Re-evaluation of the current biodiversity indicator and associated metrics for UNCCD's strategic objective 4

Report prepared in 2021 at the request of the United Nations Convention to Combat Desertification (UNCCD)

Process for Report Production & Review:

UNCCD secretariat commissioned this report to Dr. Neville D. Crossman. The draft prepared by Dr. Crossman underwent both an internal review process and an external review process. The external review process was designed to strengthen the substance of the report. It involved external experts from the scientific community, including representatives of relevant international organizations, as well as country Parties to the UNCCD. The UNCCD Secretariat is grateful to all reviewers for their helpful comments and suggestions.

Executive Summary

Parties to the UNCCD are required to report on measures undertaken to implement the five strategic objectives of the UNCCD 2018–2030 Strategic Framework. Strategic objective 4 (SO4) of the Strategic Framework aims to generate global environmental benefits through effective implementation of the Convention. For SO4 the Red List Index was used in the 2017-2018 reporting by Parties to report on trends in abundance and distribution of selected species. An upward trend in the Red List Index means that the overall level of extinction risk in the set of species considered is decreasing in the reporting country. This could be achieved by slowing the rate of extinctions AND/OR through reducing the extinction risk of threatened species by down listing them to lower categories of threat. Attribution of the upward trend in Red List Index to implementation of the Convention means co-benefits are provided by the Convention and SO4 is being achieved. Countries are encouraged to report on the drivers of trends in the indicator (abundance and distribution of selected species) and metric (Red List Index) to help attribute changes to implementation of the Convention.

Only 51 countries provided numeric Red List Index values in their 2017-2018 reporting. Indicators used in national reporting of progress against the strategic objectives should be reviewed and improved as needed. Revision should ensure alignment and compatibility with other key international conventions and initiatives, particularly the SDGs and the post-2020 Global Biodiversity Framework being developed for all biodiversity conventions under the umbrella of the Convention on Biological Diversity (CBD). Further, in decision 22/COP.11 (para 6 and Annex), UNCCD Parties decided that trends in abundance and distribution of selected species may potentially be replaced by an indicator measuring trends in ecosystem functional diversity once system understanding and data production allows.

The objective of this report is to review existing indicators and metrics for reporting on biodiversity and recommend either an alternative metric associated with the current progress indicator (trends in abundance and distribution of selected species) or an alternative progress indicator (and associated metrics) measuring trends in ecosystem functional diversity. In the context of UNCCD monitoring, indicators are *what* should be measured, and metrics/proxies are *how* the indicators should be measured.[1] For this report, a metric is defined as a component of an indicator and multiple metrics may be used to measure progress toward targets for which individual indicators are applied. For this report, the criteria for evaluating candidate biodiversity indicators/metrics were based on a refinement of those used in past UNCCD indicator development efforts (see Table 1 for the complete list).[2]

The key sources used in this report to identify global biodiversity indicators and related metrics for review were the SDGs Global Indicator Framework, the draft Monitoring Framework and proposed headline indicators for the post-2020 Global Biodiversity Framework, and the UNEP-WCMC review of biodiversity indicators supporting the post-2020 Global Biodiversity Framework. A total of 22 metrics were longlisted from the many indicators and metrics listed in these documents, and these were further scored against six criteria (see Table 1). The 22 metrics in the longlist are robust (quality is well documented and the methodology is replicable), are considered current, are comparable (consistently available across countries), are compatible (used by other initiatives), are relevant to

[1] See para 24(a) in ICCD/COP(10)/CST/2, where the underlying logic (and in some cases, language) of the indicator set hierarchy used for national reporting was initially defined. This and other core principles identified in ICCD/COP(10)/CST/2 set the stage shaping UNCCD monitoring, as per decision 19/COP.10 and decision 22/COP.11.

[2] Building on ICCD/COP(10)/CST/2 and related decisions 19/COP.10 and 22.COP.11, the criteria and methodology for establishing the UNCCD indicator and monitoring framework was further summarized in decision 11/COP.14 para 17 and its annex. The criteria listed there were used as the based for the criteria employed in this report, which are listed in Table 1.

biodiversity while being sensitive to land degradation, can be disaggregated for national use, and are ready and available to use. Many of the indicators and associated metrics presented here are also readily able to create ownership at the national level because methods are available for national use.

From the longlist, eight indicators scored the highest across the six assessed criteria. The eight indicators included the Red List Index, plus indicators of protected areas, and species abundance and extinction. Forest/forest tree cover and loss also scored highly, but there is reporting redundancy with these indicators because reporting against strategic objective 1 (SO1) in the UNCCD 2018-2030 Strategic Framework includes an assessment of change in tree land cover. An indicator of ecosystem functional diversity has been produced at global scale, but this scored relatively low.

Since the 2017-2018 reporting, significant advancements have been made to the Red List Index, including: improved disaggregation capabilities both spatially and thematically; increased functionality on the Red List Index website that allows advanced searches and downloads of disaggregated data; open source code for automating national disaggregation; more species groups; improved guidance for use of the Red List Index by countries, and; timelines of Red List Index updates that align with SDG reporting needs. These advancements will make it easier and more efficient for country Parties to interpret and report on the Red List Index.

The key findings are:

- As the Monitoring Framework and related indicators for the post-2020 Global Biodiversity Framework will not be finalised until later in 2021, the alignment with UNCCD timeframes for the next round of reporting will be challenging.
- The highest scoring indicator (Trends in proportion of area of particular importance for biodiversity protected and conserved) and associated metric (Average proportion of Terrestrial Key Biodiversity Areas (KBAs) covered by protected areas) is particularly relevant to protecting and improving biodiversity and offers a simple and intuitive measure of a Party's progress toward achieving environmental benefits from implementing the Convention. The coverage of Key Biodiversity Areas should be limited to terrestrial ecosystems to remain in the UNCCD's remit. In future the UNCCD should consider how to include broader SLM conservation actions (e.g. ecosystem restoration on private land) in addition to protected areas to further attribute implementation of the Convention to environmental benefits.
- The high scoring Red List Index should remain as the main indicator for reporting on SO4. If that is the case, the UNCCD should work with the data custodians (IUCN) to build on recent advancements so that interpretation and reporting by countries is improved, potentially through automatic linking and data extraction that provide national level Red List Index values.
- The indicator of trends in protected areas (protected area coverage) offers a consistent indicator of biodiversity protection across Parties, but without the nuance of whether important areas for biodiversity are protected.
- While the Living Planet Index, Species Protection Index and the number of species extinctions could be better reported by Parties than the Red List Index because they are simpler and more intuitive, they have limitations in other areas such as incomplete global coverage (Living Planet Index), relatively insensitive to change (number of species extinctions) and lack of independent peer review (Species Protection Index).
- The indicator describing global ecosystem functional types could be used for reporting against SO4 but there would need to be commitment from the custodian (European Commission Joint Research Centre) to provide regular updates because considerable

technical expertise is needed to produce the data. Understanding changes over time would also be difficult for Parties.

- As knowledge and data on national and global soil biodiversity matures, the UNCCD should consider additional indicators or metrics for Party reporting on SO4 that describe trends in soil biodiversity. Although significant progress has very recently been made, current global data is insufficient so the additional indicators should only be included in future iterations of reporting.

Key Recommendations

Two recommendations for reporting on biodiversity under SO4 are proposed:

1 The **Red List Index** remains as one of the metrics reported by parties for SO4 corresponding to the current indicator (**Trends in Abundance and Distribution of Selected Species**), but UNCCD and IUCN work closely to improve ways for the Red List Index to be better understood and reported by Parties.

2 The current indicator is complemented with new indicator (**Trends in protected area coverage of important biodiversity areas**) and associated metric (**Average proportion of Terrestrial Key Biodiversity Areas (KBAs) covered by protected areas**) as an area-based measure of national responses to conserving biodiversity.

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Introduction

Parties to the UNCCD are required to report on measures and actions undertaken to implement the five strategic objectives of the UNCCD 2018−2030 Strategic Framework[3]. National reporting is needed for planning and implementation of the Convention's decisions and assessing progress toward achieving the strategic objectives at global and national level. The indicators for the 2017-2018 reporting on the strategic objectives of the Strategic Framework were originally agreed by Parties in decision 22/COP.11, and subsequently reviewed and fine-tuned in decisions 7/COP.13 and 11/COP.14.

Strategic objective 4 (SO4) of the Strategic Framework aims to generate global environmental benefits through effective implementation of the Convention. The progress indicators (and associated metrics) adopted for SO4 were:

1. Trends in carbon stocks above and below ground (metric: soil organic carbon stock), and;
2. Trends in abundance and distribution of selected species (metric: Global Wild Bird Index).

According to the Strategic Framework, indicators used in national reporting of progress against the strategic objectives should be reviewed and improved as needed. Considerations when reviewing indicators include appropriateness of indicators and compliance and consistency of Party reporting, plus synergies with indicators used in the Sustainable Development Goals (SDGs), the Rio conventions, and other relevant Multilateral Environmental Agreements. Indicators should be revised and updated to ensure consistency with these initiatives and alternative indicators should be adopted if they are likely to improve reporting against SO4.

The Global Wild Bird Index, that was adopted in decision 22/COP.11 for reporting on trends in abundance and distribution of selected species, was subsequently reviewed to ensure alignment with the corresponding SDG global indicators. The review concluded that the Red List Index was better aligned with the SDGs and therefore replaced the Global Wild Bird Index. The Red List Index is SDG Indicator 15.5.1 to report on SDG Target 15.5 (*Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species*). The Red List Index is also an indicator for the Convention on Biological Diversity (CBD) Strategic Plan for Biodiversity 2011- 2020 and the Aichi Biodiversity Targets and is used for reporting by the Ramsar Convention and the Convention on Migratory Species.

The Red List Index is a measurement of change in aggregate extinction risk across groups of species and is based on changes in the number of species in each category of extinction risk on the IUCN Red List of Threatened Species. For the global Red List Index, a value of 1 equates to all species being classified as Least Concern, while a value of 0 equates to all species being classified as Extinct. For national or regional disaggregation of the Red List Index, a value of 0 represents the maximum contribution to the global index and a value of 1 represents the minimum contribution. Changes in the Red List Index are driven only by genuine improvements or deteriorations in the status of species, and not by improved knowledge or revised taxonomy.

Unlike strategic objective 1 (SO1) of the UNCCD 2018−2030 Strategic Framework, where countries were provided default estimates of indicators and metrics drawn from global datasets, countries were not provided with default values of Red List Index but were invited to download the Red List Index data for their country from the SDG indicators database. In addition, the UNCCD Reporting Manual indicated suitable data sources that could be used by countries in the absence of or to

[3] https://www.unccd.int/sites/default/files/inline-files/ICCD_COP%2813%29_L.18-1716078E_0.pdf

complement national data[4]. A total of 138 country Parties reported information using the Red List Index for the 2017 - 2018 reporting process. Of these, just over a third (51 countries) provided numeric Red List Index values, another third (48 countries) provided the names of specific Red List Index species or groups of species, while the remaining 39 countries reported neither numeric values nor species[5].

The high variability in reporting approaches prompted Parties at the seventeenth session of the Committee for the Review of the Implementation of the Convention (CRIC 17) to request the UNCCD secretariat to re-evaluate the use of Red List Index to report against SO4. The re-evaluation is to consider alternative metrics and indicators for reporting on SO4 that may be more useful and appropriate to the UNCCD 2018–2030 Strategic Framework and a better description of progress toward SO4.

Objectives

The objective of this report is to review existing indicators and metrics for reporting on biodiversity and recommend either an alternative metric associated with the current progress indicator (trends in abundance and distribution of selected species) or an alternative progress indicator (and associated metric) measuring trends in ecosystem functional diversity. The alternative indicator and/or metric will be used by Parties to report on SO4 of the 2018-2030 Strategic Framework. The identification of this new indicator and the associated metric (or only an alternative metric) shall be made in consideration of biodiversity-related targets and indicators in the SDGs Global Indicator Framework. Consideration is also given to the draft Monitoring Framework for the post-2020 Global Biodiversity Framework, which is being designed to determine the 2050 biodiversity goals and 2030 biodiversity targets to be monitored, along with specific indicators and metrics.

Identifying global indicators

The primary role of global indicators is to review progress at the global level. Some global indicators are aggregated from national level data, while others are produced at global scale and can be disaggregated to measure progress at the national level. Global data prepared in a globally consistent manner and disaggregated for national use can lower the barriers to reporting for countries. However, there are sometimes challenges when global data are downscaled for national use due to applicability at national level or to lack of resolution, which is especially relevant to geographically smaller countries including Small Island Developing States (SIDS). Political acceptability of global data for national use, and classifications/definitions of datasets may also vary between countries. Global indicators for reporting on trends in biodiversity should be sensitive to changes in the state of biodiversity and insensitive to changes external to that state so that the indicators only show true change in biodiversity. And to ensure relevance to the UNCCD, these indicators should also be as sensitive as possible to processes related to desertification, land degradation and drought and the impact of actions countries may take in response.

The key sources used in this report to identify global indicators for evaluation were the SDGs Global Indicator Framework[6], the November 2020 draft Monitoring Framework for the post-2020 Global Biodiversity Framework and associated proposed headline indicators[7], and the UNEP-WCMC review

[4] https://prais.unccd.int/sites/default/files/helper_documents/2-Manual_EN_1.pdf
[5] https://www.unccd.int/sites/default/files/sessions/documents/2019-03/ICCD_CRIC%2817%29_6-1900947E.pdf
[6] SDGs: https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202020%20review_Eng.pdf
[7] As of 11 July 2021: CBD/WG2020/3/3/Add.1 https://www.cbd.int/doc/c/d716/da69/5e81c8e0faca1db1dd145a59/wg2020-03-03-add1-en.pdf

of biodiversity indicators for the post-2020 Global Biodiversity Framework[8]. The UNEP-WCMC review was compiled with input from the Biodiversity Indicators Partnership and others working on indicator development. Their review is not a comprehensive list of all available biodiversity indicators but draws on information currently available to the Biodiversity Indicators Partnership and includes indicators either currently available or in active development.

Therefore, two types of global indicators were considered in this review:

1) Global scale indicators that are derived/aggregated from national datasets, (such as: protected area coverage, UNEP-WCMC and IUCN World Database of Protected Areas), and;
2) Those produced from data obtained by remote sensing and/or curated global scale datasets that can be disaggregated to national levels.

Current timeline of post-2020 Global Biodiversity Framework and indicators

This review and re-evaluation of indicator/metrics for country Party reporting on progress toward SO4 must be aligned with and consider the results through early 2021 on the development of the draft Monitoring Framework for the post-2020 Global Biodiversity Framework (which was originally expected to be adopted in October 2020 at CBD COP 15). It's important that the indicator or metric used to report on SO4 is compatible with, or ideally is one of the indicators used to monitor goals and targets of the post-2020 Global Biodiversity Framework.

However, COVID-19 has delayed the development of the post-2020 Global Biodiversity Framework because the pandemic has forced the rescheduling of critical meetings and processes for finalising the Framework. The post-2020 Global Biodiversity Framework is being developed by the open-ended working group (OEWG) who are rescheduled to meet in the third quarter of 2021[9]. The Monitoring Framework for the post-2020 Global Biodiversity Framework will therefore not be finalised until later in 2021[10], and work on the indicators will be taken forward by an Ad Hoc Technical Expert Group on Indicators for the post-2020 Global Biodiversity Framework, with a time-bound mandate from CBD COP 15 to COP 16. The timing of the development of the post-2020 Global Biodiversity Framework therefore does not align well with UNCCD timeframes for next round of reporting, however this report was developed on the best available information on all indicators being considered in this important process.

Review of indicators

Given the delay in the finalisation of the Monitoring Framework for the post-2020 Global Biodiversity Framework, and the pending deadlines for the next round of country Party reporting under the UNCCD 2018-2030 Strategic Framework, this review proceeded based on the preliminary set of biodiversity indicators provided in the UNEP-WCMC review and the headline indicators proposed in the CBD Executive Note to the post-2020 Global Biodiversity Framework.

[8] UNEP-WCMC: https://www.cbd.int/sbstta/sbstta-24/post2020-indicators-en.pdf
[9] The OEWG 3 will meet again 23 August to 3 September 2021 (WG2020-3). The OEWG will have before it a note by the Co-Chairs of the Working Group containing the first draft of the post-2020 global biodiversity framework (CBD/WG2020/3/3 – due out in early July), which builds on the zero draft (Aug 2020) and updated zero draft (Nov 2020) and is prepared on the basis of the consultations undertaken, the submissions received and the results of the first and second meetings of the Working Group, as well as the recommendations emanating from the eleventh meeting of the Ad Hoc Open-ended Working Group on Article 8(j), the SBSSTA24 and SBI3.
[10] CBD COP 15 is now planned for 11 – 24 October 2021 in Kunming, China.

The main criteria taken into consideration for the identification of the indicator/metrics as a potential replacement of the existing indicator (Red List Index) for SO4 (trends in abundance and distribution of selected species) are described in

Table 1. Expert judgement was used to score the criteria for each indicator/metric, and the criteria in

Table 1 were equally weighted when combined to calculate the final score for each indicator/metric. In addition, readiness and availability of the potential metrics/indicator for operational use was considered, including the appropriateness of the indicator and challenges that may need to be overcome for its effective use by countries. This included global coverage of candidate metrics/proxies for the indicator to ensure that it is possible to derive national estimates from global datasets and make them available to country Parties, as default data, and capacity to create ownership at the national level, whereby countries can follow standardized guidance to develop indicator data, empowering them to validate, replace or reject the default data.

Table 1. Main criteria considered for each indicator/metric, their definition, and approach for scoring.

Criteria	**Definition**	**How scored**
Pedigree	The quality of the data custodian and the scientific robustness of the indicator, determined by whether the methodology and underlying data is published in a peer reviewed journal that can be accessed, and the methodology can be repeated by other scientists or agencies and arrive at the same result.	5: High – Global organisation, well published. 1: Low – Not published, local/regional organisation.
Currency	How current the data are, how frequently the data are updated and how long have they been collected.	5: High – Recently updated, annual data, long history of collection. 1: Low – Old data not updated.
Comparability, Simplicity and Utility	a) Comparability of nationally reported data for the potential metrics/indicator with international standards in underlying data, methodologies and guidance; b) Simplicity: a) conceptually, how the indicator relates to SO4, b) in its presentation, and c) in the interpretation of the data, and; c) Utility: How useful and intuitive the data are to report.	5: High – Aggregated national data with high comparability (or global dataset) that is simple and intuitive and easy to report. 1: Low – Complicated data and/or methods that are hard to understand and therefore less likely to be reported by countries.
Compatibility and use by other initiatives	Synergy with indicators used in the Sustainable Development Goals (SDGs), the Rio conventions (e.g. post-2020 Headline Indicator), and other relevant Multilateral Environmental Agreements and initiatives (e.g. Biodiversity Indicators Partnership).	5: High – Used in the SDGs, CBD and other MEAs. Is a post-2020 Headline Indicator 1: Low – Not used in any international initiatives
Relevance to Biodiversity	How relevant and comprehensive the data is for capturing the main elements of biodiversity (i.e. genetic, species, taxonomic and functional diversity)	5: High – Captures the most important elements of biodiversity 1: Low: Biodiversity is incidental in the data and/or represented generically
UNCCD Sensitivity	Sensitivity and relevance of the indicator to the UNCCD 2018-2030 strategic objective 4.	5: High – Clear relevance to achieving global environmental (biodiversity) benefits from restoring land and halting land degradation.

		1: Low - Relevance to land management actions and biodiversity improvements not strong.

Note on the definition and indicators of ecosystem functional diversity and their current readiness

Decision 22/COP.11 states that 'trends in abundance and distribution of selected species', as the indicator for measuring the biodiversity element in SO4, is to potentially be replaced by an indicator measuring 'trends in ecosystem functional diversity' once system understanding and data production allows. After defining ecosystem functional diversity, this section summarizes the current level of system understanding, efforts towards measurement and the production status efforts to map this globally.

According to Laureto, Cianciaruso and Samia (2015), ecosystem functions are the processes that regulate the flux of energy and matter through the environment (e.g. primary productivity, nutrient cycling, and decomposition). The diversity in ecosystem functions is determined by the underlying species functional diversity, ranging from gene expression to landscape processes, that links biological diversity with ecosystem functioning (Cadotte, Carscadden & Mirotchnick 2011). Species functional diversity estimates have been made by grouping species into functional types based on structure (e.g. shrubs, trees), traits (e.g. leaf shape and abscission), and phylogenetic (e.g. Coniferae, Poaceae) or metabolic strategies (e.g. C3, C4) (Cazorla *et al.* 2020).

Mapping ecosystem functions and functional diversity across large geographic areas is challenging (Pettorelli *et al.* 2018) although it has been successfully mapped regionally from remote sensing of temperate forests (Schneider *et al.* 2017). Using remotely sensed data, it is possible to map Ecosystem Functional Types (EFTs), defined as areas of similar dynamics of matter and energy exchange between biota and their physical environments (Cazorla *et al.* 2020). EFTs capture heterogeneity in ecosystem functions (for example, primary production, evapotranspiration, or disturbance dynamics) and provide complementary information to other metrics such as those of vegetation structure and species composition to improve our understanding of the multidimensional nature of biodiversity (Noss 1990). The indicators used to map EFTs include descriptors of primary production, evapotranspiration, surface temperature, and albedo. EFTs have already been used to characterize the spatial heterogeneity and diversity of ecosystem functioning at the global (Ivits *et al.* 2013), regional (Lara *et al.* 2018), and protected area scales (Fernández, Paruelo & Delibes 2010).

Of significant relevance to this review is the mapping of EFTs at global scale by the European Commission Joint Research Centre and University of Copenhagen (Ivits *et al.* 2013). They used 30-year time series Earth Observation data of phenological and productivity metrics to stratify global ecosystems into EFTs exhibiting similar patterns of seasonal phenology and productivity dynamics and similar responses to climate and land-use induced environmental conditions. These global EFTs provide baseline indicator of seasonal vegetation dynamics. Annual updates and assessment of within-year variability in EFTs can capture short-term natural events such as droughts, floods and fires, short-term human-induced events such as land use change and land use intensification, and long-term impacts from climate change (Ivits *et al.* 2013). This global EFTs dataset could be used by the UNCCD for SO4 but there would need to be commitment from the European Commission Joint Research Centre to provide regular updates because considerable technical expertise is needed to produce the global scale EFTs. Furthermore, it would be difficult to convert the EFTs to simple metrics of change and challenging for Parties to interpret changes over time.

An additional consideration is that at least currently, the post-2020 Global Biodiversity Framework does not include an indicator designed to map trends in ecosystem functional diversity. Documentation supporting CBD SBSTTA-24 was developed by the CBD secretariat to provide Parties with information to support the scientific and technical review of the proposed goals and targets in the updated zero draft of the post-2020 global biodiversity.[11] In para 22, the necessity to map ecosystem functions is underscored, yet the approach proposed is through a proxy for spatial targeting, where the example of Key Biodiversity Areas is mentioned.[12] This perspective is reinforced in a related information document also considered during SBSTTA-24, which indicates "Actions could also include carrying out national ecosystem assessments and mapping, undertaking studies on biodiversity values…".

While progress has clearly been made since decision 22/COP.11 was taken in system understanding for the development of an indicator for measuring 'trends in ecosystem functional diversity', the readiness/potential for production of such an indicator at the level required to facilitate UNCCD national reporting remains a significant challenge. Later in this report, the approach noted above concerning Key Biodiversity Areas is explored in greater detail.

From a longlist to a shortlist of indicators

The longlist of global indicators and associated metrics and the results of evaluation of each indicator are listed in Table 2. All global scale indicators and metrics listed in Table 2 are consistently available across countries, can be disaggregated for national use, and are ready and available to use. All indicators and associated metrics in Table 2 are also readily able to create ownership at the national level because methods are available for national use. All references to the formal names of indicators/metrics will be in *italics* to make them standout in the text. If the indicator/metric has been recommended as a headline indicator for the Post-2020 Global Biodiversity Framework[13], it will also be in **bold.**

This longlist of 22 indicators/metrics cover a very wide range of ways biodiversity can be measured and assessed for protection and restoration from land management. Included in the longlist is the Ecosystem Functional Types metric for describing ecosystem functional diversity. This metric scored low across many of the criteria.

The longlist of 22 indicators is impractical for reporting, and many do not score well across the assessment criteria. Eight indicators (and associated metrics) had an average score of four or more, scoring well across all criteria. The shortlisted indictors (and associated metrics), in descending order, are:

1. *Trends in important biodiversity protected and conserved* ***(Protected area coverage of Key Biodiversity Areas[14]);***
2. *Trends in abundance and distribution of selected species* ***(Red List Index);***
3. *Trends in extent of protected areas (Protected area coverage);*
4. *Trends in species abundance (Living Planet Index);*

[11] CBD/SBSTTA/24/3/Add.2/Rev.1 https://www.cbd.int/doc/c/e823/b80c/8b0e8a08470a476865e9b203/sbstta-24-03-add2-rev1-en.pdf
[12] See para 22: "The outcomes of conservation and restoration activities for the abundance and diversity of species, genetic diversity and ecosystem functions and services strongly depend on location and the ecosystem being addressed; spatial targeting is therefore essential to achieve synergies with other aspects of this goal. The identification of areas of particular importance for biodiversity (for example, Key Biodiversity Areas) can inform such spatial targeting."
[13] CBD/WG2020/3/3/Add.1 – 11 July 2021: https://www.cbd.int/doc/c/d716/da69/5e81c8e0faca1db1dd145a59/wg2020-03-03-add1-en.pdf
[14] The recommended Post-2020 Global Biodiversity Framework headline indicator is '3.0.1 Coverage of Protected areas and OECMS (by effectiveness)' with proposed disaggregation to Key Biodiversity Areas.

5. *Trends in fragmentation and quality of forest ecosystems (Tree cover loss);*
6. *Trends in area of forest ecosystems (Forest area as a percentage of total land area);*
7. *Trends in number of extinctions (Number of species extinctions (birds and mammals));*
8. *Trends in species protected (Species Protection Index).*

The highest scoring indicator (*Trends in important biodiversity protected and conserved*) and associated metric (***Protected area coverage of Key Biodiversity Areas***) is particularly relevant to protecting and improving biodiversity and offers a simple and intuitive measure of a Party's progress toward achieving environmental benefits from implementing the Convention. A concern for reporting is whether Parties have capacity and will adopt the existing standards to delineate important biodiversity areas (i.e. ***Key Biodiversity Areas***[15]) and whether these important areas are identified consistently across Parties. This could be overcome with capacity building in the use of standard approaches for identifying important areas for biodiversity (***Key Biodiversity Areas***).

The second highest scoring indicator and associated metric is the existing indicator and metric used to report on SO4, namely *trends in abundance and distribution of selected species* ***(Red List Index)***. However, the relatively low level of reporting of Red List Index by Parties, despite data being freely available, suggests they may have difficulty understanding and interpreting the values or find it unrepresentative of species in their country.

The third highest scoring indicator is *trends in extent of protected areas (Protected area coverage)*, but without an assessment of areas important for biodiversity that are protected. The simpler indicator of *trends in protected areas (protected area coverage)* may offer a more methodologically consistent indicator of biodiversity protection across Parties, but without the nuance of whether important areas for biodiversity are protected. The simpler indicator may achieve a higher reporting rate but come with the risk that protected areas are included in reporting that provide minimal biodiversity benefit (e.g. protected areas on areas of low biodiversity importance).

Three of the last five shortlisted indicators describe trends in species abundance (*Living Planet Index*), species protected (*Species Protection Index*) and species extinction (*Number of species extinctions*). Although these indicators are comparable with the Red List Index, they potentially offer a simpler and more intuitive alternative. *The Living Planet Index, Species Protection Index* and the *number of species extinctions* could be better reported by Parties, but they have limitations in other areas such as incomplete global coverage (*Living Planet Index*), relatively insensitive to change (*number of species extinctions*) and lack of independent peer review (*Species Protection Index*).

The remaining shortlisted indicators describe forest cover extent or loss. Country Parties that contain little or no forest (generally trees > 5m tall with canopy cover 30% or more) will not be able to report on this indicator. There is also reporting redundancy with these indicators because reporting against strategic objective 1 in the UNCCD 2018-2030 Strategic Framework includes an assessment of change in land cover, including change in tree covered areas.

Recent advances with Red List Index

Since the 2017-2018 reporting, several advancements have been made to the Red List Index. The Red List Index custodians (IUCN and BirdLife International) have improved disaggregation capabilities both spatially and thematically. For example, the global Red List Index is disaggregated by country for SDG indicator 15.5.1, with each species weighted according to the proportion of its global range in the country of interest. The Red List Index can be also disaggregated thematically, for

[15] http://www.keybiodiversityareas.org/working-with-kbas/proposing-updating/criteria

example to show trends for migratory species or species relevant to the provision of particular ecosystem services, or to show trends driven by particular threats such as invasive alien species or pollution. These disaggregations enhance utility of the Red List Index for particular policy purposes but must be carried out in a new section of the Advanced Search on the IUCN Red List website where the respective indicator graphs and data are available for download. The opensource R code for running these calculations is freely available. Guidance for national use of the Red List Index is currently being updated and improved. Over the next few years, the taxonomic breadth of the Red List Index will increase considerably, with incorporation of data on reptiles, fish, and a number of invertebrate and plant groups.

The thematic and country disaggregations are submitted each year to the UN Statistical Division for reporting on SDG Indicator 15.5.1, and the Red List Index is currently listed as Headline Indicator A.0.3 in the Post 2020 Global Biodiversity Framework under Goal A "The area, connectivity and integrity of natural ecosystems". It is also used by the Ramsar Convention on Wetlands and the Convention on Migratory Species. The Red List Indicator is a strong bridge between the post-2020 Global Biodiversity Framework, SDGs and the UNCCD. These advancements will make it easier and more efficient for Parties to interpret and report on the Red List Index.

The Red List Index could remain as the main indicator for reporting on SO4. If that is the case, the UNCCD should work with the data custodians (IUCN) to build on recent advancements so that interpretation and reporting by Parties is improved, potentially through automatic linking and data extraction that provide national level Red List Index values.

Conclusion, recommendations and limitations

This report reviews existing indicators and metrics for reporting on biodiversity that is consistent with biodiversity-related targets and indicators in the SDGs Global Indicator Framework, the draft Monitoring Framework for the post-2020 Global Biodiversity Framework, and the proposed headline indicators for the proposed monitoring of 2050 goals and 2030 targets. The UNEP-WCMC review of biodiversity indicators that supports the proposed draft Monitoring Framework was an important information source for this report.

Indicators/metrics were scored against several criteria to assess their potential for reporting against SO4. The recommendations below call for the UNCCD to keep the current progress indicator and associated metric for the next round of reporting, but the UNCCD and IUCN work closely together to improve reporting by Parties of the current metric (***Red List Index***). Additionally, UNCCD should complement the current indicator and metric with an area-based indicator and associated metric that measures national responses to conserving biodiversity. The new indicator (*Trends in important biodiversity protected and conserved*) and associated metric (***Protected area coverage of Key Biodiversity Areas***) is recommended as a complement to the current indicator and metric. However, two modifications of the original wording are required.

Firstly, establishing protected areas can be time consuming and may result in conflict with land users and local communities. Sometimes the establishment of protected areas is necessary but benefits for biodiversity can also be achieved through sustainable land management practices that conserve and restore ecosystems without confining them to the protected area estate. Examples include private conservation and land management agreements with landowners that are within the formal national protected area estate. While Parties should be encouraged to report these conservation outcomes, the many definitions of conservation and the potential for inconsistencies across regions and countries will make quantitative measure of conservation through simple metrics more difficult to calculate. The indictor should therefore acknowledge that only protected areas are being

considered. The indicator should be worded as ***Trends in protected area coverage of important biodiversity areas***.

Secondly, given the mandate of the UNCCD is limited to terrestrial ecosystems only, the metric should be confined to terrestrial ecosystems so should be worded as ***Average proportion of Terrestrial Key Biodiversity Areas (KBAs) covered by protected areas***. The disaggregation to terrestrial ecosystems is consistent with the SDG Indicator 15.1.2.

A potential limitation and criticism of the method used to shortlist indicators/metrics is the simple arithmetic used to score criteria and calculate final scores for each indicator/metric. The scores for each criterion are not proportionate (e.g. a score of '5' is not 2.5 times better than '2') and scores cannot compensate for each other (e.g. a high Pedigree score cannot compensate for a low Relevance for Biodiversity score). Although arithmetic operations with disproportionate scores are not mathematically correct, the results still hold significant validity because they transparently present expert judgement.

A final potential limitation in the review of indicators is the absence of indicators and associated metrics describing soil biodiversity. The importance of soil biota has recently been demonstrated, with for example its modulating effect of climate change on soil carbon, and the importance of mycorrhiza in restoring degraded land. Restoring degraded soil is a significant part of sustainable land management. The study of soil biota and collection of data is an emerging field and national soil datasets and surveys are not yet common.

In 2017 the European Commission Joint Research Centre published the first atlas of global soil biodiversity[16] that provided a preliminary and coarse estimate of soil biodiversity. In 2020 the FAO published the first comprehensive assessment of the state of knowledge of soil biodiversity[17] highlighting the need for countries to invest in soil biodiversity data collection and information systems. The need for investment is further reinforced by Guerra et al. (2021), citing others, who state that "Recent efforts to describe the macroecological drivers and patterns of soil biodiversity, the general lack of comparable temporal data, the limitations to the development of coordinated large-scale monitoring efforts, and the enormous number of undescribed soil-dwelling species have all impeded the production of reliable assessments of soil biodiversity change". They go on to say that "Although initiatives to provide a more holistic representation of soils as ecosystem services providers exist [and continue to be enhanced], standardized and timely information to track policy targets related to soils is missing, particularly at global scales." In response to this need, the scientists who published Guerra et al. 2021 established the first global Soil Biodiversity Observation Network (SoilBON; https://geobon.org/bons/thematic-bon/soil-bon) under the umbrella of the Group on Earth Observations Biodiversity Observation Network (GEOBON) to systematically collect and sample observational data worldwide on the condition of soil biodiversity and functions. While soil biodiversity is mentioned as part of a component of Target 9 in the updated zero draft of the post-2020 Global Biodiversity Framework, it does not currently figure directly into the indicators under consideration.[18]

[16] https://esdac.jrc.ec.europa.eu/public_path/shared_folder/Atlases/JRC_global_soilbio_atlas_low_res-2019-06-13.pdf
[17] http://www.fao.org/3/cb1928en/cb1928en.pdf
[18] See CBD/SBSTTA/24/3Add.1, Target 9. By 2030, support the productivity, sustainability and resilience of biodiversity in agricultural and other managed ecosystems through conservation and sustainable use of such ecosystems, reducing productivity gaps by at least [50%]. Component 9.1. Sustainable management of agricultural biodiversity, including soil biodiversity, cultivated plants and farmed and domesticated animals and of wild relatives. NB: The listed headline, component and complimentary indicators do not currently include soil biodiversity in the updated zero draft of the post-2020 Global Biodiversity Framework.

Given the importance of soil biodiversity, as the efforts of national and global data collection mature the UNCCD should consider including an indicator or metric describing soil biodiversity in future iterations of national reporting on the strategic objectives of the Strategic Framework.

Key Recommendations

Two recommendations for reporting on biodiversity under SO4 are proposed:

1 The **Red List Index** remains as one of the metrics reported by parties for SO4 corresponding to the current indicator (**Trends in Abundance and Distribution of Selected Species**), but UNCCD and IUCN work closely to improve ways for the Red List Index to be better understood and reported by Parties.

2 The current indicator is complemented with new indicator (**Trends in protected area coverage of important biodiversity areas**) and associated metric (**Average proportion of Terrestrial Key Biodiversity Areas (KBAs) covered by protected areas**) as an area-based measure of national responses to conserving biodiversity.

Table 2. Longlist and score of global indicators for use in reporting against strategic objective 4 of the UNCCD 2018-2030 Strategic Framework 'to generate global environmental benefits through effective implementation of the Convention'. The final score was calculated as the average of the six equally weighted criteria scores.

Progress Indicator	Metric	What biodiversity element is monitored?	Pedigree			Currency				Comparability, Simplicity & Utility				Compatibility and use by other initiatives						Relevance to Biodiversity	UNCCD sensitivity	Final score	More information
			Data custodian	Peer reviewed or published	Score	Baseline year	Last updated	Frequency of update	Score	National data aggregated to global indicator (Y/N)	National data comparability (Y/N)	Simple & useful (Y/N)	Score	SDG indicator (Y/N)	Post-2020 GBF Relevant Goal (Target)	Post-2020 GBF Headline Indicator (Y/N)	BIP indicator (Y/N)	Other MEAs or processes (Y/N)	Score				
Trends in proportion of areas of particular importance for biodiversity protected and conserved	Protected area coverage of key biodiversity areas	Coverage of important sites for biodiversity by protected areas	BirdLife International, UNEP-WCMC & IUCN	Y	4	1900	2020	Annually	5	Y	Y	Y	5	Y (14.5.1; 15.1.2; 15.4.1)	2 (T2.2)	Y	Y	Y (Ramsar; IPBES)	5	4	5	4.7	https://www.bipindicators.net/indicators/protected-area-coverage-of-key-biodiversity-areas http://www.keybiodiversityareas.org/site/requestgis https://www.protectedplanet.net
Trends in abundance and distribution of selected species	Red List Index	Species extinction risk	IUCN, BirdLife International	Y	5	1993	2020	Annually	5	N	Y	N	2	Y (15.5.1)	Many	Y	Y	Y (IPBES; Ramsar)	5	4	5	4.3	https://www.iucnredlist.org https://sdg.tracking-progress.org/indicator/15-5-1-red-list-index/ https://www.bipindicators.net/indicators/red-list-index
Trends in extent of protected areas	Protected area coverage	Extent of protected areas drawn from the World Database on Protected Areas	UNEP-WCMC	Y	5	1819	2020	Ongoing	5	Y	Y	Y	5	N	2 (T2.1)	N	Y	N	3	3	5	4.3	https://www.unep-wcmc.org/resources-and-data/wdpa https://www.bipindicators.net/indicators/coverage-of-protected-areas-terrestrial-and-marine
Trends in species abundance	Living Planet Index and derivatives	Time-series vertebrate species data	WWF	Y	5	1970	2020	Annually	5	N	N	N	2	N	1 (T1.2), 4 (T4.1), 8 (T8.2), 15 (T15.1)	N	Y	Y (IPBES; CBD)	5	4	5	4.3	https://livingplanetindex.org/home/index https://www.bipindicators.net/indicators/living-planet-index https://f.hubspotusercontent20.net/hubfs/4783129/LPR/PDFs/ENGLISH-FULL.pdf
Trends in fragmentation and quality of forest ecosystems	Tree cover loss	Disturbance of woody vegetation (mature primary forests, secondary forests, or tree plantations) over five meters in height	WRI (Global Forest Watch)	Y	5	2001	2020	Annually	5	N	Y	Y	5	N	1 (T1.2)	N	N	N	3	2	5	4.2	https://www.wri.org/our-work/project/global-forest-watch
Trends in area of forest ecosystems	Forest area as a percentage of total land area	Remotely sensed tree cover data; ecological zones	FAO	N	5	1990	2020	5 yearly	4	N	Y	Y	4	Y (15.1.1)	1 (T1.2)	N	Y	N	5	2	5	4.2	http://www.fao.org/3/CA8753EN/CA8753EN.pdf http://www.fao.org/forest-resources-assessment/2020
Trends in number of extinctions	Number of species extinctions (birds and mammals).	Birds and mammals on IUCN Red List	IUCN /BirdLife International	Y	5	1990	2020	Decadal	3	N	Y	Y	4	N	N.A.	N	Y	Y (IPBES)	3	4	5	4.0	https://www.iucnredlist.org https://www.bipindicators.net/indicators/number-of-species-extinctions-birds-and-mammals
Trends in species protected	Species Protection Index	Index of proportion of suitable habitat for country's species that is protected, relative to 2001	Map of Life, Yale University	N	4	2001	2020	Annually	5	N	N	Y	2	N	2	N	N	Y (IPBES)	4	5	4	4.0	https://epi.yale.edu/epi-results/2020/component/spi

Progress Indicator	Metric	What biodiversity element is monitored?	Pedigree			Currency				Comparability, Simplicity & Utility				Compatibility and use by other initiatives						Relevance to Biodiversity	UNCCD sensitivity	Final score	More information
			Data custodian	Peer reviewed or published	Score	Baseline year	Last updated	Frequency of update	Score	National data aggregated to global indicator (Y/N)	National data comparability (Y/N)	Simple & useful (Y/N)	Score	SDG indicator (Y/N)	Post-2020 GBF Relevant Goal (Target)	Post-2020 GBF Headline Indicator (Y/N)	BIP indicator (Y/N)	Other MEAs or processes (Y/N)	Score				
		baseline year																					
Trends in area of forest ecosystems	Primary forest loss	Remotely sensed tree cover data	WRI (Global Forest Watch)	Y	4	2001	2019	Annually	5	N	Y	Y	4	N	1 (T1.2)	N	N	N	2	2	5	3.7	https://www.globalforestwatch.org
Trends in number of extinctions	Number of extinctions prevented by conservation action	Birds and mammals on IUCN Red List	IUCN /BirdLife International	Y	5	1993	2020	Decadal	3	N	N	Y	3	N	N.A.	N	Y	N	3	3	5	3.7	https://www.birdlife.org/worldwide/news/conservation-action-has-prevented-least-28-extinctions-1993 https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/conl.12762 https://www.bipindicators.net/indicators/number-of-extinctions-avoided
Trends in integrity (extent, rate of change, connectivity, fragementation) for all ecosystems	Species Habitat Index	Index of proportion of suitable habitat for country's species that remain intact, relative to 2001 baseline year	Map of Life, Yale University, NGS	Y	4	2001	2020	Annually	5	N	N	Y	2	N	1 (T1.2), 8 (T8.2), 11 (T11.2)	Y	N	Y (IPBES)	4	4	3	3.7	https://epi.yale.edu/epi-results/2020/component/shi
Trends in areas of particular importance for biodiversity conserved;	Area of certified forest areas under sustainable management	Country-level certified forest (natural and plantation) areas - FSC and PEFC	FSC	N	3	2012	2019	Monthly	4	Y	Y	Y	5	Y (15.2.1)	2 (T2.2), 3 (T3.1)	N	Y	N	4	2	3	3.5	https://fsc.org/en/facts-figures
Trends in the diversity of wild species	Comprehensiveness of conservation of socioeconomically as well as culturally valuable species.	Wild plant diversity protection ex situ (e.g. seedbanks) and in situ (e.g. protected areas)	CIAT	Y	4	?	2018	every 3-5 years	3	Y	N	N	2	N	N.A.	N	Y	N	3	3	5	3.3	https://www.sciencedirect.com/science/article/pii/S147016081830878 1?via%3Dihub https://www.bipindicators.net/indicators/comprehensiveness-of-conservation-of-socioeconomically-as-well-as-culturally-valuable-species https://ciat.cgiar.org/usefulplants-indicator/
Trends in ecological limits reached or surpassed	Ecological Footprint	Land uses: cropland, grazing land, fishing grounds, built-up land, forest area, plus carbon demand on land	Global Footprint Network	Y	5	1961	2020	Annually	5	Y	Y	N	3	N	14 (T14.1), 15 (T15.1)	N	Y	N	3	3	1	3.3	https://www.footprintnetwork.org/our-work/ecological-footprint/
Trends in ecological representativeness of areas conserved	Protected Area Representativeness Index (PARC-Representativeness)	Index of proportional protection of all land cells ecologically similar to cell of interest	CSIRO	Y	4	NA	2020	NA	2	N	Y	N	3	N	2 (T2.3)	N	Y	N	3	5	3	3.3	https://www.bipindicators.net/indicators/protected-area-connectedness-index-parc-connectedness https://research.csiro.au/macroecologicalmodelling/research-areas/indicators-biodiversity-change/

Progress Indicator	Metric	What biodiversity element is monitored?	Pedigree			Currency				Comparability, Simplicity & Utility				Compatibility and use by other initiatives						Relevance to Biodiversity	UNCCD sensitivity	Final score	More information
			Data custodian	Peer reviewed or published	Score	Baseline year	Last updated	Frequency of update	Score	National data aggregated to global indicator (Y/N)	National data comparability (Y/N)	Simple & useful (Y/N)	Score	SDG indicator (Y/N)	Post-2020 GBF Relevant Goal (Target)	Post-2020 GBF Headline Indicator (Y/N)	BIP indicator (Y/N)	Other MEAs or processes (Y/N)	Score				
Trends in integrity (extent, rate of change, connectivity, fragementation) for all ecosystems	Ecosystem Intactness Index	Habitat loss; habitat quality; habitat fragmentation	Wildlife Conservation Society	Y	4	2020	2020	Annually	3	N	N	N	1	N	1 (T1.2; T1.4; T1.5), 2 (T2.5)	N	N	N	2	4	5	3.2	https://conbio.onlinelibrary.wiley.com/doi/pdf/10.1111/conl.12692
Trend in connectivity of protected areas	Protected Area Connectedness Index (PARC-Connectedness).	Index of protected area connectivity to other protected areas and nearby primary vegetation in non-protected land	CSIRO	Y	4	NA	2020	NA	2	N	Y	N	3	N	1 (T1.5), 2 (T2.5)	N	Y	N	3	3	3	3.0	https://www.bipindicators.net/indicators/protected-area-connectedness-index-parc-connectedness https://research.csiro.au/macroecologicalmodelling/research-areas/indicators-biodiversity-change/
Trends in habitat connectivity	Bioclimatic Ecosystem Resilience Index (BERI)	Habitat connectivity; compositional similarity;	CSIRO	Y	4	2005	2015	5-yearly	3	N	N	N	1	N	1 (T1.5)	N	Y	N	3	3	3	2.8	https://www.sciencedirect.com/science/article/abs/pii/S1470160X2030491X
Trends in ecosystem functional diversity	Ecosystem Functional Types	Primary productivity	EC JRC and University of Copenhagen	Y	3	2011	2011	NA	3	N	N	N	1	N	N.A.	N	N	N	1	4	5	2.8	
Trends in extent and rate of change of terrestrial ecosystems	Biodiversity Habitat Index	Habitat remaining; ecological similarity	CSIRO	N	1	2005	2015	5-yearly	3	N	N	N	1	N	1 (T1.2)	N	Y	N	3	4	3	2.5	https://www.bipindicators.net/indicators/biodiversity-habitat-index
Trends in integrity (extent, rate of change, connectivity, fragementation) for all ecosystems	Biodiversity Intactness Index	Species richness and abunance, and response to land use pressures	Natural History Museum London, UCL and UNEP-WCMC	Y	3	2005	2005	NA	1	N	N	N	1	N	N.A.	N	N	N	1	4	5	2.5	https://science.sciencemag.org/content/353/6296/288 https://bit.ly/3iut7Zt https://www.nature.com/articles/nature03289
Trends in ecological limits reached or surpassed	Human Appropriation of Net Primary Production (HANPP)	Remotely sensed NPP; land use change; harvested biomass, e.g. crops and timber	Institute of Social Ecology (SEC), University of Natural Resources and Life Sciences, Vienna	Y	4	1960	2005	NA	3	N	N	N	1	N	14 (T14.1)	N	Y	N	3	2	1	2.3	https://www.bipindicators.net/indicators/human-appropriation-of-net-primary-production-hanpp https://www.pnas.org/content/110/25/10324
Trends in extent of natural intact / wilderness	Human Footprint Index	Land use: built land, cropland, pasture, human population density, nightlights, railways, roads,	Wildlife Conservation Society	Y	4	1993	2009	NA	3	N	N	N	1	N	1 (T1.2; T1.3)	N	N	N	2	1	1	2.0	https://www.nature.com/articles/ncomms12558 https://wcshumanfootprint.org

Progress Indicator	Metric	What biodiversity element is monitored?	Pedigree			Currency				Comparability, Simplicity & Utility				Compatibility and use by other initiatives						Relevance to Biodiversity	UNCCD sensitivity	Final score	More information
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		navigable waterways																					

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