Biodiversity Indicators for Extractive Companies: Proteus Meeting Pre-Read

Executive summary

Biodiversity indicators are an essential tool for understanding and managing changes in biodiversity. Efforts by the private sector to develop biodiversity indicators have often focussed on measuring biodiversity management actions rather than measuring on the ground changes in the status of, and pressures on, biodiversity. This is largely due to methodological and data challenges. This document summarises the results of an analysis of the needs, drivers and current practice relating to biodiversity indicators within the extractives sector. It is based on interviews with eleven companies and a desk review of existing and emerging guidance and approaches. This document is a first step in understanding how progress might be made within the sector in creating effective indicators to establish corporate biodiversity performance.

Key findings

- **Drivers for indicator development vary, both between and within companies:** at the site level, local regulations are the primary driver, whereas at the corporate level drivers are more varied (investor pressure, monitoring compliance against internal policies and standards, communication with internal stakeholders).
- **Existing biodiversity related reporting frameworks, guidance and indicators are not meeting the needs of those interviewed**.
- **All companies highlighted the importance of being able to aggregate site-level indicators to corporate level** in order to strengthen monitoring and reporting on biodiversity. Indicators must also be cost-effective, easy to produce/communicate, sensitive to change and credible.
- **Significant monitoring activities are underway at site level but aggregation of data and indicators up to corporate level is minimal.** Corporate reporting focuses on implementation rather than impact. Use of tailored site-specific monitoring approaches makes securing a corporate level view on biodiversity impacts and contributions challenging.
- **Existing approaches in other sectors may have potential for adaptation to meet companies' needs** and present different possible models for future indicator development that merit further exploration.

Models for indicator development identified for further exploration

Sector interviews identified three models for further evaluation: **a 'core suite' of biodiversity indicators** to act as a minimum standard for each site; a **decision tree** to help users determine which indicators from a set should be used at different sites; and a **single composite indicator** that brings together various measures of biodiversity to give an overall picture. Desk research identified a further model - **a framework which allows sites to score the importance of site-specific pressures on or state of biodiversity** in a simple and comparable way.

1. Introduction

A number of attempts have been made to design and deliver private sector focused biodiversity indicators e.g. the Energy and Biodiversity Initiative (EBI 2003), the Global Reporting Initiative indicators on biodiversity (GRI 2016), the 2005 review conducted by Earthwatch and Rio Tinto (Tucker 2005), the 2012 ICMM analysis of member's biodiversity performance (Globalbalance & TBC 2013) and IPIECA's sustainability reporting guidance (IPIECA & IOGP 2015). However, these initiatives have largely focussed on measuring and reporting on actions taken, rather than performance (impact) on the ground.

A desire to better understand and communicate the impacts of company activities on – and their contribution to - the environment is prompting increased interest in private sector biodiversity indicators. This scoping study aims to understand the drivers for biodiversity indicators and the specific requirements of Proteus members and the extractives sector more broadly. This is the first phase in a two-phase project which, subject to funding, aims to develop indicators for measurement, monitoring and management of biodiversity impacts in the extractive sectors. It is not an exhaustive review of the strengths and weaknesses of the indicator approaches assessed and UNEP-WCMC provides no endorsement of any of the indicator methodologies referenced.

Structured interviews were conducted with eleven extractives companies to identify key drivers, uses and needs for biodiversity indicators, and the current status of indicator development within the sector (see section 2). A desk-based review was undertaken of existing and emerging indicators and indicator initiatives, screening them against the user needs identified through interviews (see section 3).

This document brings together the results of the scoping study and identifies models for biodiversity indicator development to be discussed with Proteus members and guests from the Cross Sector Biodiversity Initiative at a workshop on 28th June 2017.

Box 1. Definitions and terms

Indicator: "A quantitative or qualitative factor or variable that provides a simple and reliable means to measure achievement, to reflect changes connected to an intervention, or to help assess the performance of a development actor"(OECD/DAC 2002). It may be a simple measure or metric e.g. a count of species or individuals in a population, or a compound index, which brings together a number of metrics into an easily understandable trend. Indicators are primarily communication tools, used to convey information about an issue of concern; one given measure or metric may be used for a variety of different indicators, depending on the interpretation of the indicator and the question that it is answering. There are two main types of indicators:

Impact indicators: sometimes known as 'performance' or 'outcome' indicators. These provide information on actual impacts of actions taken to address biodiversity or drivers of change. They help to answer the question, 'how are our activities affecting biodiversity?' (Bubb *et al.* 2014).

Implementation indicators: sometimes known as 'process' or 'output' indicators, these are used to monitor the completion of actions that enable conservation to be achieved: e.g. whether a Biodiversity Action Plan has been developed and implemented or not (but not to track the actual impacts on biodiversity of the Biodiversity Action Plan). They help to answer the question, 'did we do what we said we would, when we said we would?' (Bubb *et al.* 2014).

2. Drivers and status of biodiversity monitoring in the extractive sector

This section summarises the results of structured interviews with 11 companies.

2.1 Drivers for monitoring and reporting on biodiversity

A range of drivers for monitoring biodiversity were identified (see figure 1). At the site level, local regulations are the primary driver, whereas, at the corporate level, drivers are more varied.

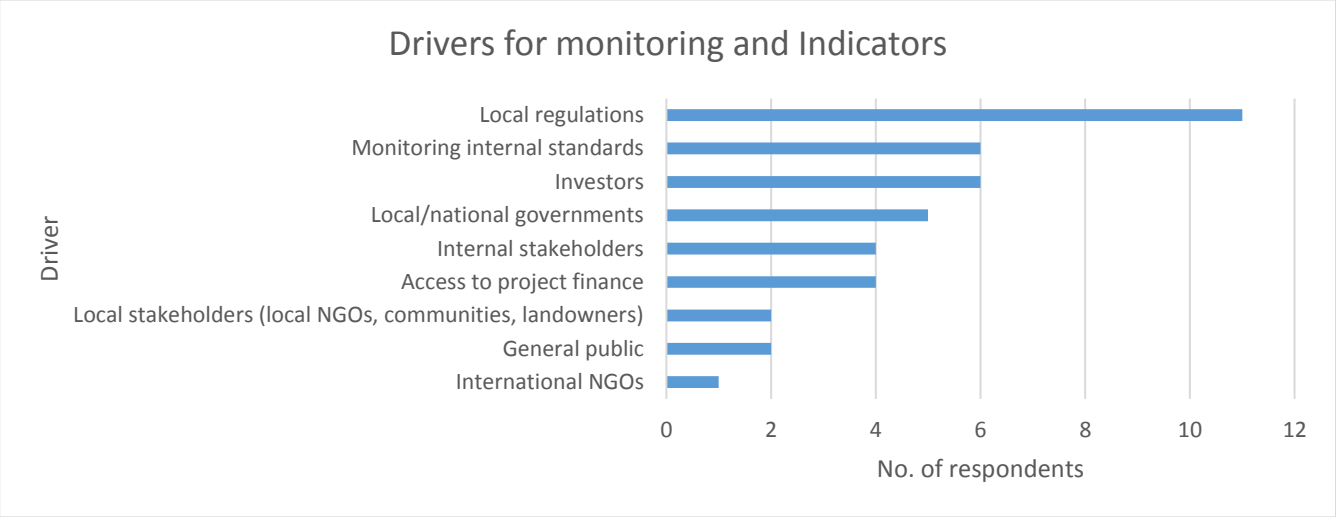

Figure 1: Drivers for monitoring and reporting on biodiversity as reported by interview respondents

- All interviewees cited **regulations**, **predominantly local or national**, as a driver for biodiversity monitoring, with three saying this was the primary driver. As a result **monitoring is largely site-specific**, **preventing comparison** across sites or meaningful aggregation up to business unit or corporate level and limiting the opportunities for corporate level oversight and reporting on biodiversity.
- **Investor interest** was identified as a key driver for biodiversity monitoring and reporting. However, it was noted that interest and information required **varied greatly across different investor groups**. For some interviewees, investors were considered to be a minor driver. It was felt that biodiversity might become of increasing interest to investors in the future; equally, better indicators would help investors understand and thus take an interest in biodiversity.
- Monitoring **compliance against internal policies and standards**, **communication with internal stakeholders** such as corporate management, sustainability teams and business units and **communications with local and national governments** were all considered important drivers. Pressure from international NGOs was not considered a significant driver.

2.2 Primary uses of indicators

The **identification of risk** within the companies' portfolio of operations and **business decision-making**, at local and corporate levels, were cited by most of the companies interviewed as the primary use of indicators. Other uses cited include:

- Monitoring **compliance** against internal standards
- Managing **reputational risk** through effective communication with the general public
- **Engagement with local communities** (noting that information requirements of communities may not always relate to issues impacted by the company)
- Demonstration to **government partners** of ability to operate near sensitive sites
- **Internal reporting**
- **External reporting,** such as compliance reporting or sustainability reporting.

2.3 Current practice

External Reporting schemes

The **Global Reporting Initiative (GRI)** was the external reporting scheme most often referred to by interviewees with seven respondents indicating that they report against the GRI standards. Other reporting requirements, indicators or guidance referred to included:

- The oil and gas industry guidance on **Voluntary Sustainability Reporting** (produced by IPIECA, API and IOGP).
- The **Dow Jones Sustainability Indices**, which include specific questions on biodiversity.
- The **Sustainable Development Goals** (SDGs), which were identified as an evolving influence on five companies. Ten of the 14 reviewed sustainability reports made at least brief references to the SDGs, although without details of the importance of biodiversity underpinning these.

A number of issues were noted with the GRI standards, namely:

- There was **not enough guidance** given on the spatial scale of data required or specific data needed (two respondents)
- The **indicators requested were not relevant or useful** for business needs, yet required a lot of work to produce (four respondents).

Table 1 shows the results of an analysis of 14 companies, including those interviewed for this report and other Proteus members, and their reporting against biodiversity-relevant GRI indicators. The nature of information reported is variable and largely qualitative in nature.

This, combined with the lack of broad uptake of the **GRI indicators** suggests that they **are not adequately meeting the needs of the extractive sector.**

Table 1: Analysis of 14 companies' sustainability reports and websites to identify information disclosed on biodiversity against the GRI

Disclosure requirement	None	Partial	Full	Examples of reporting
304-1 – Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	43%	50%	7%	• Details of sites in/adjacent to protected areas or areas of high biodiversity value (e.g. % of sites, number or name of sites). • No detail on the attribute leading the sites to be protected or classified as high biodiversity value or management interventions.
304-2 - Significant impacts of activities, products, and services on biodiversity	7%	93%	0%	• References made to pollution, construction/use of plants, mines or infrastructure, habitat conversion, extent of areas affected • No reference made to invasive species introduction, reduction in species or changes in ecological processes, species affected, duration or irreversibility of impacts.
304-3 Habitats protected or restored	64%	36%	0%	• Extent of area that had been restored. • Extent set aside/ protected for conservation. • Reference to conservation partners.
304-4 -IUCN Red List species and national conservation list species with habitats in areas affected by operations	86%	0%	14%	• Numbers of species in each IUCN category with habitats in areas affected by operations.

Site-level biodiversity monitoring

- **All companies interviewed monitor biodiversity at the site level,** with a suite of site-specific indicators used to monitor changes in biodiversity and assess implementation of BAPs. Proxy measures, such as land-cover/land-use change, are used alongside direct indicators of biodiversity. All companies produced implementation/process indicators.
- **Indicators used at different sites varied greatly**, depending on local needs and regulations; this variation was generally acknowledged to **hinder corporate-level understanding and communication of changes in biodiversity.**
- The **focus was largely on state rather than pressures,** although both the state of biodiversity (e.g. species populations) and pressures on biodiversity (e.g. habitat clearance) are monitored.
- **Quantification of losses and gains for species or habitat features was less common**, with only two companies taking this route (although two additional companies expressed an interest in doing so).
- **Monitoring and reporting was primarily undertaken for owned and operated sites,** although the company may try to influence monitoring at joint ventures to ensure corporate standards are met.

Reporting at business unit and company levels

- Reporting on impacts and associated management is **largely qualitative** in nature, **process-focused** (e.g. reporting on the level of progress towards sites' BAPs at the company level, rather than reflecting species or habitat monitoring that forms part of the individual BAPs) and **draws on examples or case studies.** It is not used for quantifying corporate-wide impact and contribution to biodiversity conservation.
- There was a **clear demand from respondents to be able to aggregate biodiversity indicators from individual operations up to the corporate or business unit level**, primarily to allow a better understanding of group risk and overall performance in biodiversity management.

Data use

- **A mixture of scales and types of data are used**, depending on data availability (e.g. if a good local, regional and or national biodiversity database already exists) and its intended use (e.g. high-level strategic decisions about a site versus local management decisions).
- **Technological advances may present an opportunity to overcome and address some of the existing gaps and challenges in data collection**. All companies make use of technology, notably remote sensing, with five also using drones, particularly for marine data. A number of respondents expressed an interest in exploring the opportunities offered by environmental DNA (eDNA)[1] technologies for cost-effective monitoring.
- **Economic/valuation approaches to biodiversity are not currently being used**, although five respondents expressed an interest in doing so. One highlighted concerns about the risks in such data fuelling decisions with negative impacts for biodiversity.

2.4 Challenges in developing and monitoring indicators

Challenges companies face with the current application of biodiversity indicators, monitoring techniques and data production include:

- **Scope and boundaries:** Understanding the cause/effect relationship and linking changes in state of biodiversity[2] to the company's activities, and identifying and accounting for externalities.
- **Methodological challenges in measuring state of biodiversity:** How to monitor habitat quality rather than quantity; how to identify key priorities to monitor; how to understand if a decline in a particular species is affecting the functioning of the ecosystem.
- **Methodological challenges in monitoring management responses:** Comparing impacts and improvements across different initiatives, e.g. where like-for-like offsets are not practical, how to compare the impact of the activity with the positive results from the offset?
- **Challenges around aggregation:** Ensuring consistent methodologies that would allow primary data to be aggregated to corporate level to give an overall view of performance.

[1] eDNA can be defined as: "genetic material obtained directly from environmental samples (soil, sediment, water, etc.) without any obvious signs of biological source material" (Thomson, P. & Willerslev, E. 2015)
2 A state indicator expresses an actual resource condition, often based on direct field measurement (Adapted from OECD Glossary of Statistical Terms, https://stats.oecd.org/glossary/detail.asp?ID=2539)

- **Sensitivity of data to change over appropriate timelines:** Ensuring that ecological data can be collected to identify change/impact in the timescales required to inform (often-rapid) project development.
- **Data cost:** The direct and associated cost of data collection (including technology required), which leads to less frequent collection and thus prevents trend identification.
- **Quality and accessibility of data:** Access to and availability of recent and robust data at an appropriate scale can be challenging. Data quality and resolution differ across the world.

2.5 Key requirements for biodiversity indicators

Respondents identified the following features of a biodiversity indicator that is fit for purpose for the extractives sector:

- Have **minimal cost** implications.
- Be **easy** to produce and communicate for a non-specialist e.g., data collection is straightforward.
- Enable site-by-site performance **comparisons** and **aggregation** to company level.
- Be **sensitive** to change in the issue of concern.
- Be reliable and scientifically **robust**.
- Allow the **separation of the company's impact** from that of others in the area.
- Be **applicable** in a wide range of environments and contexts.

There were also a number of differing needs expressed in terms of a 'final product':

- A suite of indicators that could be applied in different situations or for different features, with guidance, criteria and thresholds to select the appropriate measure (2 respondents)
- A 'core suite' of indicators to form a minimum standard for all sites in all companies to monitor (1 respondent)
- A single composite indicator of biodiversity that would provide a comprehensive overview and be comparable across sites (1 respondent). However, one respondent noted that is highly likely that there is no 'one-size-fits-all' solution.

QUESTIONS FOR DISCUSSION

The following questions will be discussed on the 28th June:

1. Are the results reflective of the sector as a whole?
2. Do different user needs require different indicators/ reporting approaches?
3. Are there any differences between needs and drivers of oil and gas versus mining industries?

3. Existing frameworks and methodologies for biodiversity monitoring and management

This section presents the results of a review of existing and emerging guidance, approaches and methodologies for monitoring biodiversity in the private sector and more broadly. **While none could be used 'off the shelf' to meet all the needs identified by companies, a number provided potentially useful models for future indicator development.**

3.1 Review methodology

We reviewed sector-specific guidance documents, peer-reviewed and grey literature, and global/regional conservation and policy monitoring frameworks against a set of evaluation criteria drawn from industry interviews and established criteria for good indicators (see table 2). A survey of members of the Biodiversity Indicators Partnership and Global Business and Biodiversity Platforms were used to identify emerging initiatives. We worked with Cambridge Institute for Sustainability Leadership (CISL) to ensure our approach was complementary to theirs.

Table 2: Criteria for evaluation of existing indicator methodologies against user needs

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

** Considered non-essential criteria, and therefore weighted lower in comparison to the other categories.*

It is important to note that this high-level review of indicators and methodologies was based on accessible information, without consultation with the indicator providers and without a detailed review of the overall robustness of the methodology. This would be a key next step to fully understand if the indicator could be applied in the extractive sector context. Equally, further scientific review would be required to ascertain the rigour and validity of indicators, particularly those still under development. For more information on the documents reviewed and any specific indicators prescribed or suggested, see Annex 2 (included in a separate document).

3.2 Mining and oil and gas sector guidance

- **None of the twelve extractives sector-focused guidance** documents, approaches and methodologies that were reviewed **meets all the needs of the extractives industry,** as identified during the interviews, **nor do they provide a clear model for indicator development**.
- Some detailed a **process** (e.g. steps in how to manage for and/or monitor biodiversity), whereas others provided a **framework for monitoring** (e.g. key headings or topics, or a framework of specific indicators to report against).
- **Only the GRI provides a suite of indicators for companies to report on across all sites**; however, these focus predominantly on identifying where the company is active in potentially important sites for biodiversity, and likely significant impacts, but do not quantify changes in biodiversity across sites or provide a measure of effectiveness of management interventions. The *Energy and Biodiversity Initiative, Biodiversity Indicators for Monitoring Impacts and Conservation Actions*, and *CSBI Good Practices for the Collection of Biodiversity Baseline Data* gave suggestions for indicators that might be used, but specified that these were just given as examples, rather than as a comprehensive framework.

3.3 Existing and emerging guidance from other sectors

- **A number of indicator initiatives are currently being (or have been) developed within other sectors which may have value for the extractive sector.** These ranged from composite indicators that provide a simple overview of biodiversity at site level, to a single indicator, to a core suite of basic indicators (for example as developed for gypsum quarries in Pitz *et. al* 2016); such models would respond to different interviewees' requests, and allow basic standardised impact monitoring across sites and thus aggregation to corporate level.
- **All five of the composite indicator methodologies reviewed had traits our interviews had identified as important**, such as comparison across sites and aggregation to corporate level, sensitivity to change. The indicators reviewed were mostly **sensitive to change**, designed to be updated at least annually, but the **underlying data were often complex to obtain** - several needed a mixture of primary data and existing (e.g. modelled) data.
- **Scientific validity was difficult to assess** due to the emerging nature of most methodologies or the lack of uptake thus far, but is likely to improve as indicators are tested.
- **Linkages to global targets and policies were not clear.** All indicators were only indirectly relevant to the SDGs or Aichi Targets, requiring further interpretation.
- **All indicators would require some technical capacity to produce**, although the indicators proposed by CISL and Ecometrica were particularly simple to understand for non-technical users.

Overall, the review suggested that a **single composite indicator could be a useful model** for future indicator development, and that the methodologies proposed by **Ecometrica, CISL** and **IUCN's BIRS** had potential (with sector-specific adaptations, and further scientific review) to meet the needs and requirements identified by the companies during the interviews. More information on these three methodologies is provided in Table 3 below.

Table 3: Overview of composite biodiversity indicators considered potentially applicable to the extractives sector

Indicator	Overview of methodology	Users & uptake	Data required
Healthy Ecosystem Metric – Cambridge Institute for Sustainability Leadership (CISL)[3]	A composite metric that encapsulates a company's impacts on a given ecosystem. Ecosystem impact is defined as the total land area of a company's operations and supply chains multiplied by its impact on biodiversity. Impacts are defined as changes in quantity or quality of biodiversity. Final metric provides a weighted land area that is adjusted for impact (reported in hectare equivalents, or Ha_{Eq}).	**Users:** Companies with impact on land **Uptake:** Developing	Land area: ha required for company's operations & supply chain. Land use type: different land uses required for production of raw materials used by the company and the intensity of their management Sourcing locations to assess the impact on the quality of a particular habitat. Measure of biodiversity quality (forest cover, ecoregions)
Normative Biodiversity Metric - Ecometrica[4]	Assesses quality of the habitat found on their land holdings. Produces a quantitative biodiversity score, which can be used to track performance over time. Outputs are a score for habitat pristineness and another for endangered species presence.	**Users:** Land owners/ managers **Uptake:** Unknown	1) Spatial data: location and boundaries of land owned by the user, 2) Information on the quality of habitat present on the user's land, referred to as "pristineness" and 3) Information on presence of endangered species.
Biodiversity Indicator and Reporting System (BIRS) – IUCN[5]	Assessment of overall suitability of landholdings for biodiversity. Provides companies with information on how they are impacting ecosystems and habitats. Calculate biodiversity condition at all sites annually. Create a Site Biodiversity Condition Class for each assessed site. Once site-level Condition Classes have been measured they are aggregated to create regional/national and global indices.	**Users:** Cement & aggregates **Uptake:** in use	Types of habitat on site. Extent of each habitat type (i.e. quantity). Ecological condition of each habitat (i.e. quality), taking into account threats and measures to enhance habitats Ecological importance of habitats to develop a Habitat Context Factor.

3.4 Existing and emerging guidance from outside the private sector

There are multiple indicator frameworks in use by governments and conservation organisations at the global, regional and national scales. Review of these frameworks showed three to be of greatest potential utility: the Convention on Biological Diversity framework, the Essential Biodiversity Variables approach and the Important Bird Area (IBA) monitoring approach.

- **The Convention on Biological Diversity (CBD) framework is not directly transferable to corporate indicators and monitoring but the indicators it uses may have value.** The global frameworks under the CBD and SDGs contain a very broad range of indicators for its goals and targets, many of which are not directly relevant or useful for companies. Some are only

[3] http://www.cisl.cam.ac.uk/publications/publication-pdfs/healthy-ecosystem-metric-framework.pdf
[4] https://ecometrica.com/assets/Update-and-Guidance-on-Ecometricas-Normative-Biodiversity-Methodology-final_kv4Feb2014.pdf
[5] https://portals.iucn.org/library/sites/library/files/documents/2014-055.pdf

applicable at the global scale or do not provide useful information at smaller scales, whereas others can be applied at national or local scales.

- **The Essential Biodiversity Variables (EBVs)** [6] **approach could inform the development of a model around a core suite of indicators.** This approach suggests a framework of core variables (e.g. species ranges & populations, species traits, ecosystem extent & structure) for monitoring at various scales, from which a comprehensive and scaleable picture of biodiversity status can be obtained.
- **Several EBVs have potential for use by the private sector others are less appropriate**, EBVs around ecosystem structure and diversity are likely to be particularly useful.
- **The IBA Monitoring Approach could provide a simple and applicable model for extractives companies,** being designed for use at site level in any context, to permit a comparable overview of pressures on and status of biodiversity (see Box 2 below). Unlike the other frameworks reviewed, this does not prescribe indicators but rather **sets out an approach to score state and pressures at a given site in a way that is then comparable across sites and can be aggregated upwards.**

Box 2: Monitoring Important Bird Areas – BirdLife International[4]

Overview of methodology: *Monitoring framework that provides Managers of Important Bird Areas (IBAs) with a standardised scoring system to record the condition of (i.e. "State") and threats (i.e. "Pressures") to IBAs, as well as the conservation actions that have been implemented in response to those threats (i.e. "Response").*

Target user(s): IBA site managers supported by local communities and authorities.

Data required:

- Pressure: this includes information on the timing, scope, and severity of threats to biodiversity in the IBA.
- State: this measures the condition of IBAs (i.e. how much the IBA contributes to the maintenance of the most endangered species found within the IBA).
- Response: this includes information on the extent to which conservation actions cover the IBA, existence and quality of a management plan, and implementation of conservation measures.

Extent of use/uptake: Not widely used beyond the BirdLife International Partnership.

Annex 2 presents the most relevant of these frameworks with a brief summary of each.

Twenty-two individual global indicators from the CBD indicator framework (which includes all biodiversity-relevant SDG indicators) and 18 of the Essential Biodiversity Variables which were considered most applicable to the extractives sector were reviewed against the criteria above.

- While the global indicator suites as a whole do not provide an appropriate framework for corporate use, **some individual indicators could serve as a useful basis for corporate**

[6] The 22 Essential Biodiversity Variables (EBVs) have been identified by the Group on Earth Observations Biodiversity Observation Network (GEO-BON) as a suite of basic "measurements required to study, report, and manage biodiversity change, focusing on status and trend in elements of biodiversity".

indicators. Some indicators could be **directly disaggregated** to any scale required, allowing indicators to be produced at minimal cost or effort to companies, while, for others, the **methodology or underlying data** could be used by companies.

- **No existing global indicator scored perfectly against all criteria for direct use by companies**. However, there are a number of potentially useful methodologies or underlying datasets that could be explored for their application at site level in conjunction with indicator providers, depending on the needs of the company. A number of existing global indicators offer access to near real-time high-resolution data, while several are based on new modelled data products such as the PREDICTS database (Newbold *et al.* 2012; www.predicts.org.uk) which may offer a cost-effective alternative for biodiversity data.
- **All models will require refinement and testing in consultation with companies.**

Box 3: Three examples of global indicators and their potential use

Of the existing and operational global-scale indicators reviewed, a number scored highly and are worthy of further consideration. Three are discussed below:

The **Wildlife Picture Index (WPI)** uses camera trap data to quantitatively measure changes in species variation over time. It can also be used for other presence/absence data, such as information collected using sound sensors. The data is collected from 17 protected areas in tropical forests which are aggregated to provide the global index. As such, direct **disaggregation** of the indicator is possible but is only likely to be of use for sites in protected areas; the **data** itself may not be appropriate for use by companies, but the **methodology** has potential for use at the site level and for aggregation.

Trends in tree cover is based on a data layer produced by Hansen *et al.* (2013). This high-resolution (30m) global remotely sensed dataset tracks trends in forest cover in near real time. This globally consistent and locally relevant indicator has the potential to be directly **disaggregated** by companies to site level, or there is also potential to use the underlying imagery **data**.

The **Local Biodiversity Intactness Index** is based on a purpose-built global database of local biodiversity surveys combined with high-resolution global land-use data. The index provides estimates of human impacts on the intactness of local biodiversity worldwide, and how this may change over time. The indicator can be reported annually at a 1km resolution, giving great potential for site-level use. Further discussions with the indicator provider would be required to fully explore the ways in which the indicator and its data can be used, but in its current form there are clearly opportunities for **direct disaggregation** by companies.

The results of the review are included in Annexes 3 and 4 (contained in a separate document to this pre-read) and more details on three indicators that showed most potential for use by companies are in Box 3 above.

QUESTIONS FOR DISCUSSION

The following questions will be discussed on the 28th June:

1. Is a single indicator feasible and credible for the sector at site and corporate level?
2. What links should be made to policy-focused indicators?
3. Can we use proxies?

4. Models for application by the extractives sector

A number of different models that could be explored for corporate indicator development in a potential phase 2 of this work. This section outlines those models and the role for Proteus partners in exploring them.

4.1 Different models for indicator development

Three models were suggested during interviews:

- **Model 1: Single indicator of biodiversity:** Single overarching biodiversity indicator, bringing together a number of 'core' elements into a single index.
- **Model 2: Suite of core indicators for measurement at all sites:** Identification of a small suite of core indicators to cover fundamental concerns common across all sites. These would serve as a 'minimum standard' – sites would identify additional indicators according to their needs.
- **Model 3: Decision tree approach:** Decision tree or similar (e.g. with thresholds/criteria) to help companies select 'core' indicators that are appropriate for different sites and contexts. This would therefore result in a more comprehensive suite of indicators, with some overlap across sites to allow aggregation and comparison where appropriate.

A fourth model was identified through desk research:

- **Model 4: Framework approach:** Provide guidance for indicator identification and then comparably assessing changes in state of the site using the state-pressure-response framework, pressure on a site or site level actions taken. Scores can be assigned to facilitate management decision making.

Although none of the identified approaches and methodologies could be used directly, there is significant existing material that could be further explored and built upon.

Table 4: Overview of potential models for indicator development

Models	Advantages	Limitations	Example	Target user
Model 1: Single indicator of biodiversity	Enable comparison across sites, across business units or across companies, even in different contexts; potential to support or build on existing initiatives.	Bringing multiple elements into a single indicator often 'hides' individual trends of interest, and may as such present a misleading picture of progress. Scientifically complex: would require significant work and consultation, including peer review.	CISL's Healthy Ecosystem Metric Ecometrica Normative Biodiversity Metric/ IUCN's BIRS method	**Corporate/business unit level**, to get a rapid overview of biodiversity impact and change over time across sites.
Model 2: Suite of core indicators for measurement at all sites	Fully comparable suite of indicators selected that can be aggregated to support company reporting, applicable at all sites, and forming a minimum standard for site-level monitoring.	May require selecting the 'lowest common denominator' in order to be applicable to all sites, may be unlikely to be fully comprehensive, so would need to be supplemented with additional site-specific indicators.	Pitz *et al.* (2016); Essential Biodiversity Variables	**Site level** to ensure basic monitoring. **Corporate level** to aggregate site level data to report on corporate impact.
Model 3: Decision tree approach	Acknowledges and allows for the variability between sites and ensures comprehensive monitoring. Clear guidance will ensure that the appropriate indicators are selected.	Not all indicators would be used at all sites meaning it would not be comparable in its entirety. Determining thresholds that would be applicable for all sites/contexts could be complex.	None identified	**Site level** to ensure comprehensive monitoring. **Corporate level** to aggregate site level data to report on corporate impact
Model 4: Framework approach	Flexibility allows application at and comparison across very diverse sites. Easy for non-specialists to apply.	Relatively subjective and simplistic.	The monitoring framework for Important Bird Areas	**Site level** to compare change in biodiversity status and pressures over time **Corporate level** to get a rapid overview of biodiversity impact and change over time across sites.

QUESTIONS FOR DISCUSSION

The following questions will be discussed on the 28th June:

1. Are there other methodologies or models we should explore?
2. Which of the models most closely meets the needs you see within your business?
3. What challenges (and associated solutions) might they pose?

4.2 Next steps

This document will be discussed at the Proteus meeting (which will include companies who were not involved in the interviews) to confirm that the results presented in this document reflect their perspectives and experiences. The models outlined in the previous section will be explored with interested companies to identify which (if any) would be most appropriate for further exploration, development and testing with companies.

Once an approach is agreed, which may consist of multiple models for indicator development, it will be necessary to raise funds to cover the work required to develop it further; this will be done in consultation with interested companies and with others working in this field. A full feasibility study for any identified model(s) and review of existing work on which they could be based would also be essential.

5. Acknowledgements

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