POSITION PAPER

INCLUSION OF MSA AND MSA.KM² AS CORE DISCLOSURE METRICS FOR "DEPENDENCY AND IMPACT DISCLOSURE METRICS" IN THE TNFD FRAMEWORK

MAY 2023

CONTEXT

In March 2023, the Taskforce on Nature related Financial Disclosure (TNFD) released the final draft (v0.4) of its risk management and disclosure framework for organisations. The TNFD framework is a great opportunity for companies and financial institutions to align their reporting through common methodologies and metrics. We support these ambitions and wish to contribute to reinforcing the TNFD framework, through suggestions on assessment and disclosure metrics.

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Our objective is to contribute to a pragmatic and operational framework, taking into account both scientifically sound metrics and current market practices, which guides businesses and financial institutions' impact measurements and progress, and allows comparability between actors. Indeed, an actionable understanding of biodiversity requires using multiple metrics to understand and reflects the different components of biodiversity. The measure of ecosystem condition and extent is currently identified in the TNFD framework as a global additional disclosure metric for Impact and dependencies, while the Mean Species Abundance (MSA[1]) metric is identified as an additional disclosure metric for the tropical forest biome (TNFD 2023a). Furthermore, the GLOBIO[2] MSA layer (Schipper et al. 2020) is also identified as a relevant dataset for biodiversity importance in the Locate phase (TNFD 2023b), and an assessment metric for the Evaluate phase (TNFD 2023c). We suggest adding:

1. **MSA and MSA.km²**[3] as **global core disclosure metrics**, associated with the following indicators: ecosystem condition; ecosystem extent; and condition-weighted area[4],[5].
2. The **GLOBIO MSA layer** as a relevant dataset for **ecosystem integrity** in the **Locate phase**.
3. **MSA and MSA.km²** as **assessment metrics** for the **Evaluate phase**.

[1] Average abundances of originally occurring species relative to their abundance in the undisturbed ecosystem (Schipper et al. 2016). Please see Appendix 5 for a more detailed definition.

[2] The GLOBIO model (Global biodiversity model for policy support) was developed by the PBL, UNEP GRID-Arendal and UNEP-WCMC to calculate the impact of environmental drivers on biodiversity in MSA.

[3] MSA.km² and km².MSA are equivalent: they correspond to MSA integrated over space. The metric can also be integrated over time, corresponding then to km².MSA.yr. This footnote applies to all occurrences of MSA.km² in the document.

[4] In practice, a measure of ecosystem condition (expressed in MSA) is difficult to produce for businesses. Condition-weighted area (MSA.km²) is the main metric used in biodiversity impact assessment tools.

[5] The exact names of the indicators and metrics proposed are available in Appendix 2.

Regarding (1), all the global core disclosure metrics currently identified by the TNFD are *impact drivers* (e.g. extent of land use change, quantities of pollutants, water withdrawal, etc.). This prevents direct assessments of the contribution of businesses to the achievement of Goal A of the Kunming-Montreal Global Biodiversity Framework and in particular alignment against the goal of maintaining, enhancing or restoring ecosystem integrity. It is thus necessary to add global core disclosure metrics focused on ecosystem condition, extent and condition-weighted area. The MSA metric and the derived MSA.km^2 provide an evaluation of the state of ecosystems compared to their undisturbed state and could be used to feed such global core disclosure metrics[6] and assess the contribution of businesses to the achievement of Goal A. MSA and MSA.km^2 can be estimated based on the GLOBIO pressure-impact relationships as well as complementary ecological literature. These metrics also allow to aggregate the pressures covered by the TNFD's core disclosure metrics. They are thus complementary to impact driver metrics and allow for a global overview of the biodiversity footprint of a company or a financial institution. MSA and MSA.km^2 also allow for comparability within and between sectors. Furthermore, the current drafts of both GRI (Global Reporting Initiative) and EFRAG ESRS E4 (European Sustainability Reporting Standards E4) include the disclosure of ecosystem condition and extent in addition to the disclosure of impact drivers; including (1) would thus further align the TNFD with these frameworks and reduce the burden borne by businesses and enhance comparability of biodiversity data.

Regarding (2), the GLOBIO MSA layer provides the MSA value by location – at a resolution of 300x300m at the equator – and can be used to determine ecosystem integrity. CDC Biodiversité is currently building a consortium to work on an updated version, with global and regional MSA values based on ESA (European Spatial Agency) data, which will be updated every year.

Regarding (3), MSA and MSA.km^2 are some of the main metrics used by corporates and financial institutions to evaluate their impacts on ecosystem integrity (Lammerant 2022; UNEP-WCMC et al. 2022), highlighting the relevance of including them as assessment metrics for the Evaluate phase. Indeed, MSA.km^2 is already available at the country level through the GLOBIO-IMAGE[7] model produced by the PBL (Netherlands Environmental Assessment Agency), and MSA is for example used in Global Biodiversity Outlooks (Secretariat of the Convention on Biological Diversity 2020). MSA and MSA.km^2 are also used in several biodiversity impact assessment tools. Examples include the Global Biodiversity Score (GBS) (CDC Biodiversité 2020b), launched in May 2020 by CDC Biodiversité to assess the biodiversity footprint of companies and financial institutions and notably used through the BIA-GBS database on the biodiversity footprint of listed companies, created by CDC Biodiversité and Carbon4 Finance; the Corporate Biodiversity Footprint (CBF) developed by Iceberg Data Lab (IDL) to assess biodiversity footprint of companies and financial institutions; the Biodiversity Impact Metric (BIM) developed by the University of Cambridge Institute for Sustainability Leadership (CISL) to measure the impact of commodity supply chains (University of Cambridge Institute for Sustainability Leadership (CISL) 2020); the Biodiversity Integrated Assessment and Computation Tool (B-Intact) developed by the Food and Agriculture Organisation of the UN (FAO), to assess the impact on biodiversity of projects in the Agriculture, Forestry and Other Land Use sector (Food and Agriculture Organisation 2021); and the Biodiversity Footprint Calculator (BFC) developed by Plansup in collaboration with Saxion to assess both current and future biodiversity footprint of a company's product at the landscape level. Therefore, the metric is used by most financial institutions assessing their biodiversity footprint and transition risk (through the BIA-GBS database, the CBF database, the Global Impact Database developed by the Impact Institute, and ISS ESG's Biodiversity Impact Assessment Tool), and by many corporates (e.g. through the GBS tool or the CBF detailed).

Considering its properties, MSA has much potential as a metric: it is sensitive to change, easy to interpret (0-100 % scale), can be globally assessed based on pressure-impact relationships from the GLOBIO model (Alkemade et al. 2009; Schipper et al. 2020), and is regularly used in scientific studies (Leclere et al. 2018; Leclère et al. 2020; Wilting et al. 2017; Wilting and van Oorschot 2017; Lucas and Wilting 2018) and international outlook studies for the Living Planet Report (Almond et al. 2020), IPBES (IPBES 2018; Brondízio et al. 2019) and the CBD (Secretariat of the Convention on Biological Diversity 2020). It is also possible to ground truth modelled MSA data with field data. A first estimate of the global planetary boundary for functional biodiversity has been estimated using MSA: it stands at 72 % (Lucas and Wilting 2018). Using MSA could thus allow target setting for companies and financial institutions (in a similar fashion to the 1.5°C-2°C for climate). Table 1 below compares the characteristics of three metrics: MSA, MSA.km^2 and Ecosystem Integrity Index (EII).

[6] The metric PDF.m^2.yr (Potentially Disappeared Fraction) could also be used for the reporting of this indicator.

[7] IMAGE (Integrated Model to Assess the Global Environment) is an integrated assessment model that simulates the environmental consequences of human activities worldwide. GLOBIO-IMAGE combines GLOBIO's pressure-impact relationships with data on past, present or future pressure levels from the IMAGE model.

Table 1: Characteristics of MSA, MSA.km² and EII. The characteristics marked with "TNFD" are cited from paragraph 5 and paragraph 5.3 of the v0.4 TNFD integrated framework (TNFD 2023c).[8]

CHARACTERISTICS	MSA	MSA.km²	EII
Identified in the Kunming-Montreal Global Biodiversity Framework	Yes[9]	No	Yes
Used by the IPBES	Yes[10]	No	No
Reflects ecosystem condition	Yes	Yes	Yes
Reflects ecosystem extent	No	Yes	Yes
Reflects ecological integrity (considers ordinary biodiversity)	Yes	Yes	Yes
Can be calculated at multiple scales through cause effect relationships	Yes	Yes	Yes
Allows to account for stocks and variation of stocks of remaining biodiversity	Yes	Yes	?[11]
Used by businesses and financial institutions	No	Yes	No[12]
TNFD - Allow "comparability across and within sectors by report users"	Yes	Yes	Yes
TNFD - "Be science-based but also practical for report preparers on an annual corporate reporting cycle"	Yes	Yes	Yes
TNFD - "Reflect that nature-related issues take place along value chain(s) and in activities financed by financial institutions"[13]	No	Yes	Yes
TNFD - "Reflect both negative and positive impacts and both risks and opportunities to the organisation"	Yes[14]	Yes[15]	Yes
TNFD - "Align with global policy goals, including the Global Biodiversity Framework, while providing flexibility for the different materiality approaches of report preparers, capital providers and market regulators globally."	Yes	Yes	Yes

Appendix 3 provides detailed justification on how MSA and MSA.km² fit the criteria set out in the TNFD beta framework (those indicated by TNFD in Table 1 above). Appendix 4 provides a more detailed comparison of MSA and MSA.km² to other metrics.

This position paper has been drafted by CDC Biodiversité, Carbon4 Finance, I Care, Iceberg Data Lab and Impact Institute. Please see attached Appendix 1 for references; Appendix 2 for our suggested integration of MSA and MSA.km² as core disclosure metrics; Appendix 3 for a more detailed assessment of the fitness of MSA and MSA.km² as core disclosure metrics; Appendix 4 for a comparison of the MSA and MSA.km² metrics to other metrics; and Appendix 5 for the definition of MSA.

[8] The following criteria could not be assessed due to lack of detail on the criteria: "Recognise that nature-related issues are specific to the location, sector and biome in which they are occurring".

[9] The MSA is identified as a complementary indicator for Goal A.

[10] For example, in (IPBES 2018; Brondízio et al. 2019).

[11] Documents published so far do not allow to assess whether EII will be used in a way that distinguishes between stocks and variation of stocks. Theoretically, the metric should allow such distinction.

[12] The goal is for it to be used by business and financial institutions in the future.

[13] The evaluation does not relate to the metrics (MSA, MSA.km², etc.) directly, but rather in general the tools that use them.

[14] MSA and MSA.km² reflect both negative and positive impacts.

[15] MSA and MSA.km² reflect both negative and positive impacts.

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APPENDIX 1

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APPENDIX 2

INTEGRATING MSA AND MSA.KM² AS GLOBAL CORE DISCLOSURE METRICS

Table 1. Suggestion on the addition of ecosystem condition, extent and condition-weighted areas as core disclosure indicators, and MSA, km² and MSA.km² as core disclosure metrics

METRICS CATEGORY	INDICATOR	METRIC	CONNECTION TO GBF TARGETS
Ecosystem condition and extent	Ecosystem condition	Conditions in MSA of ecosystems impacted by businesses in their direct operations, by ecosystem asset	Target 15
	Ecosystem extent	Extents in km² of ecosystems impacted by businesses in their direct operations, by ecosystem asset	Target 15
	Condition-weighted areas	Condition-weighted business direct operations, upstream and downstream impacts (MSA.km²)	Target 15

For the condition-weighted areas, we believe that the values of the metrics should be reported at the ecoregion level and that their use at the ecosystem asset level should be encouraged for business, in line with the Biological Diversity Protocol (Endangered Wildlife Trust 2020)[1]. Businesses are encouraged to report ecosystem condition and extent beyond their direct operations and across their value chain, but this is optional.

(1) This would allow the distinction of a mosaic landscape which is 50 % intact (100 % MSA) and 50% entirely degraded (0 % MSA) from one which is at 50 % MSA all over. Such distinctions are important as the biodiversity implications of both landscapes are very different.

APPENDIX 3

DETAILED ASSESSMENT OF THE FITNESS OF MSA AND MSA.KM² AS CORE DISCLOSURE METRICS

Paragraph 5 and paragraph 5.3 of the v0.4 TNFD integrated framework (TNFD 2023) present different criteria the indicators and metrics are intended to meet. Justifications are provided below on how MSA and MSA.km² fit these criteria.

Allow "comparability across and within sectors by report users"

MSA and MSA.km² can be used by companies of all sectors, therefore allowing comparability within and between sectors. They can be used both by companies and financial institutions, thus allowing financial institutions to report on the same metric.

"Be science-based but also practical for report preparers on an annual corporate reporting cycle"

MSA (and by extension MSA.km²) have been constructed using peer-reviewed literature, and a number of peer-reviewed publications provide details on the methodology underpinning the indicator (Alkemade et al. 2009; Schipper et al. 2016). MSA.km² is already used by most of the financial institutions (through the CBF and BIA-GBS databases) and by a number of corporates (through the GBS tool or the CBF). It is also already used by French financial institutions for their Article 29 reporting.

"Reflect that nature-related issues take place along value chain(s) and in activities financed by financial institutions"

Current tools using MSA.km² (GBS, CBF, BIM, B-Intact) allow to estimate impact across the entire value chain and to distinguish between direct operations, upstream and downstream impacts. The BIA-GBS and CBF databases allow to evaluate the impact of activities financed by financial institutions.

"Reflect both negative and positive impacts and both risks and opportunities to the organisation"

The MSA can be used to estimate both biodiversity loss or gain. In the same way, impacts in MSA.km² can be negative impacts or positive impacts. However, authors do not encourage aggregating gains and losses of biodiversity, but rather recommend reporting them separately.

"Align with global policy goals, including the Global Biodiversity Framework, while providing flexibility for the different materiality approaches of report preparers, capital providers and market regulators globally.""

Please see the main text for the justification of this criteria (paragraph (1)).

SOURCES

Alkemade, Rob, Mark van Oorschot, Lera Miles, Christian Nellemann, Michel Bakkenes, et Ben ten Brink. 2009. « GLOBIO3: A Framework to Investigate Options for Reducing Global Terrestrial Biodiversity Loss ». Ecosystems 12 (3): 374-90. https://doi.org/10.1007/s10021-009-9229-5.

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APPENDIX 4

COMPARISON OF THE MSA AND MSA.KM² METRICS TO OTHER METRICS

*Table 2. This table provides a comprehensive comparison to headline and complementary indicators selected for goal A of the CBD as well as other indicators, even if some of them are not directly relevant for the TNFD. The characteristics marked with * are cited from Annex 1 of the SBSTTA recommendation 24/2, as criteria "the indicators in the monitoring framework for the post-2020 global biodiversity framework should meet, or be able to meet by 2025". The characteristics marked with # are cited from Annex 1 of the Technical analysis of indicators proposed for the monitoring framework for the post-2020 global biodiversity framework (CBD 2022b). Finally, the characteristics starting with TNFD are cited from paragraph 5 and paragraph 5.3 of the v0.4 TNFD integrated framework (TNFD 2023).*

The evaluation of the criteria marked # was performed in (CBD 2022b) for the headline and component indicators: #Relevance ("Whether the indicators were of relevance to the corresponding draft goals or target of the post-2020 global biodiversity framework"), #Nationally feasible ("The feasibility that the indicators can be measured at national […] scales"), #Globally feasible with national disaggregation ("The feasibility that the indicators can be measured at […] global scales"), #Available ("Whether the indicator is ready for use"). The evaluation for all other criteria was performed by CDC Biodiversité without external review. Indicator developers are invited to provide feedback if they feel CDC Biodiversité's evaluation is inexact.

			HEADLINE INDICATORS				COMPONENT INDICATORS		
CHARACTERISTICS	**MSA**	**MSA.km²**	A.1 Red List of Ecosystems	A.2 Extent of natural ecosystems	A.3 Red list Index	A.4 The proportion of populations within species with an effective population size > 500	Species habitat Index	Ecosystem Integrity Index	Living Planet Index
Reflects ecosystem condition				As indicated in Appendix 1 of the SBSTTA recommendation 24/2, this indicator does not cover ecosystem integrity (CBD 2022a) .	Species component of biodiversity.	Genetic component of biodiversity.			(1)
Reflects ecosystem extent	(2)								
Reflects ecological integrity (considers ordinary biodiversity)									
Can be calculated at multiple scales through cause effect relationships									
Capacity to link to trajectories of ecosystem integrity									
Used by businesses and financial institutions								(3)	
*"The data and metadata related to the indicator are publicly available"									
*"The methodology underpinning the indicator is either published in a peer reviewed academic journal or has gone through a scientific peer review process and has been validated for national use"									
*"The data sources and indicators should be compiled and regularly updated with a time lag of less than five years between updates, if possible"		(4) (5)							
*"There is an existing mechanism for maintaining the indicator methodology and/or data generation […] including providing nationally applicable guidance on the use of the indicator"		(5)							
*"Indicators should be able to detect trends relevant to the components of the goals and targets of the post-2020 global biodiversity framework"									
*"When possible, indicators are aligned with existing intergovernmental processes under the United Nations Statistical Commission"	(3)	(5)							
#Relevance			Not provided in (CBD 2022b)					Not provided in (CBD 2022b)	Not provided in (CBD 2022b)
#Nationally feasible									
#Globally feasible with national disaggregation									
#Available					Not provided in (CBD 2022b)				
TNFD - Allow "comparability across and within sectors by report users"									
TNFD - "Be science-based but also practical for report preparers on an annual corporate reporting cycle"									
TNFD - "Reflect that nature-related issues take place along value chain(s) and in activities financed by financial institutions"(6)									
TNFD - "Reflect both negative and positive impacts and both risks and opportunities to the organisation"	(7)	(8)							
TNFD - "Align with global policy goals, including the Global Biodiversity Framework, while providing flexibility for the different materiality approaches of report preparers, capital providers and market regulators globally."									

Caption CBD (2022b) for text in between quotation marks. "The indicator meets the assessment criteria" "The indicator partially meets the assessment criteria" "No data or information can be found for the suggested indicator" or the indicator does not meet this criteria. Not assessed

(1) Indirectly, in particular through the disaggregated versions of the indicator.

(2) MSA does not meet this criteria (not even in part).

(3) The goal is for it to be used by business and financial institutions in the future.

(4) MSA.km² does not (yet) meet this criteria (not even in part).

(5) Work is under way to provide regular calculations of the indicator at global and sub-national scales, see the main text.

(6) The evaluation does not relate to the metrics (MSA, MSA.km², etc.) directly, but rather in general the tools that use them.

(7) MSA and MSA.km² reflect both negative and positive impacts.

(8) MSA and MSA.km² reflect both negative and positive impacts.

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APPENDIX 5

THE MEAN SPECIES ABUNDANCE (MSA)

The Mean Species Abundance (MSA) is the metric used in GLOBIO cause-effect relationships. It describes biodiversity changes with reference to the undisturbed state of ecosystems. It is defined as the average abundances of originally occurring species relative to their abundance in the undisturbed ecosystem. Undisturbed ecosystem is understood here as equivalent to a pristine state, intact and undisturbed by human activity. The MSA is defined as (Schipper et al. 2016):

$$MSA = \frac{1}{N_{reference\ species}} \sum_{i=1}^{N_{reference\ species}} \text{Min}\left(\frac{A_{observed}(i)}{A_{intact}(i)}, 100\%\right),$$

Where

MSA = mean abundance of native species,

$N_{reference\ species}$ = total number of species in an undisturbed ecosystem,

$A_{observed}(i)$ = abundance of species i in the observed ecosystem,

$A_{intact}(i)$ = abundance of species i in an undisturbed ecosystem,

MSA is applicable to both land and aquatic ecosystems. MSA varies between 0% and 100%[1]. The abundance of invasive alien species is not included in the calculation of MSA (they are not "native species" present in the undisturbed ecosystem): if the growth of their population is detrimental to native species, then it will result in a decline of the MSA of the ecosystem. Similarly, if some species (temporarily) grow above their undisturbed abundance (their abundance would still be 100% as it is capped) in a way that is detrimental to other species (e.g. ungulates overgrazing vascular plants), the overall abundance of the ecosystem declines. Other cases exist where one species temporarily overshoots the undisturbed abundance (e.g. saplings with a higher density per hectare than mature trees) without negatively impacting other species, thus not negatively impacting MSA.

[1] The ceiling at 100% is caused by the "minimum" function in the MSA formula.