which consists of boundaries drawn from a series of points. An example would be the Key Biodiversity Areas (KBA) dataset which delineates zones across the globe which contain high levels of biodiversity or species that are endangered or endemic to an area.

Point and Polygon datasets often come with associated attribute data (in the form of a table) which contains additional information about each point/polygon. The KBA dataset, for example, includes attribute data with the name of the site delineated by each polygon, species present, area and assigned global KBA criteria. The spatial data, however, remains a simple delineation of a boundary. From a user perspective, the spatial data can be used to tell you whether you are inside, outside or within close proximity of an area of interest such as a KBA or protected area. The associated attribute data can tell you about the key features of that area of interest, for example whether the presence of a particular species or habitat type has led to an area's designation.

Lastly, spatial data may be **continuous** in the form of raster layers. These are akin to a digital picture – where values are stored in individual pixels that make up a map 'image'. A simple example would be an elevation map, where each pixel value represents the height above sea level at that location. When plotted, this builds a picture of the terrain across the landscape. Similarly to a digital picture, higher resolution rasters will have smaller sized pixels, with individual values covering smaller areas.

BOX 1: The importance of metadata:

All spatial data should have associated **metadata.** This provides important information about the dataset but is not the same as the attributes of the dataset. As an example, the metadata for a text message would include the time and the date, but not the actual content of the message. So, metadata for spatial data includes information on the format, co-ordinate reference system, extent, resolution, organisation it belongs to and so on. This information is essential to understand the origins and features of the spatial dataset and should be the first thing a user reads before undertaking or interpreting any analysis.

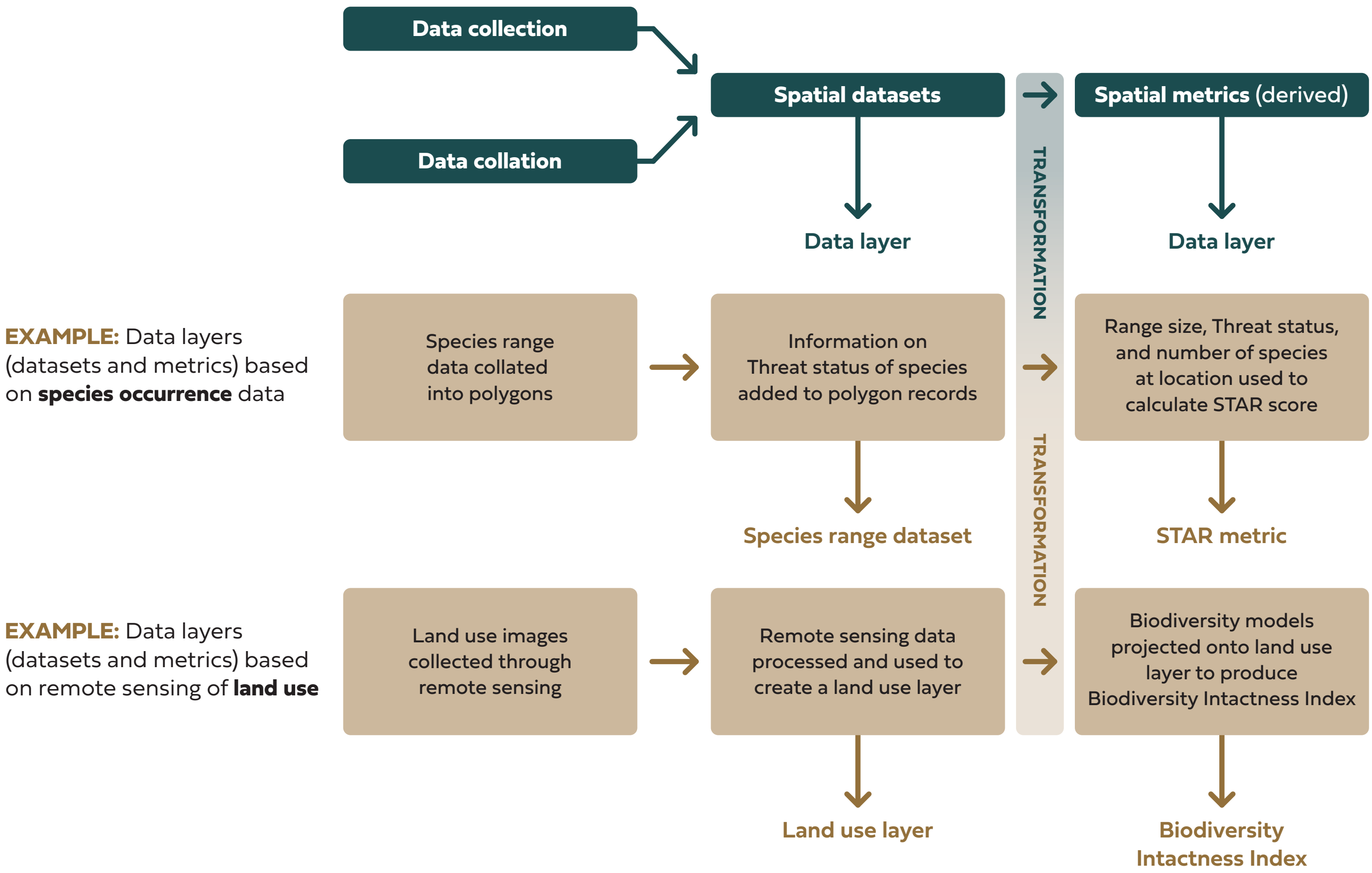
2.3 Difference between spatial datasets and metrics

Spatial datasets will vary in the degree to which the data they contain has already been aggregated and transformed to produce the values they show. For example, some datasets will simply be collations of records and observations. Examples of these would be data layers showing Protected Area boundaries, or species occurrences. Many spatial datasets will hold and display additional information on the features they map. For example, information on the threat status of the species and ecosystems a layer contains.

Other spatial datasets will display data that has been transformed into derived metrics and indices that capture the result of aggregating a specific set of variables. In this guidance this subset of datasets that display derived, transformed values are described specifically as 'spatial metrics'. An example of this would be a spatial metric showing species extinction risk at different locations, derived from species distribution datasets.

Figure 1 below, shows examples of data layers derived from spatial datasets and spatial metrics.

Figure 1: **Examples of data layers derived from spatial datasets and spatial metrics**



2.4 Key considerations when selecting spatial datasets and metrics

There are many 'characteristics' that can be attributed to spatial datasets and metrics that can be looked into and reviewed to support selecting and applying appropriate datasets. Broadly, the key considerations outlined below can help evaluate any given spatial nature dataset or metric in terms of its applicability for your purpose.[2]

Is the data from a trustworthy source and do I have access?

Not all datasets and metrics are available for commercial use or use by commercial entities. It's important to check licensing details before using any dataset. You should also look to understand the source of the data, are they an authoritative, credible and trusted source of data? Is there any third-party accreditation?

Does the dataset or metric reflect the elements of nature I am looking to understand?

Nature is complex and multi-dimensional. While some metrics and indices may cover multiple elements, all relevant aspects of nature will never be able to be condensed into a single dataset or metric. It is therefore important to understand 'what' is being reflected or measured in any given layer and assess if this information is what is required for the decision you are using it for. Capturing impacts and dependencies on nature holistically, would likely require using multiple datasets and metrics together.

2 Many elements addressed in this section are also the objectives of the Capitals Coalition-led Governance for Valuation, which includes information on 'transparency' on how data have been generated (transparency reports) in support of improved confidence in its use (confidence criteria based on decision-trees).

How accurate is the metric likely to be – is it based on observations or models?

This reflects the extent to which the values presented in a data layer reflect what is actually happening on the ground at that location. Some applications, such as initial high-level screening of areas may allow for data with lower accuracy than others such as reporting on site-level impacts against targets. Aspects that give an indication of accuracy include:

- **Method of measurement –** is the data or metric based on directly measured data, or is it the result of a model which estimates values for that location?

- **Ground-truthing –** within the underlying methods used to produce the data, has there been any ground truthing or cross-comparisons undertaken with other metrics or actual observations (in the case of modelled data)?

- **Date of measurement/modelling –** is the available data significantly out of date? Do multiple datasets from different time periods exist?

- **Completeness of data –** is the dataset fragmented and incomplete? These may still be useful in building a general understanding of the area but could omit important contextual information that make them unsuitable for decision making in isolation.

- **Data ownership –** could the organisation that collected the data have ulterior motives or hidden agendas that could have influenced the data?

Does the metric have the spatial coverage and resolution required for my decision-making need?

Spatial Coverage – this is the area that a given dataset covers. Some will have global coverage, others will have smaller coverage (e.g., country level). Some might only cover certain realms (e.g., terrestrial but not marine), or certain biomes (e.g., forests). There may be trade-offs between coverage and accuracy – often where metrics cover larger areas (or are global in extent) they likely miss finer scale details at specific locations. Data may be aggregated from multiple different sources and time-periods to produce datasets with large spatial coverage.

Spatial resolution – This is how fine scale the measurements are within a dataset. For example, for continuous raster layers, the spatial resolution is the area covered by a single pixel within a layer and is the same as the resolution of a picture. If you are trying to distinguish between different areas within a single site, then a layer that has pixel size larger than the whole site wouldn't be suitable. Importantly, this aspect of spatial 'precision' does not necessarily mean it is 'accurate'.

How responsive is the metric – will the metric change in response to my actions and does it change over time?

The 'responsiveness' of a spatial dataset can be thought of in two ways:

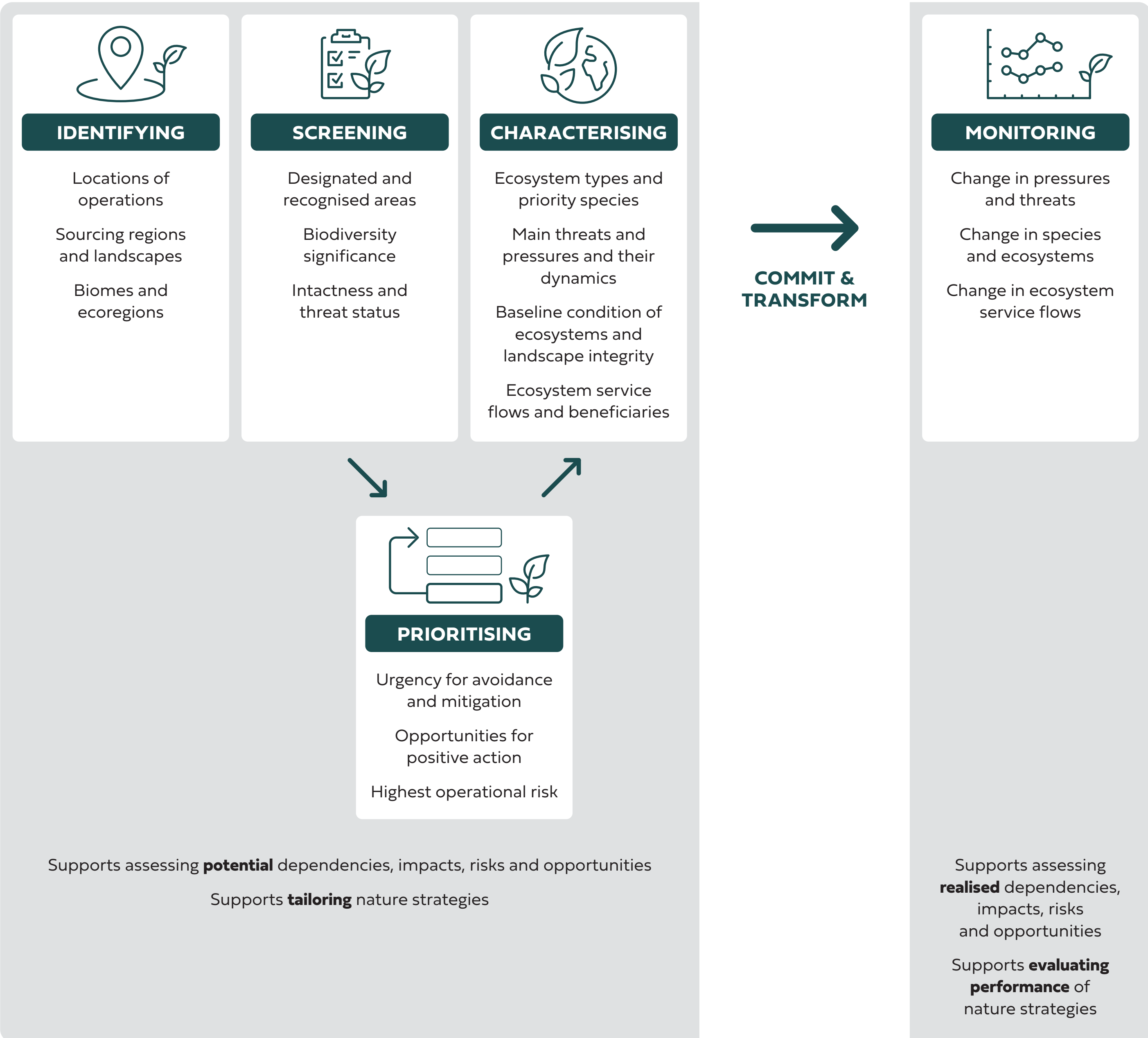
- Does it reflect a 'snapshot' of nature at one given point in time, or is the data part of a time-series that shows how that aspect of nature is changing over time? For screening of locations, static data are likely to be suitable, but responsive data are needed to monitor outcomes of actions over time.
- If it does have the ability to change over time, how sensitive is it in terms of the type of actions that might be 'picked up' by the metric? For example, a data layer of broad land use classes is unlikely to reflect changes in finer scale land management. Similarly, spatial data layers that reflect species richness based on overlapping ranges of species, will not likely reflect site-level actions to increase local richness of species.

3 Roles of spatial datasets and metrics in nature strategies

Corporate nature strategies can be informed through applying spatial metrics and datasets to understand where and how your value chain interfaces with nature. The different characteristics of spatial datasets and metrics mean they have different suitability for different stages of developing a nature strategy.

Within this guidance we outline five core roles spatial datasets and metrics can play in strategy design and implementation and supporting application of various assessment frameworks (such as TNFD's LEAP framework): **Identifying, Screening, Prioritising, Characterising** and **Monitoring.**

Figure 2: **5 core roles of spatial datasets and metrics in nature strategies**



Identifying: The entry point to location-focused decision-making is to first locate your company's interface with nature, and is the first, most basic application of nature data. This includes locating sites where business activities take place across your company's direct operations and priority upstream and downstream value chains. Other than the location itself, relevant geographical information such as the region, country and landscape would also be captured, as well as the respective biomes and ecoregions where the sites are located. This 'Identify' phase will help your company build the foundations of developing a nature strategy.

Screening and prioritising: High-level nature data can be used to screen identified sites for potential impacts, dependencies, risks and opportunities. The objective is to list sites and their nearby locations which are more ecologically (biodiversity) sensitive. Most guidance from the reporting frameworks and standards have provided criteria in defining ecologically sensitive locations (a.k.a. sensitive locations), and these criteria are closely aligned *(See table 1).*

Table 1: **Ecologically (Biodiversity) Sensitive Areas criteria under ESRS, GRI and TNFD**

Ecologically (Biodiversity) Sensitive Areas	
ESRS	• Natura 2000 network of protected areas • UNESCO World Heritage sites • Key Biodiversity Areas ('KBAs') • Other protected areas, as referred to in Appendix D of Annex II to Commission Delegated Regulation (EU) 2021/2139
GRI/ TNFD	• Areas of biodiversity importance • Areas of high ecosystem integrity • Areas of rapid decline in ecosystem integrity • Areas of high physical water risks • Areas important for the delivery of ecosystem service benefits to Indigenous Peoples, local communities, and other stakeholders.

Facing limited resources available, you may choose to further prioritize some of the ecologically (biodiversity) sensitive areas based on screening outputs (i.e. focus action first on the areas ranking highest in terms of sensitivity or that meet multiple criteria). These prioritised locations can be the focus of more-in depth assessment of nature-related issues and the development of specific nature strategies. Some of the considerations in prioritising the locations may include the urgency for avoidance and mitigation, opportunities for taking positive actions, as well as the level of operational risk.

Characterising: For priority locations, there is a need to refine the evaluation of potential impacts and dependencies to be able to formulate an appropriate and effective response. This requires 'zooming in' and taking a more in depth look at what is happening at that location. This may involve characterising the specific ecosystem types and priority species at the location, the main threats, pressures and their dynamics, the baseline condition of ecosystems and the integrity of the wider landscape, as well as the predominant ecosystem services being provided and who may be the key beneficiaries of the services.[3] 'Characterisation' of locations may apply more granular spatial data and metrics than high level screening and combine datasets that have global coverage with ones derived from more local national data sources. Outputs from characterising locations using spatial datasets and metrics can also act as a starting point for the development of an 'asset inventory' of ecosystem assets, and the development of natural capital accounts for their extent, condition and benefits provided.

Monitoring: Location specific responses and strategies typically include setting up risk management, resource allocation, and action plans, to achieve specific targets. Examples of how outputs from screening and characterising locations can support tailoring nature strategies is discussed further in ***section 5.***

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3 According to the UN System of Environmental-Economic Accounting Ecosystem Accounting (SEEA – EA), ecosystem services comprise three categories:

"provisioning services (i.e., those related to the supply of food, fibre, fuel and water); regulating and maintenance services (i.e., those related to activities of filtration, purification, regulation and maintenance of air, water, soil, habitat and climate); and cultural services (i.e., the experiential and non-material services related to the perceived or realized qualities of ecosystems whose existence and functioning enables a range of cultural benefits to be derived by individuals)."

(Exploring Natural Capital Opportunities, Risks and Exposure tool, 2025)

For more details, please refer to the UN System of Environmental-Economic Accounting Ecosystem Accounting guidance (SEEA – EA).

To track and measure progress against these targets, and assess the effectiveness of actions and plans, a periodic monitoring and review process is needed. This will enable your company to observe changes over time, evaluate performance against the targets relative to the baseline or reference condition, and make necessary adjustments to plans and actions towards achieving the desired targets.

Importantly, it is likely that in many cases, a different set of datasets and metrics will be required for monitoring outcomes than for screening and characterising locations. Datasets and metrics need to be regularly updated and able to show change over time and be at a granularity where changes in the data reflect company actions. *Many 'static' spatial datasets applied for screening will not have these characteristics.*

It is also likely that tracking a wider range of variables is required for monitoring outcomes than those that can be covered through the screening process.

For example, a spatial metric showing the species extinction risk at a location may be applied for screening and prioritising locations, and for guiding target setting on extent of suitable habitat. Outcomes of actions to improve available habitat at a location may then be best monitored through a suite of performance metrics that account for local context as well as interactions with local stakeholders. This suite of metrics may encompass a mixture of 'leading' pressure and response indicators that indicate whether suitable habitat is likely to increase in size or quality in the future, and 'lagging' state of nature indicators that measure actual increases in suitable habitat over time. Organising nature data according to natural capital accounting principles can robustly track outcomes in terms of changes in the 'stocks' of nature and 'flows' of ecosystem services.

4 Commonly available spatial datasets and metrics – ‘what they tell you and what can they be used for’

The main spatial datasets and metrics on nature you are likely to come across can be broadly grouped into five categories. These layers are likely to show:

1. **Recognised areas such as Protected areas**
2. **Distribution of pressures and derived pressure metrics**
3. **Distribution of species and derived species metrics**
4. **Distributions of ecosystems and derived ecosystem metrics**
5. **Outputs of ecosystem service models**

Figure 3 overleaf has illustrated these five categories. A selection of key commonly cited examples of these different categories at the global scale are also provided from ***table 2–6. Annex 1*** provides details on an additional, still non-exhaustive, list of examples.

Figure 3: **The 5 main categories of spatial datasets and metrics on nature at the global scale**

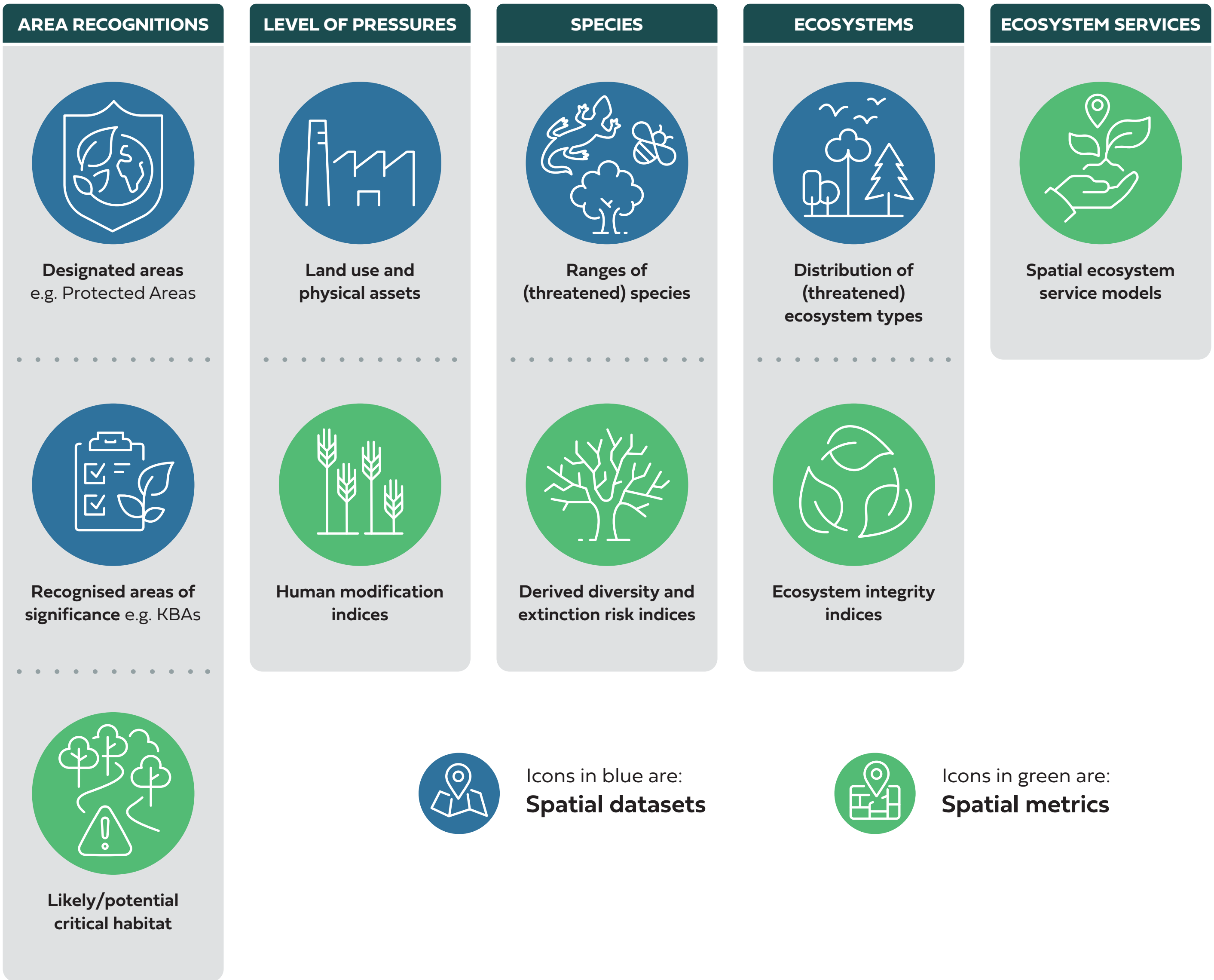


Table 2: Example of recognised areas of significance – Key Biodiversity Areas
(Source: Key Biodiversity Areas, 2025)

Recognised areas of significance	Key Biodiversity Areas			
	Most applicable role:	**Useful in conjunction with:**	**Granularity:**	**Coverage:**
	Screening and prioritising	Designated areas, Ecosystem service models	N/A	Global
What does it tell you and what drives differences in values?	Key Biodiversity Areas (KBAs) are sites that contribute significantly to the global persistence of biodiversity. The criteria used to identify KBAs incorporate elements of biodiversity across genetic, species and ecosystem levels, and are applicable to terrestrial, freshwater, marine and subterranean systems. Being in or near a KBA therefore tells you the area has recognised scientific significance for biodiversity.			
How does it work?	The KBA Standard defines a set of criteria and associated quantitative thresholds for identifying KBAs. Designed to identify sites crucial for biodiversity at the genetic, species, and ecosystem levels. The criteria used to identify a KBA are grouped into five main categories: threatened biodiversity, geographically restricted biodiversity, ecological integrity, biological processes, and irreplaceability. A site must significantly contribute to at least one of these categories to qualify as a KBA.			
How do you extract values?	The online database displays the location of the Key Biodiversity Areas. Under the quantifiable criteria, KBAs that fulfil multiple criteria whereby higher quantitative values might represent a higher conservation urgency.			
How do you interpret values?	The KBA dataset is a data layer of polygon boundaries, which can be used in overlay analyses. These analyses would reveal the coverage of/proximity to areas of high biodiversity significance.			
Can it be used to monitor progress?	No, the KBA dataset itself does not relate to company performance.			
Relevant similar datasets	The **World Database on Protected Areas (WDPA)** is similar to the KBA dataset in the sense it highlights areas of importance, but whereas the KBA dataset delineates areas recognised for their scientific significance for biodiversity (regardless of whether they have any regulatory protection), the WDPA delineates areas protected through regulation (regardless of whether they have been established in areas identified as scientifically significant).			
What are the licensing terms?	The KBA Website materials can be used for conservation, education, or research purposes without prior permission, as long as the terms are being followed. Copies of any published work using KBA data must be sent to the KBA Secretariat. Commercial use of the KBA websites is prohibited without the prior written permission of the KBA Secretariat, except such use is through the Integrated Biodiversity Assessment Tool (IBAT).			

Table 3: Example of derived diversity and extinction risk indices – Species Threat Abatement and Restoration (STAR) (Source: International Union for Conservation of Nature and Natural Resources, 2025)

Derived diversity and extinction risk indices	Species Threat Abatement and Restoration (STAR)			
	Most applicable role:	**Useful in conjunction with:**	**Granularity:**	**Coverage:**
	Screening and prioritising	Ecosystem service models	5km x 5km (1km release pending)	Global
What does it tell you and what drives differences in values?	STAR scores reflect the potential for reducing global extinction risk in a location if threats at that location were abated. Low scores suggest that whilst abating threats is still important, it would have a limited contribution to reducing extinction risk globally. High STAR scores indicate that abating threats in a location would have a large or disproportionate contribution to reducing global extinction risk. STAR scores can be disaggregated by threat, which reveals the main threats the species potentially present at that location face across their range.			
How does it work?	There are two STAR metrics available as global screening layers: STAR-T threat abatement and STAR-R restoration. STAR-T works by first assigning each species a global score based on its threat status. A maximum score of 400 is given to a species if it is critically endangered. The share of this score assigned to a specific pixel in the layer is determined by the proportion of the species' range that pixel represents. So, if a critically endangered species only occurred in one pixel, the full score of 400 would apply to that pixel for that species. This is repeated for every species included in the metric, so a particularly high STAR score would be assigned to a pixel if A) it has a lot of species occurring there, B) those species are not widespread and C) they are highly threatened. The metric is built off IUCN Red List data, which is an extinction risk assessment, where species are assessed and given a threat category from least concern to critically endangered. STAR-R score is similar but specifically shows areas that previously supported a high number of range restricted threatened species and therefore restoration of this area would contribute to reducing global species extinction risk.			
How do you extract values?	STAR values are additive – therefore to obtain a STAR score for a location, you **sum** the values of pixels within that location.			
How do you interpret values?	The STAR metric values show a large range of variation and are highly skewed towards negative values (most pixel scores close to zero). STAR values aren't directly interpretable for individual locations but can be compared across sites – a higher number in one pixel than another reflects a higher potential for reducing extinction risk. STAR scores can also be grouped into a relative Low to High scale. Values can also be expressed as a proportion of a larger area (so for example, the STAR score at a site can be expressed as a proportion of the total for a landscape or country).			

Can it be used to monitor progress?	Using the potential STAR data layer is not best suited to monitor progress, as this is dependent on when the data that underpins it was last updated. An additional methodology 'Calibrated STAR' is under development to complement the screening layer which guides through ground truthing the species and threat present at a location, and monitoring threats as a means to monitor progress.
Relevant similar metrics	There are other spatial metrics that build off the same IUCN species range data that underpins the STAR metric. For example, **Rarity Weighted Richness** provides a value just based on the number of species weighted by the proportion of their range represented by the pixel. It reveals similar information to the STAR metric in terms of areas of significance for species but doesn't reflect differences based on the Threat status of the species at a location.
What are the licensing terms?	The KBA Website materials can be used for conservation, education, or research purposes without prior permission, as long as the terms are being followed. Copies of any published work using KBA data must be sent to the KBA Secretariat. Commercial use of the KBA websites is prohibited without the prior written permission of the KBA Secretariat, except such use is through the Integrated Biodiversity Assessment Tool (IBAT).

Table 4: Example of Distribution of (threatened) ecosystem types – Red List of Ecosystems
(Source: IUCN Red List of Ecosystems, 2020)

Distribution of (threatened) ecosystem types	**Red List of Ecosystems**			
	**Most applicable role:**	**Useful in conjunction with:**	**Granularity:**	**Coverage:**
	Identifying, Screening and prioritising, characterising	Ecosystem Integrity indices	5km x 5km (1km release pending)	Global coverage, but available data limited to countries where ecosystems have been assessed
What does it tell you and what drives differences in values?	Spatial datasets from the Red List of Ecosystems informs you as to whether a location contains, or is in proximity to, ecosystem types that are assessed as threatened.			
How does it work?	The Red List of Ecosystems assesses the risk of ecosystem collapse from a subnational to global scale. Similarly to the IUCN Red List of species, assessments are applied at the level of the whole ecosystem type (rather than being a continuous layer where values differ within an ecosystem type). It uses 5 criteria to assess the risk of ecosystem collapse. The ecosystems are then assigned threat scores with threatened ecosystems categorised as: collapsed, critically endangered, endangered, vulnerable, and non-threatened ecosystems as: near threatened, least concern, data deficient and not evaluated.			
How do you extract values?	The online database displays the location of the assessed ecosystems. These can be filtered based on relevant categories. The assessment report can also be accessed which includes the description, distribution, native biota, abiotic features, threats, ecosystem risk assessment and justification.			
How do you interpret values?	Prioritise countries and areas which have multiple threatened ecosystems, whilst also consider the impact and dependencies of activities on ecosystems that are data deficient or not evaluated.			
Can it be used to monitor progress?	No – dependent on when the ecosystem is re-assessed by IUCN. To monitor progress, on the ground data could be collected on the ecosystem condition and extent.			
What are the licensing terms?	Data can be used, downloaded, and printed without asking for permission under conservation, education, research, or scientific analysis purposes, as long as the usage terms are being followed. A free electronic copy or two printed copies of any reports, publications, or other materials that use IUCN RLE data must be submitted to IUCN. Currently, commercial uses are prohibited without the prior written permission of IUCN.			

Table 5: Example of Ecosystem Integrity indices – Ecosystem Integrity Index
(Source: Hill *et al.*, 2022)

Ecosystem Integrity indices	**Ecosystem Integrity Index**			
	Most applicable role:	**Useful in conjunction with:**	**Granularity:**	**Coverage:**
	Screening and prioritising, characterising	Distribution of (threatened) ecosystem types	1km x 1km	Global Terrestrial area
What does it tell you and what drives differences in values?	The metric tells you how degraded the terrestrial biome is at that location, by comparing how different the ecosystem is to a theoretical 'intact' or 'pristine' state. Differences are driven based on the land use, presence of infrastructure and human population density.			
How does it work?	The Ecosystem Integrity Index assesses the modification of ecosystem structure, composition and function. Structural integrity is assessed by comparing how pressures present in individual pixels contribute to modification across the surrounding landscape. Compositional integrity is assessed through the Biodiversity Intactness Index, by modelling how the types and abundances of species differ between the land use present at a pixel, and a theoretical intact state, and functional integrity is assessed using remote sensing and comparing how productivity at the location compares to a modelled intact state.			
How do you extract values?	The mean pixel value at location can be used to inform on the average ecosystem integrity, supported by the range of values to understand how integrity varies across the area ***(Box 2)***			
How do you interpret values?	A value of 1 would represent a completely intact ecosystem (e.g. a forest with no human modification) and a value of 0 would represent an ecosystem that is completely degraded compared to an intact ecosystem (e.g. a concrete car park).			
Can it be used to monitor progress?	As land use data underpins variation in EII, it is unlikely to detect finer scale action to address ecosystem integrity. Instead, to monitor progress, on the ground data could be collected on ecosystem condition variables, or performance metrics related intensity of land use developed.			
Relevant similar metrics	The **Biodiversity Intactness Index,** and the **Mean Species Abundance** layer both also indicate ecosystem integrity in a similar way – but only capture the compositional aspect, whereas the Ecosystem Integrity Index builds off the Biodiversity Intactness Index to also include structural and functional aspects.			
What are the licensing terms?	Freely available for both commercial and non-commercial use under the Creative Commons Attribution – No Derivatives 4.0 International License.			

BOX 2: Taking the mean at face value

Often location prioritisation analyses will require taking a mean value from a continuous data layer to characterise a location. This mean value is useful to provide a generalised gauge of what is going on within that area. However, as an average statistic it does generalise the data that underlies it. An example of this is shown in *Figure 4* where you can see roughly half the area has high integrity, and half the area has low integrity. If only the mean was used to characterise this site, then it would be seen as having an integrity of around 50%. However, the site, and broader buffer zone, includes areas of very high integrity that may be important to protect. Other statistics such as the range and standard deviation, which are often reported alongside mean in scientific publications, can be useful to characterise the underlying data.

Figure 4: **Example of site spanning areas of high and low integrity**

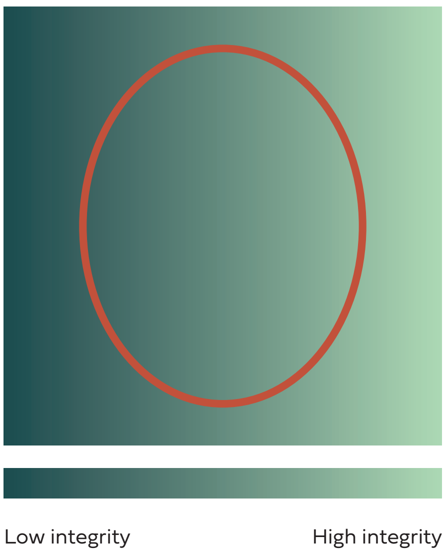


Table 6: Example of Ecosystem services models – Critical Natural Assets
(Source: Chaplin-Kramer *et al.*, 2023)

Ecosystem services models	Critical Natural Assets			
	Most applicable role:	**Useful in conjunction with:**	**Granularity:**	**Coverage:**
	Screening and prioritising, characterising	Species extinction risk indices	2km	Global
What does it tell you and what drives differences in values?	The layer highlights areas that are critical for the provision of local and global nature's contribution to people. These include flood regulation, fodder for livestock, marine fish harvest and vulnerable terrestrial ecosystem carbon storage.			
How does it work?	The layer is based on the principle that if 100% of natural assets are needed to be protected to maintain 100% of the current levels of nature's contribution to people, 'Critical natural assets' are the subset of these that needs to be protected in order to maintain the provision of the top 90%. This is assessment is done using global models of14 types of nature's contribution to people. The 'contribution' values are grouped, with the most critical pixels being ones that are needed to maintain the top 5% of provisioning.			
How do you extract values?	The layer can be interpreted as binary (critical natural asset or not, based on the 90% threshold). Alternatively, the maximum value within a location taken as an indication of relative importance. The individual ecosystem service driving values can also be disaggregated (e.g. understanding that a location has particular importance for global carbon storage).			
How do you interpret values?	In the global and local Nature's Contributions to People (NCP) data layers, values of 1 are the lowest value areas and values of 20 are highest value areas. Values above 2 are mapped as critical.			
Can it be used to monitor progress?	No, it is a static data layer. Monitoring progress may involve developing performance indicators related to the protection or enhancement of critical natural assets, monitoring changes in the flow of ecosystem services using on the ground data.			
What are the licensing terms?	Freely available for both commercial and non-commercial use with its open access status, under the Creative Commons Attribution 4.0 International License.			

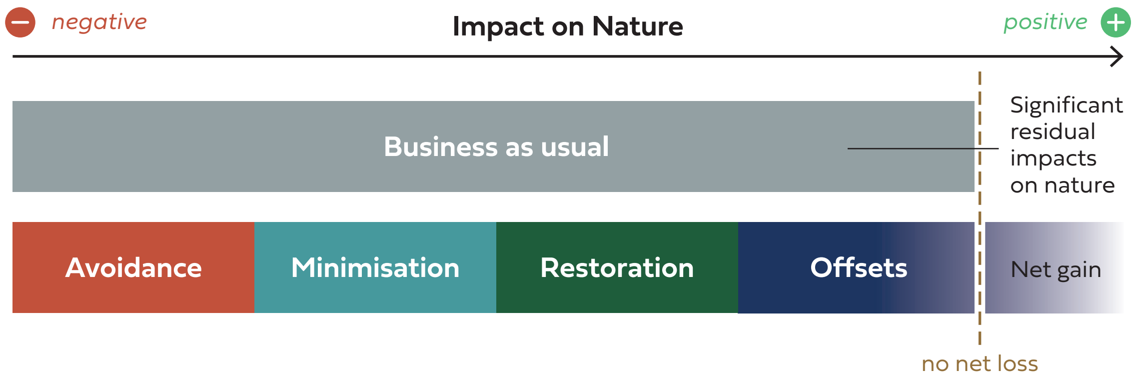
5 Commit and transform – Tailoring strategies to spatial context

Applying spatial metrics to screen, prioritise and characterise locations can provide foundational information needed to support strategy design, including setting targets and designing action plans. Spatial metrics may also support monitoring outcomes of implementation, when datasets and metrics have the required characteristics. This section builds out hypothetical example use cases centred around two contexts – applying the Mitigation Hierarchy at site level and identifying opportunities for landscape-scale action within supply chains. For each, how different metrics are applied together and the metric values obtained are shown. What information is gained for each hypothetical use case from the metrics and how this informs strategy design is outlined.

5.1 Example 1 – **Applying the Mitigation Hierarchy**

The Mitigation Hierarchy *(Figure 5)* is a commonly applied best-practice framework for managing biodiversity impacts at sites. It consists of four hierarchical stages: Avoid, minimize, restore and offset. The first stages, avoid then minimize, should be prioritised to reduce the impact as much as possible before then restoring and offsetting to compensate for any remaining impacts.

Figure 5: **The mitigation hierarchy**



Avoid: The 'avoid' step involves predicting and averting negative impacts before they occur. It is often applied right from the beginning of a project, such as in site selection, design and/or screening phases. For example, screening out potential sites to avoid sensitive areas and then once a site is chosen, further impacts can be avoided by designing project components thoughtfully. Preventative actions are the most efficient way of reducing impacts, both ecologically and economically, and offer the greatest certainty in impact mitigation.

Minimise: For impacts that cannot be fully avoided, measures can be implemented to minimize impacts through reducing their duration, intensity and scope. These measures could include physical controls such as modifying project infrastructure to minimise impacts on biodiversity, such as using quieter machinery. They could also include operational controls to regulate project activities to minimise impacts, like limiting the number and speed of vehicles to prevent wildlife collisions. Furthermore, abatement controls can focus on reducing impact levels, such as noise, light, and chemical pollution. These minimisation efforts should be initiated early in project planning phases and can continue throughout the project's lifecycle.

Restore: In many cases, some environmental degradation is inevitable and cannot be entirely avoided or minimised. In such instances, restoration efforts can help to repair damage. These activities may involve efforts to restore species composition, habitats, and the structure and function of ecosystems.

Offset: If residual impacts persist after restoration, environmental offsets may be considered. Offsets are actions, which can include restoration, applied to areas unaffected by the project, but are related to the project's residual impacts.

To illustrate how spatial data can be used to support application of the Mitigation Hierarchy in a real-world context, we present a case study involving a hypothetical multinational mining company. This example demonstrates how the company integrates the Mitigation Hierarchy into their biodiversity action plans (BAPs), informed by spatial data, to tackle negative impacts on biodiversity at their priority sites. The following sections detail the decision-making process, datasets and metrics applied, and strategies developed for one of their sites in Chile, an ecologically sensitive area identified through comprehensive screening.

Table 7: **Example 1**

Decision context and background

A multinational mining company is in the process of applying its new sustainability strategy, which includes designing and implementing a biodiversity action plan (BAP) for each of its priority sites. The aim of the BAPs is to decrease negative impacts and improve overall biodiversity value at the site and surrounding landscape, through applying the Mitigation Hierarchy.

The company has already undertaken a comprehensive screening exercise to identify priority sites, including through stakeholder consultation. 'Site A' in Chile has been identified as a priority site due to its location within an ecologically sensitive landscape. An initial review of the ecosystems present shows that Site A is dominated by seasonally dry temperate heath and shrublands, with some seasonal upland streams. To the Northeast and Southeast of the site, there is also some annual crop lands and urban and industrial ecosystems. In the future, the company plans on using remote sensing and field work to build a more granular map of ecosystems that can help inform accounting.

As a first step in developing the BAP for Site A, the company will characterise the site further using spatial datasets and spatial metrics. The results from this will help to better understand the biodiversity features present and identify potential mitigation actions that can be taken.

Metrics applied

For initial characterisation of Site A and its area of influence (AOI), the company uses a combination of 1) global spatial datasets representing areas recognised for their biodiversity importance, and 2) biodiversity metrics that are mapped globally as part of their analysis. The following metrics and datasets are chosen by the company to provide insights into multiple aspects of biodiversity, spanning species, ecological integrity, nature's contributions to people, and conservation priorities.

Spatial datasets representing areas recognised for their biodiversity importance:

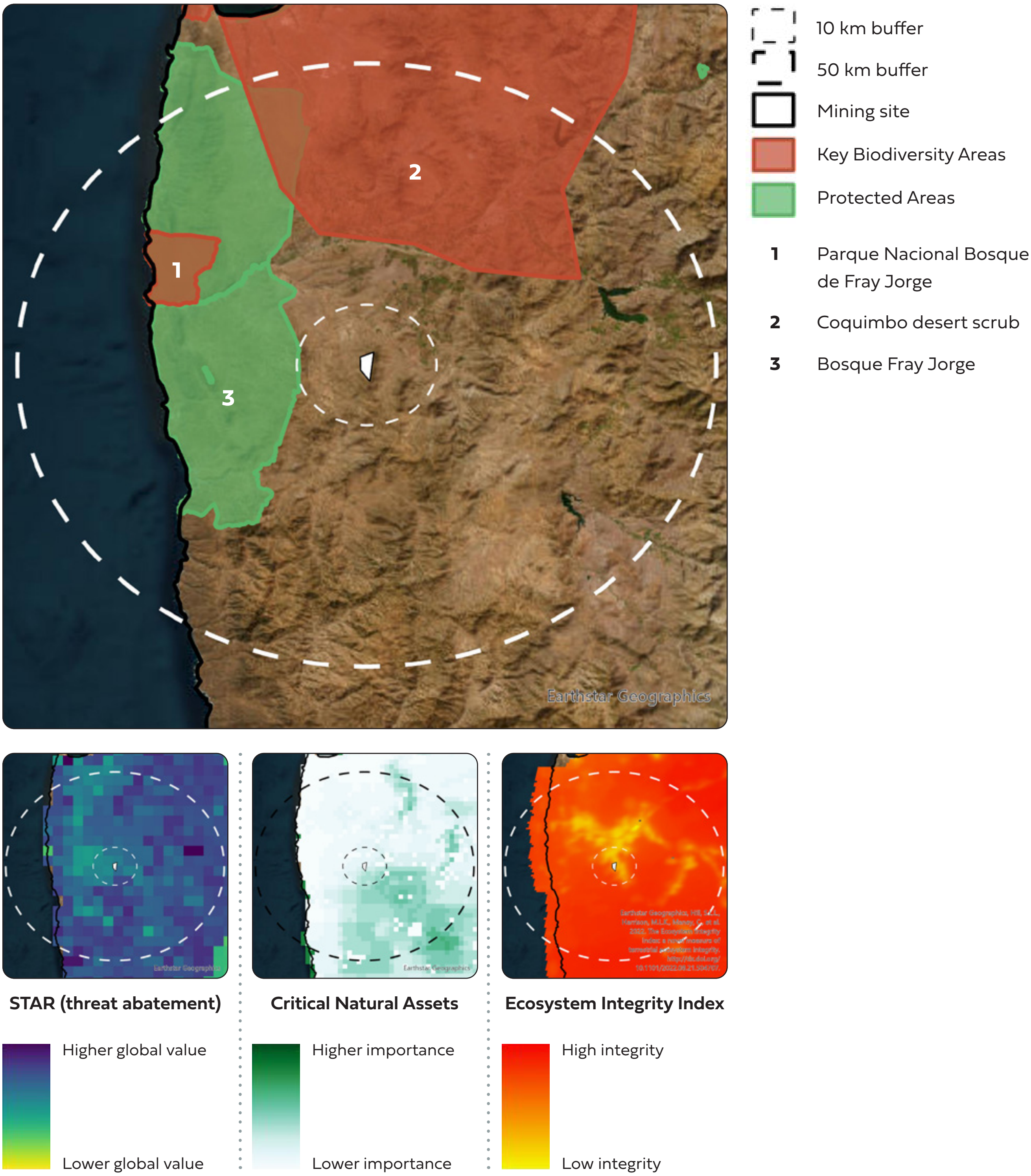
- World Database on Protected Areas (WDPA): to identify legally designated protected areas near the site, indicating zones where conservation measures are already in place (Protected Planet, 2025).
- World Database of Key Biodiversity Areas (KBAs): to identify areas scientifically recognised for their globally significant biodiversity, indicating zones of high conservation priority (Key Biodiversity Areas, 2025)

Spatial biodiversity metrics (that are mapped globally):

- Ecosystem Integrity Index (EII): to assess the health and functionality of ecosystems around the site, indicating areas where avoidance and restoration activities may be particularly relevant (Hill *et al.*, 2022)
- Critical Natural Assets (CNA): to identify areas that are important for delivering multiple ecosystem services, indicating regions that people rely upon for water regulation, carbon sequestration, etc. (Chaplin-Kramer *et al.*, 2023)
- Species threat abatement and restoration (STAR): to identify areas where potential contributions to threat abatement or restoration will have greater impacts on reducing global species extinction risk (International Union for Conservation of Nature and Natural Resources, 2025)

Results and information gained

Figure 6: **Results of site level assessment**[4]



4 The boundaries and names shown, and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

STAR threat abatement scores within 50 km buffer:

Total:	216.950633
Min:	0.00117
Max:	73.54
Mean:	0.1677

EII scores within 50 km buffer:

Min:	0.139078
Max:	0.901083
Mean:	0.753266

- There is one Protected Area within 10 km of Site A and two KBAs within 50 km ***(Figure 6)***.
  - The STAR metric reveals medium to high threat abatement scores around the site, with particularly high scores immediately South of the site.
- In addition to STAR, the company investigates further sources of information to find out what species are potentially present in the 50 km around the site.
  - The company gets more detailed information on the KBA 'Coquimbo desert scrub' from keybiodiversityareas.org. The assessment details for this KBA reveal the presence of an endangered cactus, 'Quisco Coquimbano', whose global population is entirely contained within the KBA. Details from the IUCN Red List indicate that the biggest threat to this species are tourist developments, which are causing habitat degradation and declines in the number of mature individuals.
  - The company also consults the IUCN Red List of Threatened Species range spatial data through the Integrated Biodiversity Assessment Tool (IBAT), revealing another two endangered species. The 'Andean Cat' and the 'Long-tailed Chinchilla'. According to the IUCN Red List, the Andean Cat is an elusive felid of spiritual importance to some Indigenous Peoples. Demand for minerals and fossil fuels is threatening its habitat. This, combined with climate change, is fragmenting suitable habitat. The Long-tailed Chinchilla, is a rodent that has historically been hunted for its soft fur. It is also threatened by local mining developments, but there are indications that populations are increasing within restored habitats.
  - Areas important for delivering ecosystem services are present around the site's AOI, particularly to the South-East, indicating that the natural functioning of this area is important for the local population.
- Much of the area surrounding the site has medium to high ecosystem integrity, but there are areas of low ecosystem integrity to the North-East of the site.

Application of information in strategy

The information gathered from the spatial analyses has given the company a better picture of the biodiversity features present around Site A that could be impacted by their activities. As part of the BAP design process, they have identified the following mitigation actions to address their impacts on the biodiversity present.

Avoid:

- The company has decided to conduct impact assessments on the Protected Areas and KBAs in proximity to Site A to better understand how they can avoid impacts to these areas as much as possible. They will establish appropriate buffer zones around these areas to prevent expansion of activities into these spaces.
- The area directly South of the site has a relatively high EII score, indicating that the surrounding environment is relatively undisturbed and healthy. In addition, high STAR-T scores in this area indicate a significant potential to reduce the extinction risk of threatened species through targeted threat abatement actions (e.g. providing habitat for species, restoring degraded habitats, and managing threats to species). The company will carefully consider how mining road infrastructure in these areas could directly impact areas of high ecosystem integrity, including habitat fragmentation and disturbance impacts on the threatened species present. They will also consider potential indirect impacts, such as opening up new areas for potential logging and farming (the two biggest threats in this area). They will work with local conservation programs to develop biodiversity-sensitive infrastructure plans, ensuring that new roads avoid disruption of key habitats for threatened species, such as the Andean cat and long-tailed chinchilla.

Minimize:

- An area southeast of the site is particularly important for NCPs. Site A depends on this area for the provision of water and they also depend on the local population for provision of labour. The company will work closely with local rightsholders and stakeholders to identify important NCPs and create management plans to minimize impacts on these services, such as optimizing Site A's water use and recycling.

Restore:

- For residual impacts that cannot be avoided or minimized, the company plans to implement restoration programmes to help repair the damage caused by their project, with close consultation and participation of local stakeholders.
- The areas Northeast of Site A have low ecosystem integrity, indicating that the ecosystems present have lost much of their natural structure, function and resilience. This is partly due to Site A's activities in this area, including pollution to water bodies and building linear infrastructure. The company plans to utilise bioremediation techniques to remove heavy metals from water bodies. They will also reconnect habitats though building road overpasses for wildlife and planting corridors of appropriate native species to re-connect patches of habitat to the adjacent protected areas.

Offset:

- Despite the plans outlined above to avoid and minimize impacts and carry out restoration efforts, the company predicts that some residual impacts will remain. This is partly due to past destruction of vegetation under the mine's footprint. The company will design appropriate offsets, in line with recognised best practice, that will address this residual impact, focusing action on the adjacent Key Biodiversity Area, 'Coquimbo desert scrub'.
- Additionally, the company aims to support efforts to conserve the globally significant and geographically restricted cactus, *Quisco Coquimbano.* The company will work with local stakeholders to identify local conservation programs for this species and support activities such as ex-situ conservation and seed banking.

Combining data from different spatial datasets and spatial metrics has given the company a better understanding of the biodiversity features and ecosystem services at risk from operations at Site A. This analysis represents an initial step in characterising Site A, providing suggestions for further inquiries and on-the-ground data gathering including working and consulting with local stakeholders. By using this information to inform their mitigation strategy, they will reduce their impacts to an ecologically sensitive area while also balancing their operational needs. Moving forward, the success of the BAP will depend on continuous monitoring, adaptive management and collaboration with local groups.

5.2 Example 2 – **Assessing risks and opportunities within supply chains**

Business can have significant dependencies and impacts on nature within their supply chains, which can be particularly prominent when sourcing agricultural commodities, forestry products, fisheries products and minerals. Developing a nature strategy to address these dependencies and impacts embedded within supply chains can be confounded by a lack of traceability to individual plot level, and a lower degree of direct influence of site-level outcomes than in direct operations. Instead, location-based decision making within this context may be at the level of sourcing landscapes. Analyses at this scale may support decisions around sourcing strategies, supplier engagement and involvement in collective landscape initiatives[5].

To illustrate how spatial data can be used to support screening dependencies, impacts, risks and opportunities within an agricultural supply chain, we present a case study involving a hypothetical food and beverage company. This example demonstrates how the company uses spatial data to undertake a high-level risk profile of different sourcing regions for a priority commodity, cocoa, to compare contexts and develop tailored actions.

5 For more information, please refer to https://jaresourcehub.org/iseal-guidance/

Table 8: **Example 2**

Decision context and background

A multinational food and beverage company has identified cacao as a high-priority commodity (in terms of links with biodiversity loss) within their product value chains and is in the process of adjusting its nature strategy to consider landscape level actions in the West/Central Africa regions they source from. The aim is to use spatial data to develop a high-level risk profile for a landscape that identifies areas most at risk of nature degradation, the main threats posed by cacao production, and options for mitigating these impacts.

The company has started the process of mapping its value chain, are aware they source cocoa from Ghana and Cameroon, and understand to some extent their transport lanes for moving cacao from farms to the next actor in the value chain.

Metrics applied

Establishing a landscape in Ghana:

The Western region of Ghana was identified by the company as the sourcing region for cacao. From here, a national land use map of cacao farms was used to narrow down the landscape where cacao is grown. (https://ghana-national-landuse.knust.ourecosystem.com/interface/). A 5km buffer was introduced around the region of production to establish the final landscape relevant for the assessment. For additional context, the transport lane, with a 5km buffer, used to move cacao to the city of Accra was overlayed to complete the area of land the company value chain potentially impacts.

Establishing a landscape in Cameroon:

In Cameroon the Centre region of the country was where cacao was being sourced from for the company. As Cameroon did not have national maps for cacao production, the global data product 'CropGrids" was used to identify where cacao was likely to be farmed (Tang *et al.*, 2024) ' A 5km buffer was introduced to delineate the final landscape relevant for the assessment. To provide additional context, the company used Google Maps to plot a transport route to the nearest port Douala, with a 5km buffer.

Once the landscapes in both Ghana and Cameroon were established, the company looked to identify the ecosystems present, trends in pressures they contributed to on the landscape and their potential impacts on areas of biodiversity significance.

Spatial datasets applied:

RESOLVE Ecoregions: identifies the type of ecosystem the landscape is in and divides and characterises all terrestrial ecoregions (One earth, 2025)

Key Biodiversity Area (KBAs)s (Source: Key Biodiversity Areas, 2025)

World Database of Protected Areas: (Source: Protected Planet, 2025)

Spatial metrics applied:

Global Forest Watch – Forest cover loss (Source: Global Forest Watch, 2024)

Biodiversity Intactness Index (Source: Natural History Museum, 2021)

IUCN species rarity-weighted richness (Source: International Union for Conservation of Nature and Natural Resources, 2024)

Results and information gained

Ecoregion descriptions

- The Cameroon landscape ***(Figure 7)*** covers a mixture of lowland- and highland- forest, with some savannah ecosystems in the north. There is also a small overlap between this region and coastal forests, as well as a mangrove ecoregion.
- The ecoregions in the landscape in Ghana ***(Figure 8)*** are also split between lowland humid tropical forests and savannah systems (in the north).

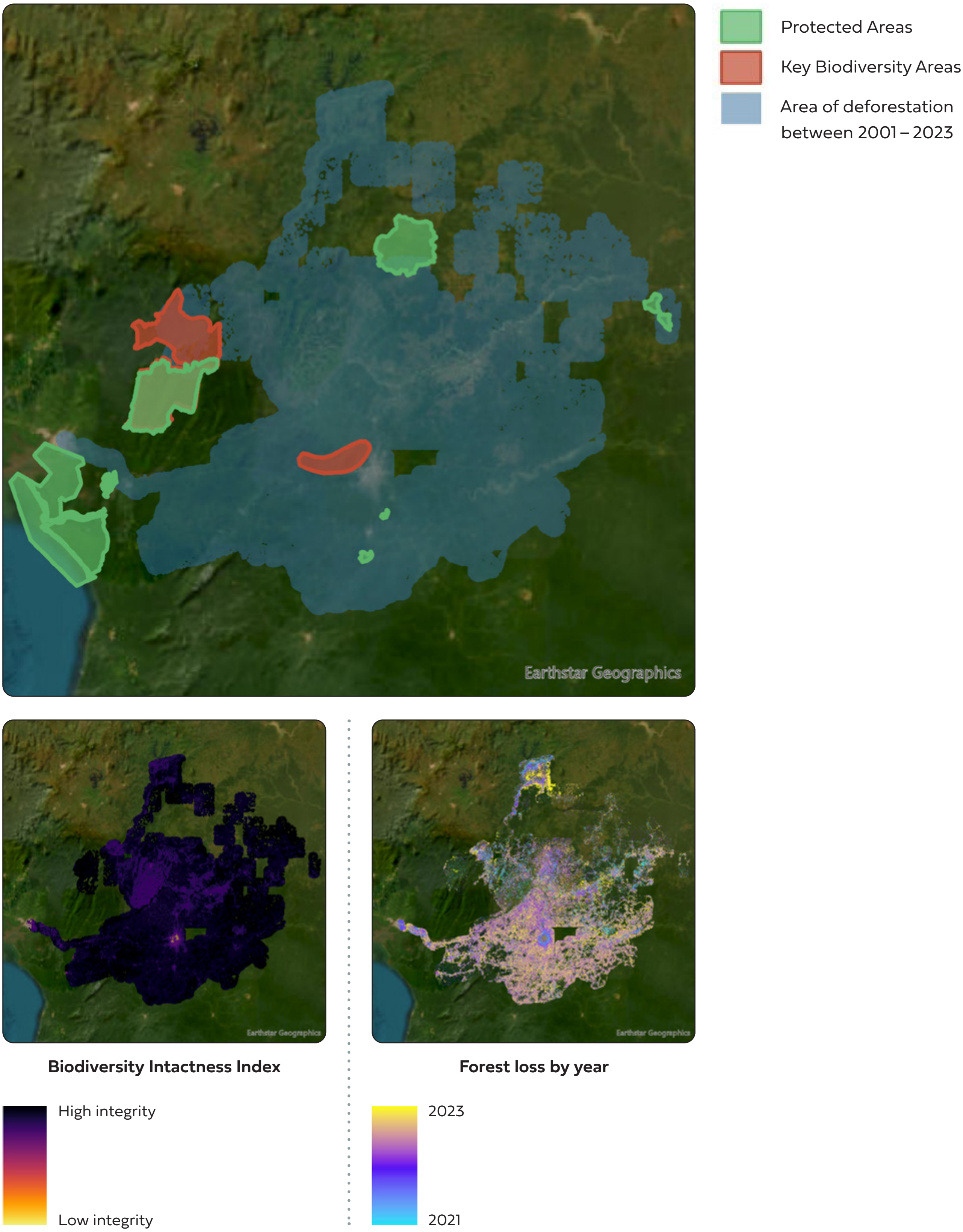
Key Biodiversity Areas and Protected Areas

- Across the Ghana landscape, there is a high presence of KBAs and Protected Areas, but the transport corridor to Accra has significantly fewer intersections with these areas
- In the landscape of Cameroon, there are significantly fewer KBAs and Protected Areas. The KBAs present also are not covered by Protected Areas, indicating that these significant areas for biodiversity are not legally protected.

Biodiversity intactness and deforestation trends

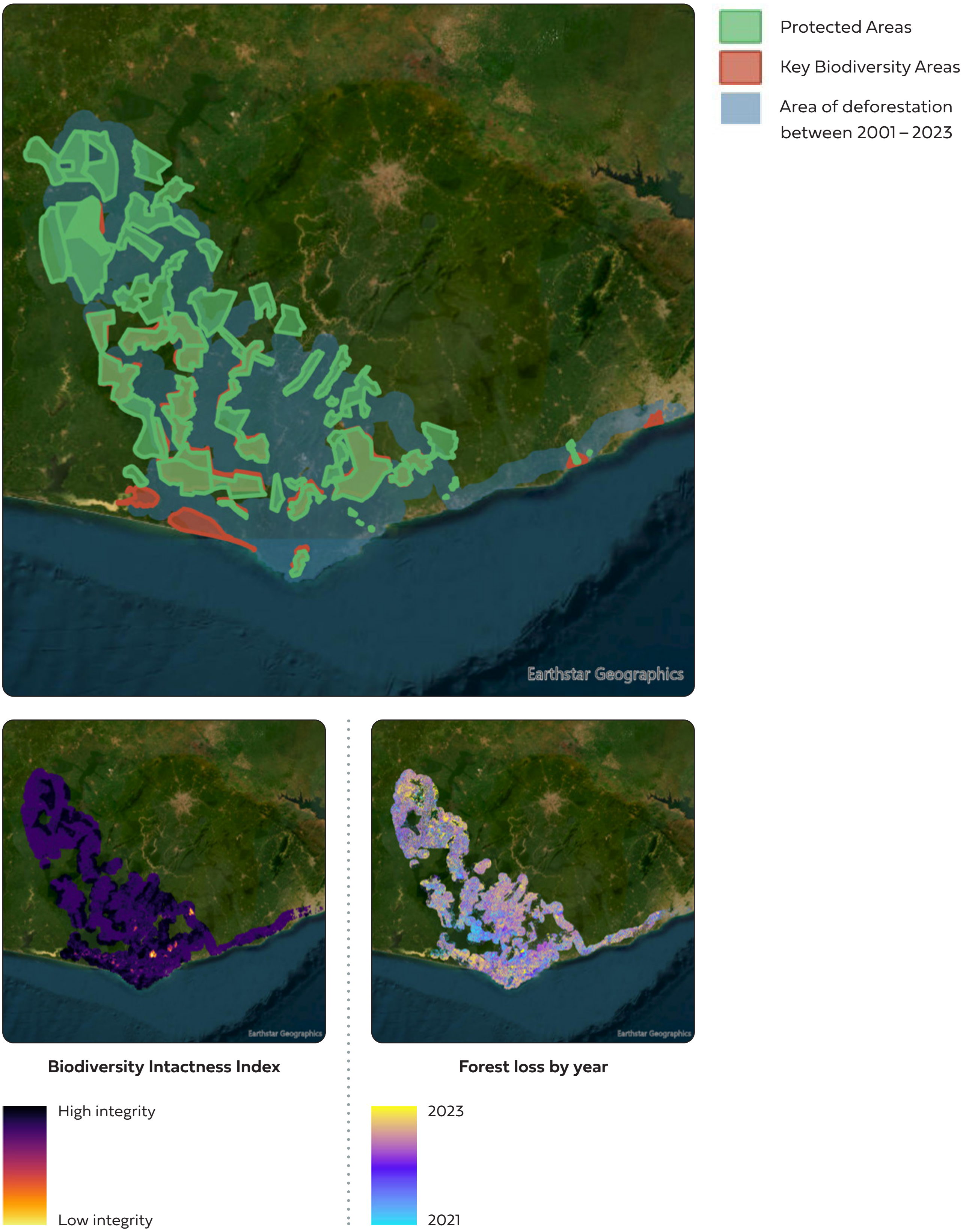
- The ecological communities within the cacao landscape in Ghana have lower modelled intactness than Cameroon, driven by largely historical deforestation but with some more recent deforestation. The patterns of deforestation do not seem to be related to the presence of Protected Areas, suggesting these Protected Areas are not preventing deforestation within them.
- In Cameroon, the west and northeast of the landscape has ecological communities with higher remaining modelled intactness, which correlates with areas with no reported deforestation over the last 20 years. The deforestation that has occurred in the Cameroon landscape is often more recent.
- This means that sourcing cacao from the Cameroon landscape is potentially at higher risk of being associated with driving new deforestation and a reduction of biodiversity intactness in previously intact areas.

Figure 7: **Cameroon sourcing landscape analysis** [6]



6 The boundaries and names shown, and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Figure 8: **Ghana sourcing landscape analysis**[7]



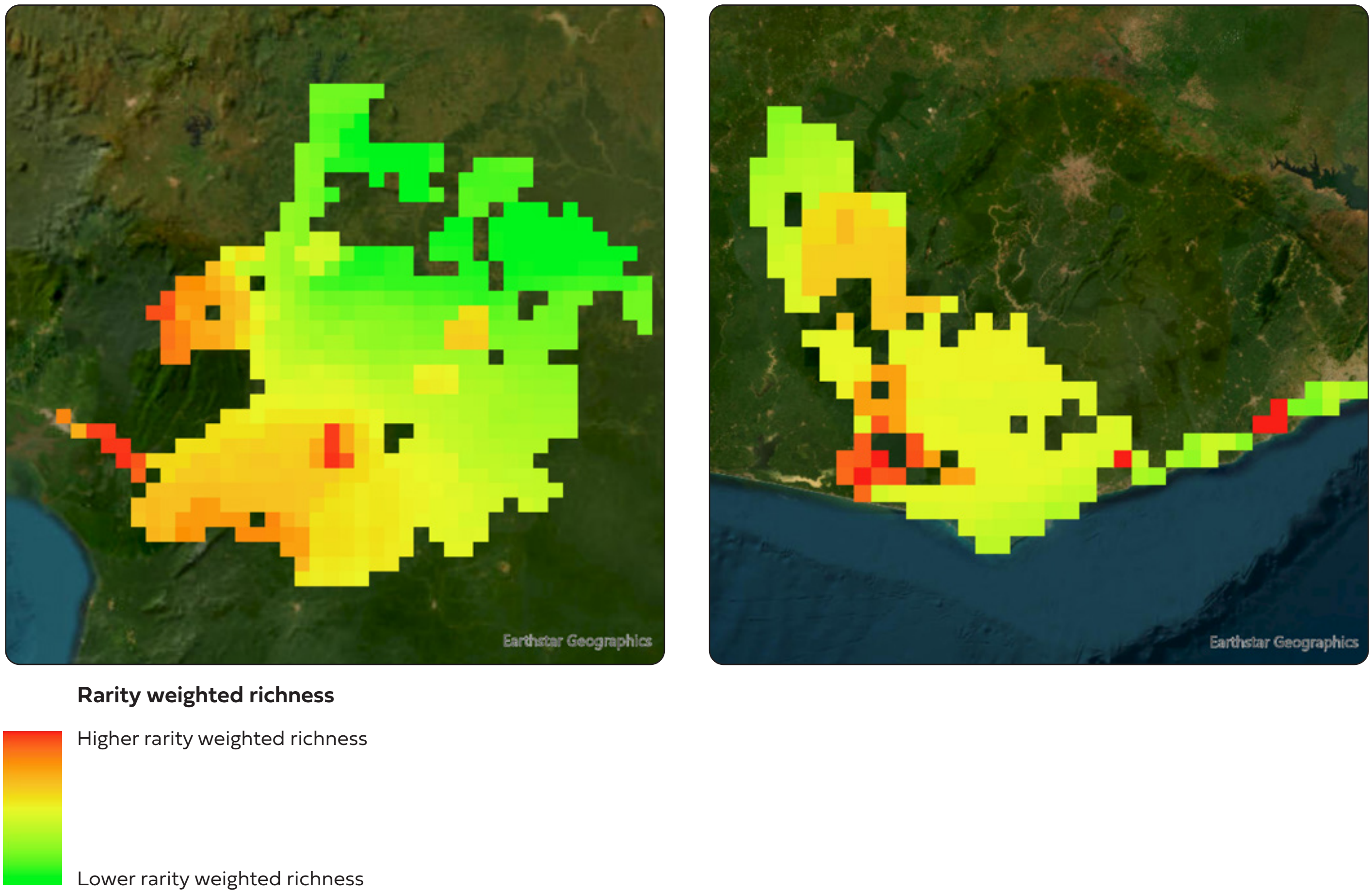
7 The boundaries and names shown, and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Species significance – Relative rarity-weighted richness

- The Cameroon landscape has a higher richness of small-ranged species, compared to the national distribution. Environmental impacts in this region will therefore have a disproportionate impact on Cameroon's species. The southern area of the region that encroaches on the coastal forests has a higher concentration of small-ranged species, as does the region at the intersection of the coastal and highlands forests in the West. Areas on the northern savannah frontier have a lower concentration of small-ranged species.

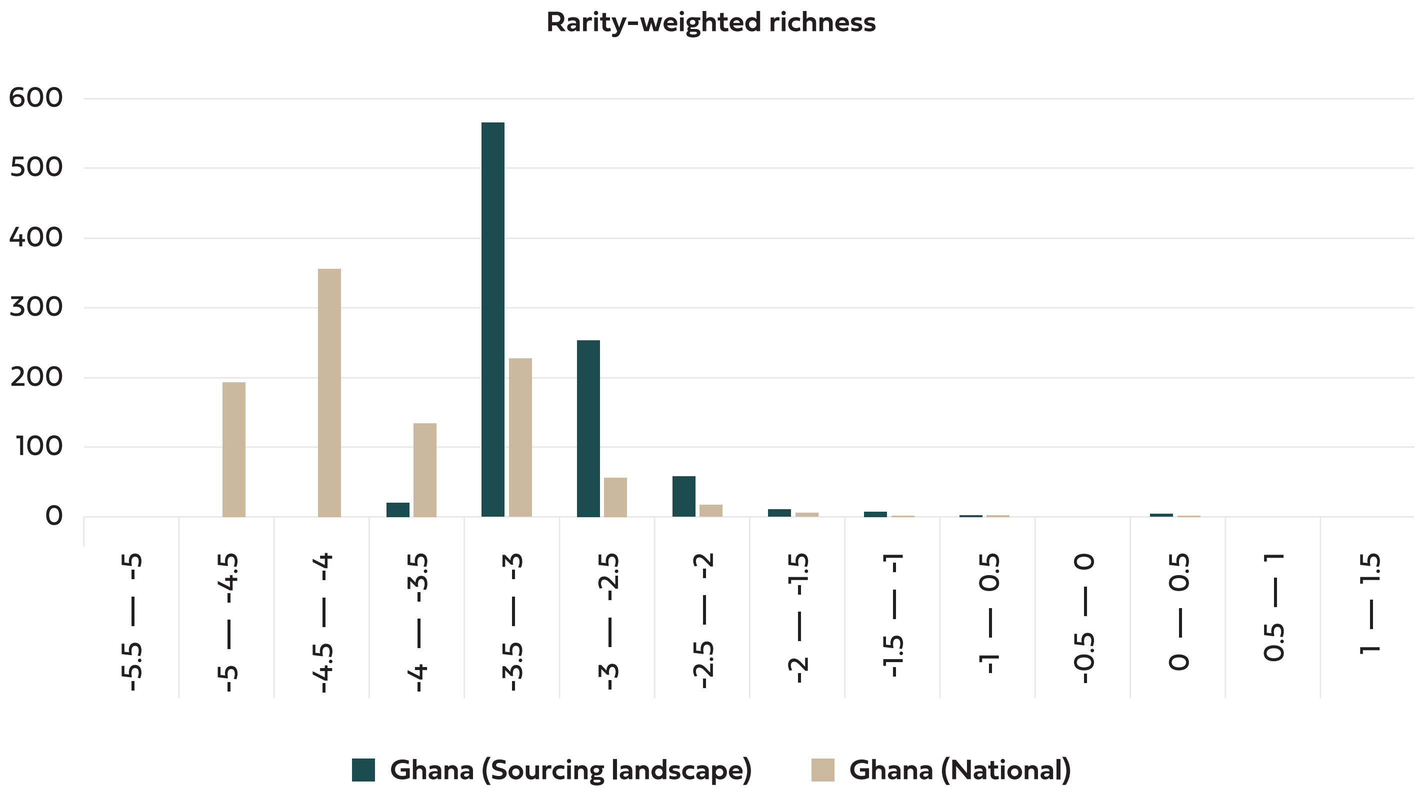
- The Ghana landscape has a more uniform distribution of small-ranged species, suggesting that most areas of remaining forest cover have a similar species value. Compared with the national distribution, the landscape has a higher rarity-weighted richness. Environmental impacts in this region will therefore have a disproportionate impact on Ghana's species.

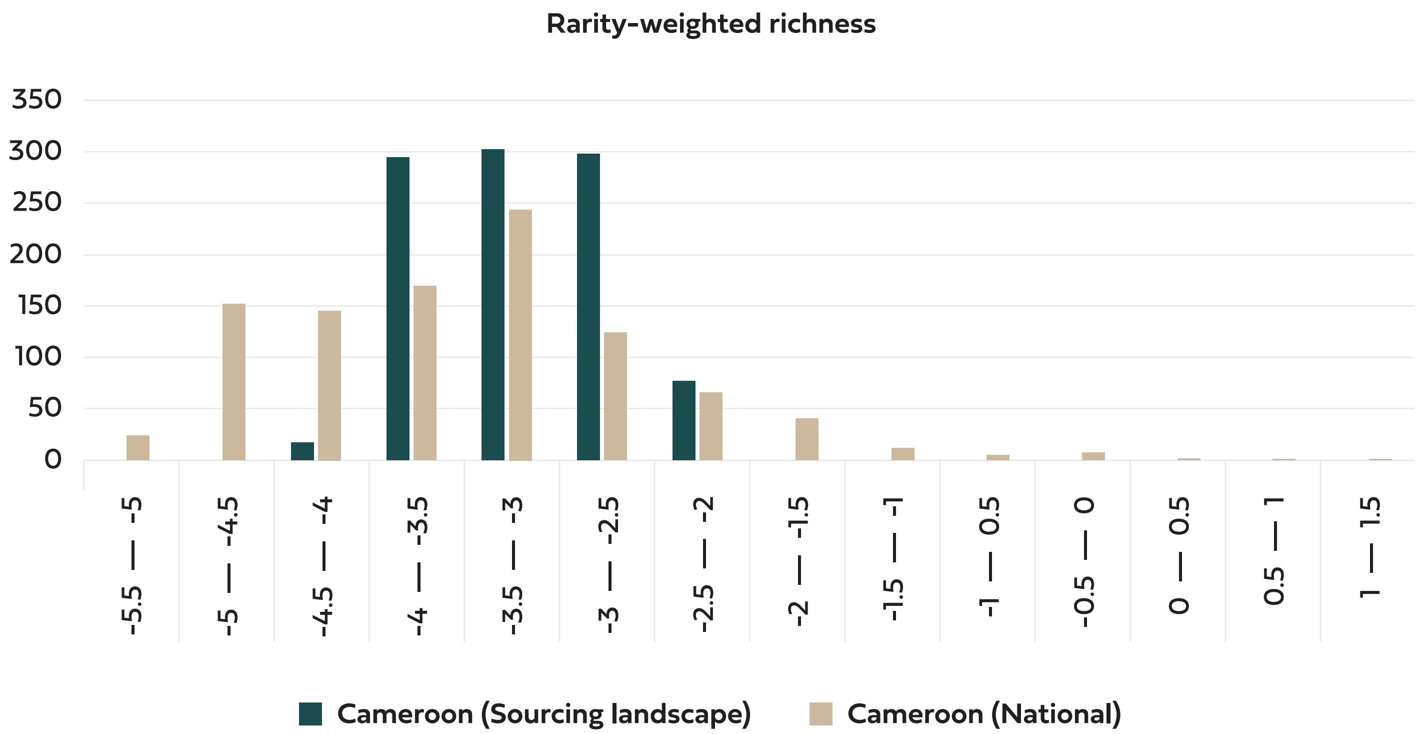
Figure 9: **Rarity weighted richness in Cameroon (left) and Ghana (right) sourcing landscapes**[9]



8 The boundaries and names shown, and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Figure 10: **These histograms reflect the distribution of Rarity-weighted richness values throughout each sourcing landscape and compare to a random selection of the same number of pixels from the wider national distribution of values. These allow a comparison of the relative species importance of sourcing landscapes within their respective countries.**





Application of information in strategy

Cameroon:

- As recent deforestation is more prevalent in the Cameroon landscape, the company focuses its strategy on ensuring cacao sourced from this landscape is not driving new deforestation, and highlights risks internally of expanding the volume sourced from this landscape in terms of the company's EU Regulation on Deforestation-free Products (EUDR) compliance. The company works to achieve the spatial specificity of its traceability needed to avoid sourcing from areas showing a high concentration of deforestation from 2020 onwards.
  - Addressing the concentration of small-ranged species in the northeast of the landscape revealed by the rarity-weighted richness metric, the company investigates further which specific species of strategic importance are found in this area with the support of local specialists, including identifying species that have high cultural or socio-economic value for local people. The company plans to work with local communities to support habitat conservation, and play an active role supporting the monitoring, recording and reporting of species populations.

Ghana:

- Compared to the Cameroon landscape, much of the deforestation within the Ghana landscape appears pre-2020, and therefore the company places greater emphasis within their Ghana sourcing strategy on work with community networks to promote sustainable agroforestry to contribute to increasing forest cover and landscape connectivity through participatory approaches.

6 Conclusions

Spatial datasets and metrics can be applied to describe nature status, significance, threats and trends at different locations, which in turn can inform assessments of dependencies, impacts, risks and opportunities.

For example, understanding the biodiversity significance and sensitivity of a location can complement data on pressures from company activities to inform assessments of potential impacts. Risk and opportunity assessments should also include consideration of the interactions between nature and people and particularly consider impacts on groups of people considered vulnerable (e.g. Indigenous Peoples, local communities, women, etc.). More granular local data, as well as primary collected data is often required to design robust responses and to track outcomes of decisions, as often the outcomes of company-scale actions are unlikely to affect trends in regional or global data layers.

Understanding elements of the scientific robustness of datasets and metrics is important, as well as, 'what' a given dataset or metric is measuring and therefore informing about a location, to be able to interpret results effectively and apply them in decision making. Crucially, while applying an extensive set of data layers and metrics is impractical, a strategically selected complementary set of datasets is needed to capture multiple elements and values of nature and ensure an effective nature strategy.

Annex 1: **Additional common datasets**

Type of spatial dataset or metric	Distribution of (threatened) species
Name	IUCN Species ranges
Other similar layers	IUCN rarity-weighted richness, IUCN species richness.
Description – how does the metric work?	Species ranges are available from the IUCN Red List. When species are assessed by the Red List, a map is provided either showing the point where the taxon has been collected or the polygon showing the taxon's known habitat. The taxon is then assessed using the IUCN Red list criteria, which includes assessing the biome, population trend and movement pattern.
What information does the metric tell you?	The species distributions maps tells you the where the species may be found.
How do you extract values from the layer?	Species ranges can be downloaded as polygons or points, with the Red List category, criteria and biomes, and analysed in GIS. The polygons and points contain data on the biome, shape area, scientific name of each species, and IUCN Red List extinction risk category. Information from the species list such as IUCN Red list criteria, assessor, population trends and movements patterns can be added to the polygons in GIS for more detailed analysis.
How should you interpret the values?	The polygons represent the known range of the species. Data deficient species are not mapped.
Accuracy?	The assessment process is robust, and maps follow standards.
Spatial coverage and granularity	More than 166,000 species have been assessed by the IUCN Red list and therefore have species range maps available across the world.
Responsive? What actions would it detect?	The species range maps aren't responsive to actions. The species range maps may be reassessed and updated when the species is re-assessed by IUCN Red List.
Most applicable role	Screening and prioritising.
Can it be used to monitor progress?	Species range maps cannot be used to monitor progress, as the maps are static. To monitor progress, on the ground monitoring of species can be used at project sites.
Useful in conjunction with?	Ecosystem extent and condition metrics.
Licensing terms	Data are made freely available for non-commercial use. Commercial use of the data will be through the Integrated Biodiversity Assessment Tool (IBAT).

Type of spatial dataset or metric	Distribution of (threatened) species
Name	GBIF – Species Occurrence
Other similar layers	
Description – how does the metric work?	The Global Biodiversity Information Facility (GBIF) provides global data that document the occurrence of species. The GBIF occurrence dataset combines data from a wide array of sources including specimen-related data from natural history museums, observations from citizen science networks and environment recording schemes.
What information does the metric tell you?	Data offers evidence of the occurrence of a species (or other taxon) at a particular place on a specified date.
How do you extract values from the layer?	Data and values that formulate species occurrence such as number of occurrence records, spatial coverage, temporal trends and taxonomic coverage can be extracted from different types of data layers as part of the species occurrence dataset.
How should you interpret the values?	Values will be interpreted depending on the specific type of data. For example, a high value in the occurrence record represents a high species occurrence.
Accuracy?	GBIF ensures data accuracy through automated cleaning, metadata documentation, and expert validation. This might include applying filters to remove errors, standardise species and names. Metadata provides details on collection methods and confidence levels.
Spatial coverage and granularity	GBIF currently integrates datasets documenting over 1.6 billion species occurrences, growing daily.
Responsive? What actions would it detect?	The dataset is not responsive to the actions taken. Changes can only be tracked when updates of the specific dataset is available.
Most applicable role	Screening and prioritising.
Can it be used to monitor progress?	While species occurrence data are dynamic and can potentially be used to monitor progress, availability of updates on the datasets would be required.
Useful in conjunction with?	Ecosystem extent and condition metrics.
Licensing terms	Data are generally available for non-commercial use. Commercial use of the data will largely depend on the specific conditions set by individual data publisher. Licensing details can be found here.

Type of spatial dataset or metric	Distribution of ecosystem types
Name	Ecoregions
Other similar layers	IUCN Global Ecosystem Typology.
Description – how does the metric work?	The ecoregion map shows the distribution of 846 terrestrial ecoregions, categorised by 14 terrestrial biomes.
What information does the metric tell you?	The dataset tells you the location and distribution of the ecoregion, the goal of protection e.g. 80%, and level of protection. The level of protection is categorised as 1 – Half Protected • 2 – Nature Could Reach Half • 3 – Nature Could Recover • 4 – Nature Imperiled.
How do you extract values from the layer?	Clicking on the ecoregion in the map takes you to a webpage which shows information including the protection status.
How should you interpret the values?	1 – Half Protected • 2 – Nature Could Reach Half • 3 – Nature Could Recover • 4 – Nature Imperiled.
Accuracy?	
Spatial coverage and granularity	Global coverage of terrestrial ecoregions.
Responsive? What actions would it detect?	The ecoregion map is not responsive. It is not clear when future assessments will take place in order to monitor any changes.
Most applicable role	Screening and prioritising.
Can it be used to monitor progress?	The ecoregion map is not responsive. It is not clear when future assessments will take place in order to monitor any changes. To monitor changes in the ecoregion, other data sources could be used such as on the ground monitoring of the ecosystem condition and state, or satellite monitoring of the ecosystem.
Useful in conjunction with?	Species datasets.
Licensing terms	Licensing terms not stated.

Type of spatial dataset or metric	Distribution of ecosystem types
Name	IUCN Global Ecosystem Typology
Other similar layers	
Description – how does the metric work?	The IUCN Global Ecosystem Typology is a hierarchical classification system that, in its upper levels, defines ecosystems by their convergent ecological functions and, in its lower levels, distinguishes ecosystems with contrasting assemblages of species engaged in those functions. The Typology has divided the biosphere into five global realms, 25 biomes, and 108 Ecosystem Functional Groups.
What information does the metric tell you?	The dataset tells you the location and the distribution of the 108 Ecosystem Functional Groups, the 25 biomes and 5 global realms.
How do you extract values from the layer?	Clicking on the location provides information about the specific Ecosystem Functional Group, as well as the biomes or realms it is classified under.
How should you interpret the values?	The detailed description of the Ecosystem Functional Groups, Biomes, and global realms that the location belong to can be found in the descriptive profile of the IUCN Global Ecosystem Typology 2.0.
Accuracy?	Adopted in the World Conservation Congress 2020, the typology is developed by IUCN and academic institutions.
Spatial coverage and granularity	Global Coverage.
Responsive? What actions would it detect?	The typology is not responsive to actions.
Most applicable role	Screen and prioritising.
Can it be used to monitor progress?	The typology is not responsive. It depends on the updates/ new versions of the typology issued by IUCN. To monitor changes, other data sources could be used such as on the ground monitoring of the ecosystem condition and state, or satellite monitoring of the ecosystem.
Useful in conjunction with?	Species datasets.
Licensing terms	Data are freely available for non-commercial use. Commercial use is prohibited without prior written permission of the copyright holder.

Type of spatial dataset or metric	**Water stress**
Name	Water Footprint Assessment Tool
Other similar layers	
Description – how does the metric work?	Water Footprint Assessment Tool can be used to assess the green, blue and grey water footprints of sectors, across countries, river basins, commodities, and products.
What information does the metric tell you?	The metric tells you the total water footprint across all sectors and crops per country or river basin.
How do you extract values from the layer?	In the web-based tool, you can select the country, river basin, world map, raw product or commodity, and view the green, blue, grey or total water footprint as a percentage of m^3 per year.
How should you interpret the values?	
Accuracy?	Based on a scientific paper by Hogeboom 2020.
Spatial coverage and granularity	Global coverage, with resolution to river basin level.
Responsive? What actions would it detect?	No, it is not specified how often the database will be updated.
Most applicable role	Screening and prioritising.
Can it be used to monitor progress?	The Water Footprint Assessment Tool may not be best suited to monitor progress as it is not specified how often the tool is updated. To monitor progress on water stress you could look at local hydrological models.
Useful in conjunction with?	Ecosystem condition and extent data, species data.
Licensing terms	Licensing requirements not specifically stated. Enquiry on both the commercial and non-commercial use of the tool can be through their contact information provided here.

Type of spatial dataset or metric	Human pressure
Name	Human Footprint Index
Other similar layers	
Description – how does the metric work?	The human footprint index is a global map showing human pressures in 1993 and 2009. It is built using eight variables of human pressure; built environment, population density, nighttime lights, croplands, pasture lands, roads, railway, navigable waterways.
What information does the metric tell you?	The metric ranges from 0–50, with greatest pressure at 50.
How do you extract values from the layer?	You can download the data layers and analyse in GIS.
How should you interpret the values?	0 is lowest human footprint and 50 is the highest human footprint. In 2009 the area-weighted average for all terrestrial land was 6.16.
Accuracy?	The latest data layer is for 2009, therefore it is a useful screening tool but may not reflect on the ground pressures.
Spatial coverage and granularity	Global terrestrial coverage at 1km^2 resolution.
Responsive? What actions would it detect?	No, it is not responsive to actions as it is a static data layer from 2009.
Most applicable role	Screening and prioritising.
Can it be used to monitor progress?	No, it is not responsive as it is a static data layer from 2009. You could ground truth the information by using more recent data for each of the eight variables assessed in the human footprint index.
Useful in conjunction with?	Species and ecosystem metrics.
Licensing terms	Commercial use of the data is prohibited unless written permission is obtained from the license holder. Non-commercial use is allowed with acknowledgement of the license holder made.

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