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VIEWPOINT

Global Biodiversity Targets Require Both Sufficiency and Efficiency

Moreno Di Marco[1,2], James E.M. Watson[2,3], Oscar Venter[4], & Hugh P. Possingham[1,5]

[1] ARC Centre of Excellence for Environmental Decisions, Centre for Biodiversity and Conservation Science, The University of Queensland, 4072 Brisbane, QLD, Australia
[2] School of Geography, Planning and Environmental Management, The University of Queensland, 4072 Brisbane, QLD, Australia
[3] Global Conservation Program, Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460, USA
[4] Ecosystem Science and Management, University of Northern British Columbia, Prince George, BC V2N 4Z9, Canada
[5] Department of Life Sciences, Imperial College London, Buckhurst Road, Ascot, Berkshire SL5 7PY, UK

Correspondence
Di Marco Moreno, ARC Centre of Excellence for Environmental Decisions, Centre for Biodiversity and Conservation Science, Goddard Building, The University of Queensland, 4072 Brisbane, QLD, Australia.
E-mail: m.dimarco@uq.edu.au

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With the adoption of the 2011–2020 Strategic Plan of the Convention on Biological Diversity (CBD), 196 nations agreed to achieve ambitious biodiversity-related targets. These targets encompass conservation inputs, such as increasing the amount of financial resources invested in biodiversity conservation (Target 20), conservation outputs, such as protecting areas of particular importance for biodiversity and ecosystem services (Target 11), and conservation outcomes, such as preventing the extinction of threatened species (Target 12). The evidence to date reveals limited progresses in achieving these targets, especially those related to conservation outcomes, and an alarming disparity between the rate of biodiversity decline and the rate at which conservation actions take place (Tittensor *et al.* 2014).

International biodiversity targets are essential for coordinating global conservation efforts, and we believe that the conservation community should improve upon existing CBD targets to have a better chance of achieving the overall vision of ending the ongoing biodiversity crisis. We argue that it is now time that targets clearly outline what is "sufficient" in conservation terms, and that nations identify "efficient" ways to achieve these targets.

Defining sufficient biodiversity targets

"How much is enough?" is a core question that should guide the definition of sufficient biodiversity targets, that is, adequate levels of conservation inputs, outputs, and outcomes necessary for the protection of biodiversity. However, this question does not seem to guide current CBD targets, which, despite more than two decades of development and monitoring, still suffer from ambiguity, unquantifiability, complexity, and redundancy (Butchart *et al.* 2016). For example, Target 11 calls for the conservation of at least 17% of terrestrial and 10% of marine areas—"especially areas of particular importance for biodiversity and ecosystem services"—through "effectively and equitably managed, ecologically representative, and well-connected systems of protected areas." This target includes seven different elements (Butchart *et al.* 2016), most of which are not quantified and none of which reflect what is sufficient from a biodiversity perspective. Many have argued that even if the static areal element of this target was globally achieved, it would not be enough to protect marine and terrestrial biodiversity (Venter *et al.* 2014; Butchart *et al.* 2015; O'Leary *et al.* 2016).

Specifically Butchart *et al.* (2015) found that protection of 26% of terrestrial land is required to adequately represent known threatened species and their habitats (28% if also considering nonthreatened species). This finding is likely to have correspondence in the marine realm, where scientists called for at least 30% protection of the oceans (O'Leary *et al.* 2016). We recognize that value judgements are involved here, for example, in determining an "adequate" representation for species. However, this does not reduce the need for pursuing sufficiency in biodiversity targets setting, based on the best available scientific knowledge.

As different elements vary in scale and purpose within the protected area target (e.g., protecting areas important for biodiversity, achieving a representative sample of ecosystems, achieving connectivity), and within all the other targets, there is a need for clear science to derive measures of sufficiency to help define the targets. This is doable. In the case of the above-discussed Target 11, a sufficient protection can be sought in relation to the areal extent required to ensure coverage for all known threatened species and habitats, for example, 30% coverage for the currently unprotected Clarke's Gazelle (if scaling the target according to species' range size; Venter *et al.* 2014; Butchart *et al.* 2015). In the case of Target 15, which calls for the restoration of at least 15% of degraded ecosystems globally, a possible sufficient formulation could be set around restoring the average abundance of native species to 90% or more of their value in natural habitats (Newbold *et al.* 2016).

Defining efficient conservation strategies

The achievement of biodiversity targets is often hindered by the inefficient allocation of conservation resources, for example by not locating protected areas in the most cost-efficient places for protecting threatened species (Venter *et al.* 2014). One solution to overcome this inefficiency is for countries to adopt explicit formulations of the resources allocation problem (Wilson *et al.* 2006), in which investments are allocated in space and time toward specific actions for achieving multiple biodiversity targets, such as protected area expansion and extinction risk reduction. Empirical evidence demonstrates that, if implemented, this strategic approach can produce a much more efficient allocation of conservation resources, with small changes in budget (Venter *et al.* 2014; Polak *et al.* 2016). An example of where improvement could be easily made is the derivation of national conservation strategies which explicitly prioritize protection in areas where underrepresented ecosystems are subject to the greatest threat levels (Watson *et al.* 2016).

An important part of an efficient global plan for biodiversity conservation is the establishment of an efficient framework for monitoring progress toward targets. However, the set of indicators used for target monitoring is sometimes inadequate, hindering the ability to accurately monitor some of the targets (Shepherd *et al.* 2016). More alarmingly, there is evidence that different indicators can lead to contrasting assessments. For example, species richness can remain stable in an area for a long period of time even when species abundance declines drastically (Hill *et al.* 2016). Identifying a comprehensive set of indicators, which are able to represent the changing state of a study system (e.g., the threatened species of a country), is an important step to be taken every time new targets are being defined. For each indicator, it is important to clarify whether it refers to conservation outputs (e.g., more protected areas) or outcomes (e.g., higher species abundances), what is the availability of baseline data, and what is the cost of collecting and maintaining new data. There are now new metrics that are readily available for target monitoring, such as "protection equality", which can be used for measuring the ecological representation of national protected area systems (Kuempel *et al.* 2016).

The role of conservation scientists in pursuing sufficiency and efficiency

Many studies have shown that global biodiversity targets do not set out what is sufficient to prevent ongoing biodiversity decline, and that national strategies to achieve these targets have been inefficient in their allocation of limited resources. We believe it is timely to constructively build on these findings, and that more scientists become proactively engaged with parties involved in targets setting. Scientists should provide policy makers with direct evidence of how alternative formulations of targets, and strategies to achieve them, can lead to improved biodiversity outcomes. An opportunity for this increased engagement will be the definition of post-2020 targets. These future targets are likely to play a fundamental role in supporting the UN's Agenda for Sustainable Development, through which the world's governments have agreed to achieve ambitious social, economic, and environmental goals by 2030. We believe that incorporating elements of sufficiency and efficiency into future global biodiversity targets is key to support their role in guiding global conservation efforts.

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