Dr. rer. nat. Axel G. Rossberg, FHEA
School of Biological and Behavioral Sciences
Queen Mary University of London
London E1 4NS
https://www.qmul.ac.uk/sbbs/
a.rossberg@qmul.ac.uk
Tel: 07551396243

1 June 2023

Re: Comments on version 0.4 of the TNFD Framework

We have expertise in metrics and therefore comment only on the Disclosure Framework

1. When the term “biodiversity” was coined by ecologists in the 1980s, this related almost entirely to concerns about the global and irrevocable extinctions of species. These concerns persist. Extinction rates have been accelerating over the last century and we are moving towards a 6th mass extinction. Currently, we are losing around one species every day, while the natural baseline is closer to one species every year. Ecologists therefore speak with good reason of an *extinction crisis*.
2. There is a risk that insufficient attention to the extinction crisis undermines the credibility of the TNFD Framework.
3. Much of the persistent confusion about who to quantify impacts on biodiversity stems from insufficient distinction between impacts on species extinction risk, corresponding to Target 4 of the GBF, and impacts on ecosystem extent and condition/integrity, addressed by GBF Targets 1-3. In fact, these are entirely different things. Loss of the last few individuals of a species often barely affects the integrity of the ecosystem they inhabit, and the lost individuals can be replaced by individuals of functionally similar species. In terms of the extinction crisis, however, this is a major event.
4. Any assessment of impacts on biodiversity must therefore distinguish between impacts on ecosystem extent and condition on one hand and impacts on species extinction risk on the other. The current TNFD disclosure framework does not do this. Most biodiversity-related metrics in the TNFD disclose framework relate to impacts on ecosystem condition and extent or the resulting impacts on the services ecosystems can deliver. Only a few metrics relate to global extinction risk or impacts on global extinction risk (they are easily recognized by the high value or weight they assign to areas of high species density, so-called biodiversity hotspots, or by the fact that, on a global or regional scale, they give equal weight to each species).
5. We suggest grouping the latter kind of metric in a separate category or sub-category “Quantitative measures of (impact on) global species extinction risk” or similar. This would include metrics SA 6.6 (STAR), SA 6.7 (“local species population indexes, e.g. farmland bird index”), SA 6.9 (Red List Index), BA 6.1 (maximum STAR-t). The current classification of these metrics as relating to “ecosystem condition and extent” is incorrect. [For an explanation of how the farmland bird index and similar geometric mean abundances indices relate to species extinction risk, see https://arxiv.org/abs/2111.03867.]

6. For impacts on extinction risk, there is barely any disagreement amongst ecologists about how best to quantify it (contrasting the situation for biodiversity metrics in general). Historically proposed in different contexts, there is now an entire family of closely related metrics that are highly correlated with each other and all measure essentially the same thing: impacts on mean species extinction risk. The oldest such metric is Range-Size Rarity (RSR). This metric is given by the sum of the proportions of the ranges of species affected by an intervention. Since 1991 this metric has been used by conservation ecologists to decide the locations of nature reserves. Based on a very similar formula and highly correlated with RSR is the $STAR_T$ metric (after summing over all threat categories). For every situation where $STAR_T$ can be computed, so can RSR. Both metrics, however, can be difficult to apply for impacts on very small scales, which can limit their utility to businesses. This limitation was overcome by a study[1] of biodiversity impact conducted for IUCN and Rio Tinto by The Biodiversity Consultancy Ltd. in 2012, which introduced the Units of Global Distribution (UD) metric. This metric is given by the sum of the proportional changes in the global population sizes of species resulting from an intervention. On large scales UD is approximated by RSR. We recently introduced a metric called Biodiversity Impact Credits[2] (BICs) which differs from UD only in minor details introduced for theoretical reasons.[3] Conversely, on scales that are large compared to the typical ranges of species, RSR is approximated by species density (number of distinct species per km^2). To make a long story short: all these metrics express impacts on mean species extinction risk in convertible currencies and thus approximate each other. Which metric best to use depends on context and data availability.
7. *It would therefore be easy to include in the TNFD Disclosure Framework a consistent set of metrics of (impacts on) global species extinction risk, with benefits for the credibility of the overall framework.*
8. We therefore suggest to include at an appropriate place in the TNFD Disclosure Framework a generic placeholder “Metrics for impacts on mean global species extinction risk”, with a reference to DOI 10.48550/arXiv.2111.03867, where the underlying theory and relations to specific metrics are explained, alongside the specific metrics discussed above.
9. Exemplar methodologies to compute BICs are now available[4] for endangered tree species and for afforestation/reforestation projects. Due to the particularly high species density in tropical forests, impacts of interventions on mean species global extinction risk can there be particularly large. We therefore suggest inclusion of Biodiversity Impact Credits (BICs) computed using these methodologies among the “Quantitative additional disclosure metrics for the tropical forest biome” under the new category of metrics of (impact on) species extinction risk.

---

[1] Temple, H., Anstee, S., Ekstrom, J., Pilgrim, J., Rabenantoandro, J., Ramanamanjato, J.-B., Randriatafika, F., Vincelette, M., 2012. Forecasting the path towards a net positive impact on biodiversity for rio tinto QMM. IUCN, Gland, Switzerland. https://portals.iucn.org/library/efiles/documents/2012-049.pdf

[2] Rossberg, A.G., O’Sullivan, J.D., Malysheva, S., Shnerb, N.M., 2023. A metric for tradable biodiversity credits linked to the Living Planet Index and global species conservation. https://doi.org/10.48550/arXiv.2111.03867

[3] For example, proportional population changes are in UD computed as proportions of the global population size *before* the intervention, while they are computed as proportions of global population size *after* the intervention (in fact, as proportions of the current population size) in BICs. Amongst the advantages of the latter choice is that this yields systematically conservative estimates of the impacts of interventions on species extinction risk, while the former choice can be too optimistic.

[4] http://biodiversitycredits.info/BIC-Methodology-2023.pdf