SCIENCE BASED TARGETS NETWORK

Business action for biodiversity via science-based targets for nature

Current opportunities and future directions

January 2026

Table of contents

Disclaimer for readers

The user must ensure that the following citation is used in any publication or analysis involving this SBTN content in any derived form or format:

Science Based Targets Network (2026). Business action for biodiversity via science-based targets for nature.

Acknowledgements

This work was developed using unrestricted core funds that support the Science Based Targets Network's mission and operations. More information about how SBTN is funded is available here.

Authors: Alizée K. M. Masson*[a], Graham W. Prescott*[b], Craig Beatty[a], Sharon Brooks[c], Neil D. Burgess[c], Alena Cierna[c], Rebekah Church[a], Nicole Flores[d], Amanda Hyman[e], Edwin Pynegar[b], Patrick Roehrdanz[d], Jordan Rogan[d], Laura J Sonter[b], Malcolm Starkey[b], Paris V. Stefanoudis[b], Alice Thomas-Smyth[a], Taylor Witkin[d], Alex Zvoleff[d], Varsha Vijay[e]

a : WWF
b : The Biodiversity Consultancy
c : UNEP-WCMC
d : Conservation International
e : SBTN

* joint first-authorship

Abstract

The private sector has a critical role in achieving global biodiversity goals. The Science Based Targets Network (SBTN) provides a framework for companies to set quantitative targets to reduce their pressures on biodiversity and support its protection and restoration. These science-based targets (SBTs) for nature are grounded in scientific evidence, in line with the IPBES assessments and the Global Biodiversity Framework (GBF), and reflect what is needed from corporate actors to reduce human-caused pressures responsible for some of the most significant harm to nature and to help meet local, regional and global goals. This paper outlines how SBTs for nature can mobilize corporate action for biodiversity and explains the rationale for the pressure-based target approach in the SBTN framework. It identifies prospects for increased target coverage in future to improve outcomes for

biodiversity. Finally, it highlights four critical steps to safeguarding biodiversity within the SBTN approach:

1. Identify and avoid potential negative trade-offs between targets,
2. Prioritize response options with multiple co-benefits,
3. Use state of nature metrics to prioritize where to act and evaluate outcomes for biodiversity, and
4. Engage and collaborate with other stakeholders.

Context

Humans have transformed the biosphere, appropriating over half of the terrestrial land surface for anthropogenic land uses. Freshwater ecosystems have been particularly affected by degradation and conversion (Dudgeon *et al.* 2006), and 35.5% of marine fish stocks have been overfished (Sharma *et al.* 2025). This has resulted in species extinctions above background rates (Pimm *et al.* 2006) and transformed the global climate in a way that risks crossing potentially irreversible tipping points (Bouwman *et al.* 2009; Ellis *et al.* 2010; Barnosky *et al.* 2011; Smil 2011; IPBES 2019; Armstrong McKay *et al.* 2022; IPCC 2022; Lenton *et al.* 2025; Sharma *et al.* 2025). The cumulative pressures of human activities have already exceeded some Safe and Just Earth System Boundaries, and are in danger of exceeding more in the coming decades (Rockström *et al.* 2023), ultimately threatening the stability of modern civilization (Ehrlich & Ehrlich 2013).

Businesses have a key role to play in averting the overshoot of Safe and Just Earth System Boundaries, both because of the impacts of their activities and because of regulatory and physical risks to their business models (Smith *et al.* 2020; White *et al.* 2024). Science-based targets (SBTs) are measurable, actionable, and time-bound objectives that support companies in aligning with Safe and Just Earth System Boundaries (Rockström *et al.* 2023). They are a pragmatic way for businesses to demonstrate that their sustainability actions will collectively add up to their share of the contributions needed to achieve global goals for nature (Bai *et al.* 2024). Alongside methods for Greenhouse Gas (GHG) emissions reduction targets already provided by the Science Based Targets Initiative (SBTi), there is a need for methods for corporate target setting on other environmental pressures.

Global goals for biodiversity conservation are embedded in global multilateral treaties, including the UN Agenda for Sustainable Development, UN Convention to Combat Desertification (UNCCD), and the UN Convention on Biological Diversity's Kunming-Montreal Global Biodiversity Framework (GBF). The role of business in achieving international goals is increasingly recognized, e.g., GBF Target 15 ('businesses assess, disclose and reduce biodiversity-related risks and negative impacts'), as is the importance of science-based targets guiding corporate action. For example, UNCCD Business for Land encourages the mobilization of the private sector toward sustainable land and water management, which includes setting science-based targets for nature and aligning with the broader SBTN framework (UNCCD 2024). The scientific basis for the need for concerted multilateral action on addressing drivers of biodiversity loss is outlined by multiple IPBES reports (IPBES 2019; Pörtner *et al.* 2021; McElwee *et al.* 2025; O'Brien *et al.* 2024; Roy *et al.* 2024). The IPBES conceptual framework identifies five key direct drivers of biodiversity loss: habitat conversion (land/freshwater/ocean-use change), climate change, exploitation, pollution and introduced species (Díaz *et al.* 2015). Several elements of the IPBES conceptual framework are closely aligned to the Driver-Pressure-State-Impact-Response (DPSIR) approach underlying the SBTN framework (Table 1). In particular, the direct driver categories, referred to as pressures within the SBTN framework, provide a basis for assessing and reducing private sector impacts on biodiversity via science-based targets whereby changes in business activities drive changes to pressures—and eventually, as private sector actors work in cooperation and collaboration with public sector and

community actors in a system, in a whole-of-society approach (CBD/SBI/3/INF/20) (Convention on Biological Diversity 2022a), result in changes in the state of nature.

Science-based targets for nature

The Science Based Targets Network (SBTN) is the leading source of guidance for companies to operationalize the concept of science-based targets for nature. This involves assessing their impacts on nature (Step 1), prioritizing where to set science-based targets (Step 2), setting those targets (Step 3) (Step 3), taking action to achieve them (Step 4), and tracking progress (Step 5) (Table 1). SBTs have been recognized as a critical mechanism for assessing and taking actions on environmental impacts in regulatory measures (ESRS Set 1 2023) and voluntary frameworks (TNFD 2023). SBTN has developed SBTs for nature to enable corporate contributions toward a net-zero, nature positive future by 2030, recognizing that global ambitions to limit warming to 1.5°C cannot be achieved without halting and reversing biodiversity loss for the benefit of all society. Since the start of target validation in 2024, 10 companies have independently validated 50 science-based targets for nature, with four companies to date publicly disclosing their progress for greater accountability. This creates the potential for a wide-scale impact if SBTs for nature achieve global coverage and uptake. More recently, SBTN has begun focusing on scaling target-setting for nature, with an additional 24 companies publicly sharing their timelines for setting science-based targets, drawn from a broader group of 150 companies preparing to set targets with SBTN. This trajectory aims to mirror the growth in SBTs for climate that has scaled to over 9,500 companies setting validated targets over the past decade, with an additional focus on locations and sectors associated with the highest impacts on nature.

The objective of the SBTN guidance is to provide a process for companies to reduce their pressures on biodiversity—these pressures map directly to IPBES direct drivers—and contribute to biodiversity protection and restoration through a systematic process informed by the scientific literature. To that end, biodiversity is not addressed as a separate target but is instead embedded across target-setting mechanisms aimed at reducing pressures on land, freshwater and marine systems. As it is rarely practical to address all of a company's impacts everywhere at once, the SBTN process requires companies to take a funnel-shaped approach that leverages data, capacity and resources from existing internal company strategies as well as other key frameworks and disclosures (e.g., SBTi, TNFD, and GRI).

This method starts with high-level environmental materiality screening (referred to as Step 1A in SBTN guidance), conducted across the company operations and upstream value chain, to identify which company activities, commodities, and pressures are in scope. To do so, companies use SBTN's Materiality Screening Tool and High-Impact Commodity List, which are based on literature synthesis about which economic activities and commodities are most likely to have an impact on biodiversity. This holistic starting point helps companies identify synergies for biodiversity and to scale up action over time, increasing the potential impact of their targets and engaging other small and medium-sized companies within their value chain where possible.

Those activities and pressures identified as potentially material are brought forward for a value chain assessment of impacts on nature (Step 1B), which considers both the magnitude of the assessed pressures and the state of nature, including biodiversity, in the impacted locations or broader geographies using global data layers. The pressures and state of nature scores are ranked to prioritize locations and geographies (Step 2) for setting targets across different realms, emphasizing locations of high biodiversity importance. Guidance (Step 3, Table 1) is available for setting targets for key pressures for land, freshwater, and ocean realms (Science Based Targets Network 2024a, 2024b, 2025). Currently, SBTN is developing additional guidance on target implementation to ensure positive outcomes for biodiversity (Step 4) and on monitoring to track and report progress towards meeting targets (Step 5).

These technical resources will synthesize resources on actions, while providing room to integrate local socio-ecological context, and emphasize how SBTN guidance on target setting complements global voluntary and regulatory frameworks on monitoring and disclosure.

SBTN directly helps companies contribute to the achievement of GBF Target 15 by providing a robust and quantified framework to monitor, assess, and transparently disclose their impacts on biodiversity, and in doing so, create the potential to provide decision-useful information to consumers, to progressively reduce negative impacts and increase positive impacts on biodiversity. By addressing the key threats to biodiversity (Table 1), SBTN can help companies contribute to meeting a wide range of GBF targets (Table 2).

How science-based targets for nature contribute to positive biodiversity outcomes

SBTN's target-setting methodology contributes to biodiversity outcomes through incentivizing actions that address pressures within land, freshwater, and marine systems that are linked to biodiversity loss (see Figure 1). Consistent with the SBTN action framework (Science Based Targets Network 2020), this includes actions that avoid impacts, reduce pressures on biodiversity, adopt regenerative approaches to enhance biodiversity in anthropogenic systems, restore degraded ecosystems, and catalyze business transformation. Target indicators and thresholds by biome or ecological realm, as described below, can help understand these connections to biodiversity outcomes.

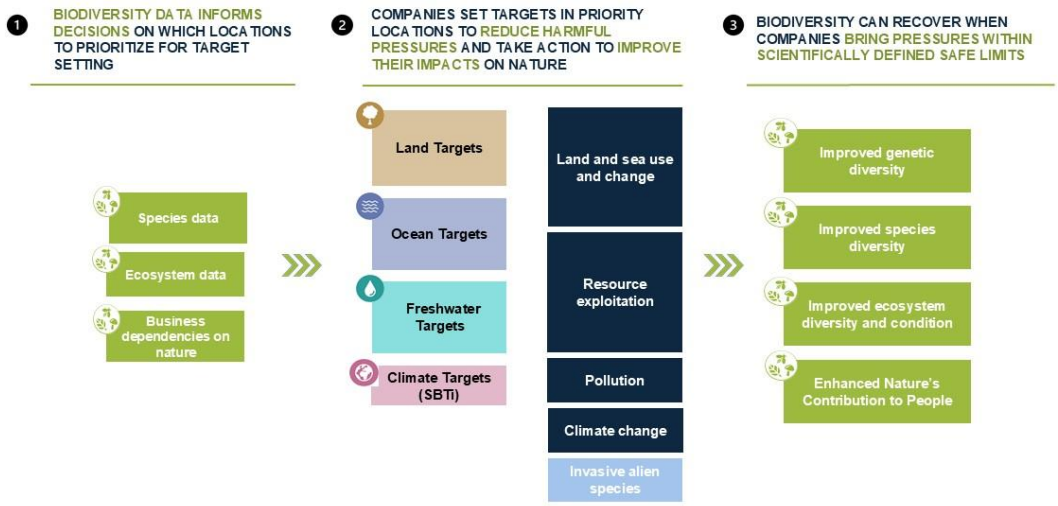

Figure 1. Conceptual diagram depicting how science-based targets for nature drive measurable corporate actions for biodiversity

The SBTN Land targets address pressures of land use and land use change, incorporating both value chain-wide and multistakeholder landscape targets. The targets complement and build on SBTi Forest Land and Agriculture (FLAG) guidance (Anderson *et al.* 2023) for companies that manage and impact large areas of land. Land use change is currently the pressure that most contributes to biodiversity loss globally (Jaureguiberry *et al.* 2022) and is also a major contributor to the next biggest driver of biodiversity loss, climate change (IPCC 2018). Avoiding further conversion of natural habitat, consistent with SBTN's "No Conversion of Natural Ecosystems" target, is therefore one of the most important targets

for global biodiversity conservation, and the priority for abating the impacts of agriculture on biodiversity (Phalan *et al.* 2011). However, halting further conversion will not be enough to meet global biodiversity goals focused on halting and reversing biodiversity loss. Target 2 of the GBF calls for the restoration of 30% of degraded land, and meeting the most sustainable SSP1 scenario will require decreases of up to 800 Mha of pastureland and 450 Mha of cropland (IPCC 2018). Achieving these global targets will require both producers and sourcing companies to invest in overall reductions in the area of agricultural land for commodity growth, reflected in SBTN's "Land Footprint Reduction" target and its further updates, which include additional indicators of land quality referenced in the GBF (Targets 2 and 11). However, actions to avoid conversion and reduce land footprint will only be effective in practice if there is engagement with key stakeholders in relevant landscapes and if actions are tailored to the specific local context (Sayer *et al.* 2013), which is why the first two targets are complemented by the third land SBT, "Landscape Engagement," that includes a range of social-ecological indicators aimed at more holistically addressing pressures associated with biodiversity loss in a given location in collaboration with local and jurisdictional actors.

Freshwater biodiversity is declining even more rapidly than terrestrial biodiversity, driven by a range of threats including water withdrawal, freshwater habitat conversion, and eutrophication (Dudgeon *et al.* 2006; McElwee *et al.* 2025). Four of the Safe and Just Earth System Boundaries (ESBs) relate to the quantity and quality of water use: nitrogen, phosphorus, groundwater, and surface water (Rockström *et al.* 2023). To help bend the curve on freshwater biodiversity loss (Tickner *et al.* 2020), SBTN Freshwater targets take direct aim at the provisioning of environmental flows and improving water quality through preventing eutrophication to sustain aquatic life. Overexploitation of freshwater systems negatively impacts biodiversity, aquatic ecosystem resilience and ecosystem functioning (Vörösmarty *et al.* 2010) . Eutrophication, driven by anthropogenic nutrient application, is a major driver of freshwater biodiversity decline through changes in community composition that can result in reductions in population of rare and specialist species, leading to biotic homogenization and loss of critical ecosystem services (Cook *et al.* 2018; Machado *et al.* 2023). To address these critical pressures on freshwater biodiversity, the freshwater target-setting methods build on locally and globally developed hydrological models (Hogeboom *et al.* 2020) for freshwater extraction and (McDowell *et al.* 2020) for freshwater nitrogen and phosphorus pollution, to guide companies to stay within ESBs. Modelled water quantity thresholds account for the maintenance or enhancement of the freshwater ecosystems, including the needs of specific species, using environmental flow requirements. Similarly, water quality thresholds for nutrients used in science-based targets are linked to eutrophication of freshwater ecosystems to avoid impacts on freshwater species and ecosystems. Upcoming expansions to the freshwater quantity and quality targets more comprehensively address freshwater pressures and company impacts with a focus on averting groundwater depletion to safeguard freshwater connectivity and reducing pesticide use, as well as other harmful chemical pollutants.

SBTN Ocean targets address overexploitation, habitat loss, and degradation, as well as the risks to endangered, threatened, and protected (ETP) marine wildlife from fisheries and aquaculture. Extinctions in the ocean realm were once deemed impossible (Roberts *et al.* 1999). Cumulative human pressure on oceans has been responsible for dramatic declines (e.g., over 90% declines from the 1950s to 1990s in pelagic shark populations in the Gulf of Mexico (Baum & Myers 2004) and a high risk of extinction to many marine species (Turner *et al.* 2024), which have been revealed by better monitoring. An analysis of the Species Threat Abatement and Restoration metric for marine species found that overexploitation of commercially exploited species (Ocean target 1) is the biggest opportunity for abating threats to marine species that have been assessed in the IUCN Red List (43% of global threat abatement score (Turner *et al.* 2024)). Beyond overexploitation, non-commercially

harvested ETP species are also at risk from wild capture fishing and aquaculture, including seabirds, turtles, marine mammals, sharks, rays and teleosts (Gray & Kennelly 2018; Bath *et al.* 2023). Ocean target 3 requires companies to change their practices (e.g., gear improvements to reduce bycatch) and enhance engagement in seascapes and jurisdiction to support recovery efforts of affected species. Moreover, benthic structural habitats like coral reefs, seagrass beds, and sponge grounds that support marine biodiversity (Sobha *et al.* 2023) and provide refuge and nursery grounds for a suite of commercially important species (De Clippele *et al.* 2025) are directly impacted by aquaculture and wild fisheries capture through destructive fishing practices (Du Preez *et al.* 2020; OSPAR 2023), habitat conversion (Bath *et al.* 2023), and pollution (Pinheiro *et al.* 2023). Ocean target 2 directly addresses this threat by helping companies to avoid and reduce impacts on marine and transitional structural habitats.

Table 1. Overview of SBTN coverage by realm and pressure.

Direct Driver (IPBES terminology)	Pressure (SBTN terminology)	Step 1a – materiality screening	Step 1b – value chain assessment	Step 2 – prioritization	Land targets	Freshwater targets	Ocean targets
Land Use Change	Ecosystem use	Required for land, freshwater, ocean	Required (land only)	Required (land only)	Land Footprint Reduction (absolute or intensity-based) (T2); Landscape Engagement (T3)		
	Ecosystem use change	Required	Required	Required	No Conversion of Natural Ecosystems (T1); Natural Land Cover (maintain or increase natural land cover) (V2)	Partly covered through the No Conversion of Natural Ecosystems target (e.g., wetlands, peatlands, and water bodies included in the SBTN Natural Land map)	Protect Structural Habitats (T2) using context-specific indicators. Note that cross-realm ecosystems partly covered in the "no conversion of natural ecosystems" land target (e.g., mangroves included in the SBTN Natural Land map)
Overexploitation	Water extraction	Required	Required	Required		Freshwater Quantity target (T1) for surface water bodies and additional upcoming coverage of groundwater levels (V2).	

Direct Driver (IPBES terminology)	Pressure (SBTN terminology)	Step 1a – materiality screening	Step 1b – value chain assessment	Step 2 – prioritization	Land targets	Freshwater targets	Ocean targets
	Overexploitation – logging, hunting, and fishing	Required (for threatened species, fishing and aquaculture)	Required (for threatened species, fishing and aquaculture)	Required (for fishing and aquaculture)			Avoid and Reduce Overexploitation (T1) through stock-health-related indicators. Reduce Risks to ETP species (T3) using context-specific indicators.
Climate Change	GHG emissions	Required	*Assessment, prioritization, and targets for GHG emissions are covered by SBTi*				
Pollution	Non-GHG air pollution	Optional					
	Water pollution	Required	Required	Required		Freshwater Quality target (T1) for reducing pollution from nitrogen and phosphorus, which will extend to other toxic chemicals (pesticides and other point source pollutants) (V2)	
	Soil pollution	Required	Required	Required	Reducing nutrient (nitrogen and phosphorus) application to soils through the Landscape	Partly covered through the Freshwater Quality target (T1) for reducing pollution from nitrogen and phosphorus, which will	

Direct Driver (IPBES terminology)	Pressure (SBTN terminology)	Step 1a – materiality screening	Step 1b – value chain assessment	Step 2 – prioritization	Land targets	Freshwater targets	Ocean targets
					Engagement (T3) target. In the future this will be further addressed in the Land Footprint Reduction target by restoring soil organic carbon levels, reducing soil erosion, and reducing terrestrial acidification (V2)	extend to other toxic chemicals (pesticides and other point source pollutants) (V2)	
	Solid waste	Optional					
	Other ecological disturbances (e.g., noise)	Optional					
Invasive and Alien Species	Invasive and Alien Species	Optional					Future guidance (V2) may address invasive species in the marine system

Table 2. Mapping of the potential contributions of SBTN land, freshwater, and ocean targets towards achieving headline indicators for 22 GBF targets. Note that Target 23 does not have a headline indicator (Convention on Biological Diversity 2022). These corporate contributions are scored as being directly or indirectly positively linked to GBF target achievement. Where the contribution of SBTs for nature to the headline indicator is either unknown or unlikely, the cell is colored gray. For example, land targets directly aid target A.2 around the extent of natural habitat through no conversion targets, while freshwater targets indirectly aids this target by addressing pressures that degrade natural ecosystems. This approach to evaluating influence of SBTs for Nature on GBF targets is adapted from the methodology described by Nilsson *et al.* (2016) for interactions between Sustainable Development Goals.

Target	Target name	Category	Number	Indicator name	Land targets	Freshwater targets	Ocean targets
Target 1	Plan and manage all areas to reduce biodiversity loss	Headline	A.1	Red List of Ecosystems	Indirect	Indirect	Indirect
Target 1	Plan and manage all areas to reduce biodiversity loss	Headline	A.2	Extent of natural ecosystems	Direct	Indirect	Direct
Target 1	Plan and manage all areas to reduce biodiversity loss	Headline	1.1	Percentage of land & sea area covered by biodiversity-inclusive spatial plans	Direct		
Target 2	Restore 30% of all degraded ecosystems	Headline	2.2	Area under restoration	Indirect	Indirect	Indirect
Target 3	Conserve 30% of land, waters and seas	Headline	3.1	Coverage of protected areas and OECMs			
Target 4	Halt species extinction & protect genetic diversity	Headline	A.4	Proportion of populations within species with an effective population size> 500	Indirect	Indirect	Indirect
Target 4	Halt species extinction & protect genetic diversity	Headline	A.3	Red List Index	Indirect	Indirect	Indirect

Target 5	Sustainable, safe & legal use, harvesting and trade of wild species	Headline	5.1	Proportion of fish stocks within biologically sustainable levels			Direct
Target 6	Reduce invasive alien species introductions by 50% and minimize their impacts	Headline	6.1	Rate of invasive alien species establishment			
Target 7	Reduce pollution harmful to biodiversity	Headline	7.1	Index of coastal eutrophication potential	Indirect	Indirect	
Target 7	Reduce pollution harmful to biodiversity	Headline	7.2	Pesticide environment concentration (or aggregated total applied toxicity)	Indirect	Direct	
Target 9	Manage wild species sustainably to benefit people	Headline	9.1	Benefits from the sustainable use of wild species			Indirect
Target 9	Manage wild species sustainably to benefit people	Headline	9.2	Percentage of the population in traditional occupations			
Target 10	Enhance biodiversity & sustainability in agriculture, aquaculture, fisheries & forestry	Headline	10.1	Proportion of agricultural area under productive and sustainable agriculture	Direct	Indirect	Direct
Target 10	Enhance biodiversity & sustainability in agriculture, aquaculture, fisheries & forestry	Headline	10.2	Progress towards sustainable forest management	Direct		
Target 11	Restore, maintain & enhance nature's contributions to people	Headline	B.1	Services provided by ecosystems	Indirect	Indirect	Indirect
Target 12	Enhance urban green/blue space & biodiversity-inclusive planning	Headline	12.1	Average share of built-up area that is green/blue space for public use for all			

Target 13	Access & Benefit-Sharing (ABS)	Headline	C.1	Monetary benefits received (ABS)	Indirect	Indirect	Indirect
Target 13	Access & Benefit-Sharing (ABS)	Headline	C.2	Non-monetary benefits (ABS)	Indirect	Indirect	Indirect
Target 15	Business disclosures & impacts on biodiversity	Headline	15.1	Number of companies reporting disclosures of risks, dependencies and impacts on biodiversity	Direct	Direct	Direct
Target 18	Reduce harmful incentives; scale positive incentives	Headline	18.1	Positive incentives in place to promote biodiversity conservation and sustainable use			
Target 18	Reduce harmful incentives; scale positive incentives	Headline	18.2	Value of subsidies and other incentives harmful to biodiversity eliminated, phased out or reformed			
Target 19	Finance mobilization for biodiversity (US$200bn/yr)	Headline	D.1	International public funding incl. ODA for biodiversity			
Target 19	Finance mobilization for biodiversity (US$200bn/yr)	Headline	D.2	Domestic public funding on biodiversity			
Target 19	Finance mobilization for biodiversity (US$200bn/yr)	Headline	D.3	Private funding on biodiversity (domestic & international)	Indirect	Indirect	Indirect
Target 20	Strengthen capacity-building, technology transfer, and scientific and technical cooperation for biodiversity	Headline	20.1	Number of countries that have taken significant action to strengthen capacity-building and development and access to and transfer of technology, and to promote the development of and			

				access to innovation and technical and scientific cooperation			
Target 21	Data, information & knowledge for biodiversity action	Headline	21.1	Indicator on biodiversity information for monitoring the GBF			
Target 22	Participation & access to justice/information (IPLCs, women, youth, PWD)	Headline	22.1	Land-use change and land tenure in the traditional territories of Indigenous Peoples and local communities			

Key	
Direct	Direct contribution to the target indicator
Indirect	Indirect contribution to the target indicator
	Unknown or unlikely contribution to this target indicator

Opportunities to expand biodiversity coverage within pressure-based target-setting methods

SBTN currently includes ambitious targets for many of the key pressures on biodiversity, which, if sufficiently adopted by companies, will deliver meaningful contributions from the private sector to achieving global goals on biodiversity and sustainability. However, as outlined in Tables 1–2, the current set of SBTs does not cover all pressures or all targets captured in global frameworks like the GBF. The following sections discuss what additional coverage of corporate impacts could be possible with further development of the SBTN approach, and which global goals may be more appropriately addressed through other mechanisms.

Further development of SBTs for nature will require close collaboration with a range of stakeholders from business, funders, researchers, governments, and methods developers to ensure that targets are consistent with the best available science and are actionable by corporate end users.

Develop new pressure-based targets

What makes a pressure amenable to setting science-based targets?

Under the current framing, SBTs for nature must meet the following criteria:

1. A science-based consensus exists on the global or local threshold or limit that society must adhere to. Examples of these approaches include Safe and Just Earth System Boundaries (Rockström *et al.* 2023), ecosystem tipping points (Dakos *et al.* 2019), or pollution limits for freshwater basins. This is key because it enables quantitative targets to be calculated and set for individual companies based on their proportional contribution to potentially exceeding the targets.
2. Companies have influence over the pressure. They should only set pressure-reduction targets for their actions that are possible to achieve.
3. The targets should be measurable and attributable, so progress can be tracked.

Table 3. Mapping pressures against criteria for pressure-based SBTs that are well-established in the scientific literature, companies' influence, and that are actionable. Climate Change is not included because it is covered by SBTi. ESB = Earth System Boundary, *sensu* Safe and Just Earth System Boundaries (Rockström *et al.* 2023).

IPBES Direct Driver	SBTN Pressure	Scientific basis for global or local thresholds (non-exhaustive)	Current status in SBTN and potential for future development
Land and sea use change	Land use	ESB for natural ecosystem area	Included through land targets on No Conversion, Land Footprint and Landscape Engagement
	Land use change	ESB for natural ecosystem area	Included in No Conversion target
	Freshwater ecosystem use	ESB for natural ecosystem area	Included through landscape initiatives. No "No Conversion" target explicitly for freshwater ecosystems yet, but often integrated into wider Landscape Engagement target, since hydrological systems are harder to separate out from broader context. However, the No Conversion land

			target covers some freshwater ecosystems such as wetlands and peatlands as well as other freshwater bodies that are considered as natural in the SBTN Natural Land map.
	Freshwater ecosystem use change	ESB for natural ecosystem area	No "No Conversion" target explicitly for freshwater ecosystems yet, but often integrated into wider Landscape Engagement targets since hydrological systems are harder to separate out from broader context. However, the "No Conversion" land targets cover some freshwater ecosystems such as wetlands and peatlands as well as other freshwater bodies that are considered as natural in the SBTN Natural Land map.
	Marine ecosystem use	ESB for natural ecosystem area	Can be partly addressed by ocean target 2. Challenging to develop quantitative targets but may be addressed through seascape initiatives or practice changes (e.g., fishing practice and fishing gears) for some sectors (expanding current coverage) (Heinze *et al.* 2021; Bryce & Hunter 2024).
	Marine ecosystem use change	ESB for natural ecosystem area	Can be partly addressed by ocean target 2. Challenging to develop quantitative targets but may be addressed through seascape initiatives or practice changes for some sectors (expanding current coverage) (Schläppy & Hobbs 2019; Heinze *et al.* 2021; Bryce & Hunter 2024).
Overexploitation	Water use	ESB for groundwater and surface water	Included in freshwater target 1 on a basin basis with local or global models (where locally developed models are available; (Hogeboom *et al.* 2020).
	Other resource use	Maximum sustainable yield (MSY) can be calculated for individual species	Included on a species by species basis in ocean target 1 for wild capture seafood systems (marine and freshwater; finfish and invertebrates), including commercial bycatch. Incidental catch of marine wildlife, including endangered and threatened species, is addressed through ocean target 3.
Pollution	Non-GHG air pollution	ESB for aerosols; others can be calculated	Not currently included, but theoretically could be calculated on a pollutant-by-pollutant basis
	Water pollution	Basin-level thresholds for specific watersheds	Included in freshwater target 2 on a pollutant-by-pollutant basis, on a basin basis with local or global models (where locally developed models are available; (McDowell *et al.* 2020))
	Soil pollution	No global target or threshold, but regional and local	Partially included in land targets v2 (soil acidification) and can theoretically be calculated on a pollutant by pollutant basis and may

		thresholds can be determined	be addressed through other realm targets (e.g., freshwater).
	Solid waste	No global target or threshold, but regional and local thresholds can be determined	Subject to be explored by SBTN. No current plan to include as a specific target. Would be challenging due to lack of general agreement on suitable quantitative targets and often addressed through regulatory measures (Selkoe *et al.* 2015; Boucher & Friot 2017; IPBES 2019).
Does not fit into IPBES framework	Other ecological disturbances	No global target or threshold, but regional and local thresholds can be determined	Subject to be explored by SBTN. No current plan to include as a specific target, but can be covered by guidance.
Invasive and Alien Species	Biological alterations and invasions	Highly relevant to global targets to reduce species extinctions. National, regional, and local thresholds can be determined.	May be included in ocean targets v2. Not currently included due to challenges in attributing impacts to corporate actions and in generalizing targets across contexts. Could be set on an ecosystem / regional / or species-by-species basis and could either be about rate of introductions or control of the impacts (Early *et al.* 2016; Seebens *et al.* 2017, 2023). The subject could also be explored beyond targets, based on best practices linked to company actions (e.g., SBTN Step 4)

While a broad range of pressures for all realms are considered in Steps 1-2 of the SBTN methods, not all pressures in all realms are covered in Step 3 (Table 1), meaning that some global biodiversity targets relating to pressure reduction will not be fully met by scaling up SBTs (Table 2).

For some pressures, e.g., invasive and alien species (IAS) (GBF Target 6), this is due to the inherent challenges in setting corporate-level targets. There are global and local targets for IAS, and there is strong evidence that avoiding the establishment of invasive species and managing or eradicating established populations of invasive species drives positive biodiversity outcomes, particularly in islands and freshwater ecosystems. It is generally more challenging, however, to attribute IAS risks to specific company actions than it is for (for example) water extraction or land use. It is possible to link specific IAS management actions to desired biodiversity targets (Green *et al.* 2014; Schiel *et al.* 2018), but these are context-specific. While the context-specificity of IAS best practice removal and the more indirect nature of the link to company activities make it more challenging to set targets, SBTN is exploring the development of best practice guidance on managing IAS and may include targets on invasive species in the next set of ocean targets.

Tables 1-2 outline different pressures covered in different realms. Land targets are focused on habitat conversion, land footprint and landscape engagement (land use and land use change), freshwater targets are focused on water extraction and pollution, and ocean targets are focused on overexploitation of commercially harvested species, with some consideration of habitat conversion as well. Non-included pressures can be pertinent in these realms, and pressures present in one realm can be linked and have an impact on another realm. Overexploitation of biological resources is a key extinction driver in the land and freshwater realms, habitat conversion and modification is a major pressure in freshwater ecosystems (e.g., dams, wetland conversion), and nitrogen and phosphorus pollution shape terrestrial and marine biological communities.

Some differences in the coverage of pressures across realms in the target-setting methodologies to date can be partly explained by the choice to initially focus, within each realm, on the pressures associated with the sectors most likely to set targets and with the greatest impacts. In the case of land ecosystems, land use and land-use change are the biggest threat for biodiversity. For freshwater systems, it is a combination of pressures, including land use change, overexploitation, and pollution. For ocean ecosystems, the overexploitation of species, and the ecosystem use change and pollution (including that coming from the land and freshwater) have the largest negative impacts (IPBES, 2019). The targets developed for the first version as well as the second version of the methods give companies direction to reduce their impacts linked to ecosystem-use and use change (Land target 1, Ocean target 3), overexploitation (Freshwater target 1, Ocean target 1, and 3) and pollution (Freshwater target 2 and Land target 2, related particularly to soil quality). When considering sectors most likely to set targets with the greatest impacts, some examples can be pointed out, such as the relevance of the land and freshwater targets to the pressures associated with agricultural supply chains, while the ocean targets are most relevant to seafood supply chains—addressing sectors with particularly significant impacts on biodiversity outcomes. However, the diversity of pressures considered to date suggests a wider range of target-setting approaches could be developed for each realm, e.g., targets for overexploitation of commercially harvested species in the terrestrial realm.

Safeguarding biodiversity benefits from existing targets

Setting ambitious targets across a wide range of domains brings risks of trade-offs and opportunities for synergies (Nilsson *et al.* 2018; Adhikari *et al.* 2023; McElwee *et al.* 2025). Trade-offs and synergies between different actions to preserve biodiversity, and between multiple outcomes for people and nature (Batáry *et al.* 2025), including action on climate and biodiversity (IPCC 2022), and multiple outcomes for food, health, water, climate, and biodiversity (McElwee *et al.* 2025).

Because of the close interconnections between biodiversity, climate, socio-economic, and other considerations, science-based targets for nature need to be accompanied by appropriate safeguards to manage potential trade-offs and synergies. Categories of safeguards needed include:

1. Identify and avoid potential negative consequences of trade-offs between SBTN targets

While SBTN targets across different realms can show strong synergies when combined and enhance positive outcomes across ecosystems (e.g., combining land and freshwater targets can support wetland ecosystems), and while some targets can have positive indirect effects on other ecosystems (e.g., setting freshwater quality targets will decrease the pollution of ocean ecosystems), trade-offs between targets can also arise. These trade-offs may occur in particular when the actions deployed to achieve a target are not considered in a broader system context, including potential consequences for the ecosystem where the target is set, and for connected ecosystems. For example, reducing land footprint (Land target 2) will require producers to increase yields in order to maintain existing levels of production. Conventional approaches to yield increases, including fertilizer and pesticide application as well as irrigation, have the potential to create negative unintended consequences. To mitigate this risk, SBTN provides guidance for companies to avoid unsustainable intensification via additional use of fertilizers and pesticides. As the land and freshwater target-setting methods expand, new SBTN targets will include complementary terrestrial ecosystem condition and pesticide thresholds that safeguard against these outcomes (including forthcoming land quality targets and existing freshwater quantity and pollution targets), particularly when companies apply SBTN methods holistically. Concentration of land footprint is still likely to be net beneficial to biodiversity even if these externalities are considered (Phalan *et al.* 2011; Balmford 2021), but measures to increase yields while minimizing externalities should be prioritized, e.g., using sustainable intensification

(Garnett *et al.* 2013) and regenerative agriculture frameworks (DeClerck *et al.* 2021). Another trade-off example is when companies choose to reduce pressure by substituting one activity for another or changing practices. For example, a seafood product company could decide to reduce its overfishing pressure by setting an Ocean target (Ocean target 1) and substitute wild fisheries with aquaculture. By doing so, there could be an increase in land use in their value chain due to the reliance on soy, wheat, and corn protein for animal feed (Gephart *et al.* 2021).

2. Prioritize response options with multiple benefits

In addition to expanding the coverage of SBTs, new target implementation resources will provide additional means to safeguard and encourage actions that maximize positive outcomes for biodiversity. As it is rarely feasible for companies to implement all available response options, they can optimize their impact by choosing response options with multiple co-benefits. Response options for abating pressures on biodiversity vary substantially in their co-benefits for other nature goals. For example, the IPBES Nexus Assessment estimated a greater magnitude of co-benefits for sustainable intensification than for reducing pesticide pollution (McElwee *et al.* 2025). There are multiple approaches for assessing co-benefits (Vijay *et al.* 2022; Adhikari *et al.* 2023; Prist *et al.* 2026). SBTN is currently developing some approaches to maximize benefits across multiple dimensions of nature and climate, including outcomes for biodiversity and for people.

3. Use state of nature metrics to prioritize where to act and evaluate outcomes for biodiversity

Biodiversity and threats to biodiversity are unevenly distributed across the world. Actions to abate threats can be orders of magnitude more effective in preventing extinction in some locations than others (Mair *et al.* 2021; Turner *et al.* 2024). SBTN currently requires companies to use state of nature metrics to prioritize where to set targets to maximize these outcomes (SBTN Step 2). While this approach has been effective in highlighting areas of biodiversity significance where environmental impacts have the potential to create a disproportionate impact on biodiversity, this could be expanded by using a wider range of state of nature metrics to inform the prioritization process. Current corporate pilots of the Nature Positive Initiative metrics could address this need by complementing SBTN's existing biodiversity metrics to inform target implementation and longer-term biodiversity monitoring. In addition to prioritizing action, further development of biodiversity monitoring frameworks (e.g., the Nature Measurement Protocol, a collaboration between several organizations, including NPI and WBCSD) can help inform our understanding of the outcome of science-based targets on the state of nature. This thinking will inform SBTN's measurement, reporting and verification (MRV) frame.

4. Stakeholder engagement is a critical factor for success

However ambitious and influential a company's actions for biodiversity may be, they always happen with a unique social, economic, and political context and need to be adapted accordingly. This emphasizes the importance of inclusive "whole society" approaches to target-setting and implementation, such as those embodied in multilateral environmental agreements (e.g., GBF), to mitigate potential unintended consequences of siloed action. SBTN's approach emphasizes jurisdictional approaches to landscape-level actions that embed multistakeholder processes, and clear guidance on stakeholder consultation and engagement throughout target setting. This can help address concerns of leakage and other associated impacts, which tend to vary based on policy or socio-ecological context. For example, whether increases in crop yields lead to reductions in the amount of land used for agricultural production—thereby sparing land for conservation and restoration as intended in land target 2—or instead result in rebound effects through cropland expansion driven by increased demand, depends on the policy context (Balmford 2021). Consultation with local stakeholders in a participatory process can be used to better understand and mitigate the

risk of leakage (Rouhi Rad *et al.* 2021; Filewod & McCarney 2023), particularly in smallholder contexts, to ensure that land not converted or freed from agricultural production is incorporated into integrated biodiversity-inclusive spatial planning that balances human needs for natural resources and NCPs with biodiversity outcomes. The need for stakeholder consultation is embedded in SBTN across realms. For example, stakeholders need to endorse local hydrological models for freshwater targets and ocean targets 1 and 3 require engagement with stakeholders to identify appropriate data sources to inform target thresholds.

State-based targets

The ultimate aim of global biodiversity commitments and corporate biodiversity action, including through SBTs for nature, is to create positive outcomes for the state of nature. At the highest level, the Kunming-Montreal Global Biodiversity Framework (GBF) (Convention on Biological Diversity 2022b) contains a series of goals and targets, and an associated monitoring framework that contains headline indicators including ecosystem extent and condition and rates of species extinction.

The mechanism to influence these measures involves changes to the indirect and direct drivers of biodiversity loss, and positive actions to improve the situation on the ground. Businesses can help deliver improvements in the state of biodiversity through reducing their pressures (i.e., direct drivers) and by taking actions that improve the state of nature, e.g., directly contributing to conservation and restoration efforts.

SBTN's approach to state-based vs. pressure-based targets

Some business and biodiversity frameworks have developed approaches for state-based targets—targets where the core indicator is a metric describing the state of nature in locations of high biodiversity risk or significance, such as IUCN RHINO (IUCN 2025). While state-based targets bring the intended outcomes for nature to the forefront, they need to be correctly interpreted in order to inform corporate action. SBTN centers its approach on pressure-based targets, which enable action by requiring organizations to set targets where their impacts and dependencies on nature are likely to be greatest (Figure 1). The advantage of a pressure-based approach to target-setting is that it is typically more straightforward for companies to act, measure, and attribute changes in pressure than in the state of nature, as these are levers they can control and influence across their operations and value chains.

SBTN focuses on globally-applicable targets for which pressure targets are most suited. These pressure targets are adapted to local conditions and state of nature values most closely connected to the pressure that the company is aiming to reduce. In some cases, the state values informing the pressure targets may include direct measures of biodiversity; however, in most cases, it is too challenging to select an actionable state of biodiversity value or to attribute the state of biodiversity to the actions of different actors. For this reason, SBTN does not include specific global state targets, but rather provides options for users to set local targets for the state of nature within the context of landscape engagement. Further, state metrics may be used at the landscape scale to measure the outcomes of collective action.

As examples of how biodiversity outcomes (i.e., changes in the biodiversity state) are linked to pressure-based SBTs, both the "Avoid Overexploitation" and the "Reduce Risk to ETP Marine Wildlife Populations" targets within the ocean SBTs provide distinct mechanisms for translating impacts on fish and other marine species populations into corporate responsibility for pressure reduction. Likewise, measures of ecosystem extent and condition, as well as other complementary biodiversity metrics, are embedded within upcoming land SBTs (V2 to be released in 2026). Both land and ocean targets also include landscape approaches that create opportunities to incorporate state-based indicators, guiding collective action by companies in specific areas to effectively address systemic

biodiversity challenges.

Conclusion

As articulated above, science-based targets incorporate biodiversity data and considerations at multiple stages of the target-setting process. As companies continue to set targets and take action to deliver them, this data becomes increasingly critical to ensuring that science-based targets—when adopted at sufficient scale by corporate actors—can realize their full potential to help bend the curve of biodiversity loss.

References

Adhikari, B., Urbach, D., Chettri, N., Sharma, E., Breu, T., Geschke, J., Fischer, M. & Prescott, G.W. (2023) A multi-methods approach for assessing how conserving biodiversity interacts with other sustainable development goals in Nepal. *Sustainable Development* 31: 3239–3253.

Anderson, C.M., Bicalho, T., Wallace, E., Letts, T. & Stevenson, M. (2023) Forest, Land and Agriculture Target-Setting Guidance. Version 1.1. World Wildlife Fund, Washington D.C.

Armstrong McKay, D.I., Staal, A., Abrams, J.F., Winkelmann, R., Sakschewski, B., Loriani, S., Fetzer, I., Cornell, S.E., Rockström, J. & Lenton, T.M. (2022) Exceeding 1.5°C global warming could trigger multiple climate tipping points. *Science* 377: eabn7950.

Bai, X., Hasan, S., Andersen, L.S., Bjørn, A., Kilkiş, Ş., Ospina, D., Liu, J., Cornell, S.E., Sabag Muñoz, O., de Bremond, A., Crona, B., DeClerck, F., Gupta, J., Hoff, H., Nakicenovic, N., Obura, D., Whiteman, G., Broadgate, W., Lade, S.J., Rocha, J., Rockström, J., Stewart-Koster, B., van Vuuren, D. & Zimm, C. (2024) Translating Earth system boundaries for cities and businesses. *Nature Sustainability* 7: 108–119.

Balmford, A. (2021) Concentrating vs. spreading our footprint: how to meet humanity's needs at least cost to nature. *Journal of Zoology* 315: 79–109.

Barnosky, A.D., Matzke, N., Tomiya, S., Wogan, G.O.U., Swartz, B., Quental, T.B., Marshall, C., McGuire, J.L., Lindsey, E.L., Maguire, K.C., Mersey, B. & Ferrer, E.A. (2011) Has the Earth's sixth mass extinction already arrived? *Nature* 471: 51–57.

Batáry, P., Gallé, R., Korányi, D., Lakatos, T., Deák, B., Gallé-Szpisjak, N., Kabai, M., Koszta, C., Kotowska, D., Marja, R., Palotás, B., Szabó, B., Torma, A., Báldi, A., Hornung, E., László, Z., Molnár, Z., Purger, J.J., Seress, G., Urák, I., Purger, D., Sándor, K., Somay, L., Süle, G., Valkó, O., Zsigmond, A.R., Fischer, C., Marini, L., Tscharntke, T., Szitár, K. & Török, E. (2025) Biodiversity and human well-being trade-offs and synergies in villages. *Nature Sustainability* 8: 894–904.

Bath, G.E., Price, C.A., Riley, K.L. & Morris Jr, J.A. (2023) A global review of protected species interactions with marine aquaculture. *Reviews in Aquaculture* 15: 1686–1719.

Baum, J.K. & Myers, R.A. (2004) Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico. *Ecology Letters* 7: 135–145.

Boucher, J. & Friot, D. (2017) *Primary microplastics in the oceans*. IUCN.

Bouwman, A.F., Beusen, A.H.W. & Billen, G. (2009) Human alteration of the global nitrogen and phosphorus soil balances for the period 1970–2050. *Global Biogeochemical Cycles* 23.

Bryce, K. & Hunter, K.L. (2024) Enhancing climate change planning and adaptive management in marine protected areas through targets, thresholds, and social-ecological objectives. *Frontiers in Marine Science* 11.

Convention on Biological Diversity (2022a) Actors Othen Than National Government In The Post-2020 Global Biodiversity Framework – Catalyzing Ambition and Action 2020-2030.

Convention on Biological Diversity (2022b) Kunming-Montreal Global Biodiversity Framework.

Cook, S.C., Housley, L., Back, J.A. & King, R.S. (2018) Freshwater eutrophication drives sharp reductions in temporal beta diversity. *Ecology* 99: 47–56.

Dakos, V., Matthews, B., Hendry, A.P., Levine, J., Loeuille, N., Norberg, J., Nosil, P., Scheffer, M. & De Meester, L. (2019) Ecosystem tipping points in an evolving world. *Nature Ecology & Evolution* 3: 355–362.

De Clippele, L.H., Nozères, C., Xu, J., MacDonald, B., Lirette, C., Phelan, K., Staniforth, C., Whoriskey, F., Wolff, G.A., Blackbird, S., Mohn, C. & Kenchington, E. (2025) Fish use of deep-sea sponge habitats evidenced by long-term high-resolution monitoring. *Scientific Reports* 15: 17656.

DeClerck, F.A.J., Koziell, I., Sidhu, A., Wirths, J., Benton, T.G., Garibaldi, L.A., Kremen, C., Maron, M., Rumbaitis del Rio, C., Clark, M., Dickens, C., Estrada-Carmona, N., Fremier, A.K., Jones, S.K., Khoury, C.K., Lal, R., Obersteiner, M., Remans, R., Rusch, A., Schulte, L.A., Simmonds, J., Stringer, L.C., Weber, C. & Winowiecki, L.A. (2021) *Biodiversity and agriculture: rapid evidence review*. International Water Management Institute.

Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., Larigauderie, A., Adhikari, J.R., Arico, S. & Báldi, A. (2015) The IPBES Conceptual Framework—connecting nature and people. *Current Opinion in Environmental Sustainability* 14: 1–16.

Du Preez, C., Swan, K.D. & Curtis, J.M.R. (2020) Cold-Water Corals and Other Vulnerable Biological Structures on a North Pacific Seamount After Half a Century of Fishing. *Frontiers in Marine Science* 7.

Dudgeon, D., Arthington, A.H., Gessner, M.O., Kawabata, Z.-I., Knowler, D.J., Lévêque, C., Naiman, R.J., Prieur-Richard, A.-H., Soto, D., Stiassny, M.L.J. & Sullivan, C.A. (2006) Freshwater biodiversity: importance, threats, status and conservation challenges. *Biological Reviews* 81: 163–182.

Early, R., Bradley, B.A., Dukes, J.S., Lawler, J.J., Olden, J.D., Blumenthal, D.M., Gonzalez, P., Grosholz, E.D., Ibañez, I., Miller, L.P., Sorte, C.J.B. & Tatem, A.J. (2016) Global threats from invasive alien species in the twenty-first century and national response capacities. *Nature Communications* 7: 12485.

Ehrlich, P.R. & Ehrlich, A.H. (2013) Can a collapse of global civilization be avoided? *Proceedings of the Royal Society B: Biological Sciences* 280: 20122845.

Ellis, E.C., Klein Goldewijk, K., Siebert, S., Lightman, D. & Ramankutty, N. (2010) Anthropogenic transformation of the biomes, 1700 to 2000. *Global Ecology and Biogeography* 19: 589–606.

ESRS Set 1 (2023). https://xbrl.efrag.org/e-esrs/esrs-set1-2023.html

Filewod, B. & McCarney, G. (2023) Avoiding carbon leakage from nature-based offsets by design. *One Earth* 6: 790–802.

Garnett, T., Appleby, M.C., Balmford, A., Bateman, I.J., Benton, T.G., Bloomer, P., Burlingame, B., Dawkins, M., Dolan, L., Fraser, D., Herrero, M., Hoffmann, I., Smith, P., Thornton, P.K., Toulmin, C., Vermeulen, S.J. & Godfray, H.C.J. (2013) Sustainable Intensification in Agriculture: Premises and Policies. *Science* 341: 33–34.

Gephart, J.A., Henriksson, P.J.G., Parker, R.W.R., Shepon, A., Gorospe, K.D., Bergman, K., Eshel, G., Golden, C.D., Halpern, B.S., Hornborg, S., Jonell, M., Metian, M., Mifflin, K., Newton, R., Tyedmers, P., Zhang, W., Ziegler, F. & Troell, M. (2021) Environmental performance of blue foods. *Nature* 597: 360–365.

Gray, C.A. & Kennelly, S.J. (2018) Bycatches of endangered, threatened and protected species in marine fisheries. *Reviews in Fish Biology and Fisheries* 28: 521–541.

Green, S.J., Dulvy, N.K., Brooks, A.M.L., Akins, J.L., Cooper, A.B., Miller, S. & Côté, I.M. (2014) Linking removal targets to the ecological effects of invaders: a predictive model and field test. *Ecological Applications* 24: 1311–1322.

Heinze, C., Blenckner, T., Martins, H., Rusiecka, D., Döscher, R., Gehlen, M., Gruber, N., Holland, E., Hov, Ø., Joos, F., Matthews, J.B.R., Rødven, R. & Wilson, S. (2021) The quiet crossing of ocean tipping points. *Proceedings of the National Academy of Sciences* 118: e2008478118.

Hogeboom, R.J., de Bruin, D., Schyns, J.F., Krol, M.S. & Hoekstra, A.Y. (2020) Capping Human Water Footprints in the World's River Basins. *Earth's Future* 8: e2019EF001363.

IPBES (2019) Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Zenodo. https://zenodo.org/records/6417333

IPCC (2018) Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments — IPCC. https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/

IPCC (2022) Summary for Policymakers: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. https://www.researchgate.net/publication/362431578_Summary_for_Policymakers_Climate_Change_2022_Impacts_Adaptation_and_Vulnerability_Contribution_of_Working_Group_II_to_the_Sixth_Assessment_Report_of_the_Intergovernmental_Panel_on_Climate_Change

IUCN (2025) The IUCN approach to setting robust targets and implementing rapid, verifiable actions for species and ecosystems: IUCN Rapid High-Integrity Nature-positive Outcomes (IUCN RHINO). IUCN, Gland, Switzerland. https://cdn.prod.website-files.com/68b5bcab2e9b175c9bf0fa8e/68e7bd96fea70908ba9b51f6_IUCN%20RHINO%20Technical%20Source%20Doc%20V2.pdf

Jaureguiberry, P., Titeux, N., Wiemers, M., Bowler, D.E., Coscieme, L., Golden, A.S., Guerra, C.A., Jacob, U., Takahashi, Y., Settele, J., Díaz, S., Molnár, Z. & Purvis, A. (2022) The direct drivers of recent global anthropogenic biodiversity loss. *Science Advances* 8: eabm9982.

Lenton, T.M., Milkoreit, M., Willcock, S., Abrams, J.F., Armstrong McKay, D.I., Buxton, J.E., Donges, J.F., Loriani, S., Wunderling, N., Alkemade, F., Barrett, M., Constantino, S., Powell, T., Smith, S.R., Boulton, C.A., Pinho, P., Dijkstra, H.A., Pearce-Kelly, P., Roman-Cuesta, R.M. & Dennis, D. (2025) The Global Tipping Points Report 2025. The University of Exeter.

Machado, K.B., Bini, L.M., Melo, A.S., Andrade, A.T. de, Almeida, M.F. de, Carvalho, P., Teresa, F.B., Roque, F. de O., Bortolini, J.C., Padial, A.A., Vieira, L.C.G., Dala-Corte, R.B., Siqueira, T., Juen, L., Dias, M.S., Gama Júnior, W.A., Martins, R.T. & Nabout, J.C. (2023) Functional and taxonomic diversities are better early indicators of eutrophication than composition of freshwater phytoplankton. *Hydrobiologia* 850: 1393–1411.

Mair, L., Bennun, L.A., Brooks, T.M., Butchart, S.H.M., Bolam, F.C., Burgess, N.D., Ekstrom, J.M.M., Milner-Gulland, E.J., Hoffmann, M., Ma, K., Macfarlane, N.B.W., Raimondo, D.C., Rodrigues, A.S.L., Shen, X., Strassburg, B.B.N., Beatty, C.R., Gómez-Creutzberg, C., Iribarrem, A., Irmadhiany, M., Lacerda, E., Mattos, B.C., Parakkasi, K., Tognelli, M.F., Bennett, E.L., Bryan, C., Carbone, G., Chaudhary, A., Eiselin, M., da Fonseca, G.A.B., Galt, R., Geschke, A., Glew, L., Goedicke, R., Green, J.M.H., Gregory, R.D., Hill, S.L.L., Hole, D.G., Hughes, J., Hutton, J., Keijzer, M.P.W., Navarro, L.M., Nic Lughadha, E., Plumptre, A.J., Puydarrieux, P., Possingham, H.P., Rankovic, A., Regan, E.C., Rondinini, C., Schneck, J.D., Siikamäki, J., Sendashonga, C., Seutin, G., Sinclair, S., Skowno, A.L., Soto-Navarro, C.A., Stuart, S.N., Temple, H.J., Vallier, A., Verones, F., Viana, L.R., Watson, J., Bezeng, S., Böhm, M., Burfield, I.J., Clausnitzer, V., Clubbe, C., Cox, N.A., Freyhof, J., Gerber, L.R., Hilton-Taylor, C., Jenkins, R., Joolia, A., Joppa, L.N., Koh, L.P., Lacher, T.E., Langhammer, P.F., Long, B., Mallon, D., Pacifici, M., Polidoro, B.A., Pollock, C.M., Rivers, M.C., Roach, N.S., Rodríguez, J.P., Smart, J., Young, B.E., Hawkins, F. & McGowan, P.J.K. (2021) A metric for spatially explicit contributions to science-based species targets. *Nature Ecology & Evolution* 5: 836–844.

McDowell, R.W., Noble, A., Pletnyakov, P., Haggard, B.E. & Mosley, L.M. (2020) Global mapping of freshwater nutrient enrichment and periphyton growth potential. *Scientific Reports* 10: 3568.

McElwee, P.D., Harrison, P.A., van Huysen, T.L., Alonso Roldán, V., Barrios, E., Dasgupta, P., DeClerck, F., Harmáčková, Z., Hayman, D.T.S., Herrero, M., Kumar, R., Ley, D., Mangalagiu, D., McFarlane, R.A., Paukert, C., Pengue, W.A., Prist, P.R., Ricketts, T.H., Rounsevell, M.D.A., Saito, O., Selomane, O., Seppelt, R., Singh, P.K., Sitas, N., Smith, P., Vause, J., Molua, E.L., Zambrana-Torrelio, C. & Obura, D. (2025) IPBES Nexus Assessment: Summary for Policymakers. Zenodo. https://zenodo.org/doi/10.5281/zenodo.13850289

Nilsson, M., Chisholm, E., Griggs, D., Howden-Chapman, P., McCollum, D., Messerli, P., Neumann, B., Stevance, A.-S., Visbeck, M. & Stafford-Smith, M. (2018) Mapping interactions between the sustainable development goals: lessons learned and ways forward. *Sustainability Science* 13: 1489–1503.

Nilsson, M., Griggs, D. & Visbeck, M. (2016) Policy: Map the interactions between Sustainable Development Goals. *Nature* 534: 320–322.

O'Brien, K., Garibaldi, L., Agrawal, A., Bennett, E., Biggs, O., Calderón Contreras, R., Carr, E., Frantzeskaki, N., Gosnell, H., Gurung, J., Lambertucci, S., Leventon, J., Chuan, L., Reyes García, V., Shannon, L., Villasante, S., Wickson, F., Zinngrebe, Y. & Périanin, L. (2024) IPBES Transformative Change Assessment: Summary for Policymakers. Zenodo. https://zenodo.org/records/11382231

OSPAR, O. (2023) Benthic Habitats Thematic Assessment. https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/synthesis-report/key-messages/

Phalan, B., Onial, M., Balmford, A. & Green, R.E. (2011) Reconciling Food Production and Biodiversity Conservation: Land Sharing and Land Sparing Compared. *Science* 333: 1289–1291.

Pimm, S., Raven, P., Peterson, A., Şekercioğlu, Ç.H. & Ehrlich, P.R. (2006) Human impacts on the rates of recent, present, and future bird extinctions. *Proceedings of the National Academy of Sciences* 103: 10941–10946.

Pinheiro, H.T., MacDonald, C., Santos, R.G., Ali, R., Bobat, A., Cresswell, B.J., Francini-Filho, R., Freitas, R., Galbraith, G.F., Musembi, P., Phelps, T.A., Quimbayo, J.P., Quiros, T.E.A.L., Shepherd, B., Stefanoudis, P.V., Talma, S., Teixeira, J.B., Woodall, L.C. & Rocha, L.A. (2023) Plastic pollution on the world's coral reefs. *Nature* 619: 311–316.

Pörtner, H.-O., Scholes, R.J., Agard, J., Archer, Emma, Bai, Xuemei, Barnes, David, Burrows, Michael, Chan, Lena, Cheung, Wai Lung (William), Diamond, Sarah, Donatti, Camila, Duarte, Carlos, Eisenhauer, Nico, Foden, Wendy, Gasalla, Maria A., Handa, Collins, Hickler, Thomas, Hoegh-Guldberg, Ove, Ichii, Kazuhito, Jacob, Ute, Insarov, Gregory, Kiessling, Wolfgang, Leadley, Paul, Leemans, Rik, Levin, Lisa, Lim, Michelle, Maharaj, Shobha, Managi, Shunsuke, Marquet, Pablo A., McElwee, Pamela, Midgley, Guy, Oberdorff, Thierry, Obura, David, Osman Elasha, Balgis, Pandit, Ram, Pascual, Unai, Pires, Aliny P F, Popp, Alexander, Reyes-García, Victoria, Sankaran, Mahesh, Settele, Josef, Shin, Yunne-Jai, Sintayehu, Dejene W., Smith, Peter, Steiner, Nadja, Strassburg, Bernardo, Sukumar, Raman, Trisos, Christopher, Val, Adalberto Luis, Wu, Jianguo, Aldrian, Edvin, Parmesan, Camille, Pichs-Madruga, Ramon, Roberts, Rogers, Alex D., Díaz, Sandra, Fischer, Markus, Hashimoto, Shizuka, Lavorel, Sandra, Wu, Ning & Ngo, Hien (2021) IPBES-IPCC co-sponsored workshop report on biodiversity and climate change. Zenodo. https://zenodo.org/record/4782538

Prist, P.R., Seppelt, R., Hayman, D., MOLUA, E., Arneth, A., Biber-Freudenberger, L., Bukvareva, E., Chaudhary, S., Dubey, Dr.P.K., Fischer, J., Földvári, G., Godoy-Faúndez, A., Howe, C., Hussain, A., Lorilla, R.S., Maire, E., Materu, S.F., Miyake, Y., Türkmen, A. & Vanham, D. (2026) IPBES Nexus Assessment: Chapter 2 – Status and past trends of interactions in the nexus. Zenodo. https://zenodo.org/records/18165173

Roberts, C.M., Hawkins, J.P., Roberts, C.M. & Hawkins, J.P. (1999) Extinction risk in the sea. *Trends in Ecology & Evolution* 14: 241–246.

Rockström, J., Gupta, J., Qin, D., Lade, S.J., Abrams, J.F., Andersen, L.S., Armstrong McKay, D.I., Bai, X., Bala, G., Bunn, S.E., Ciobanu, D., DeClerck, F., Ebi, K., Gifford, L., Gordon, C., Hasan, S., Kanie, N., Lenton, T.M., Loriani, S., Liverman, D.M., Mohamed, A., Nakicenovic, N., Obura, D., Ospina, D., Prodani, K., Rammelt, C., Sakschewski, B., Scholtens, J., Stewart-Koster, B., Tharammal, T., van Vuuren, D., Verburg, P.H., Winkelmann, R., Zimm, C., Bennett, E.M., Bringezu, S., Broadgate, W., Green, P.A., Huang, L., Jacobson, L., Ndehedehe, C., Pedde, S., Rocha, J., Scheffer, M., Schulte-Uebbing, L., de Vries, W., Xiao, C., Xu, C., Xu, X., Zafra-Calvo, N. & Zhang, X. (2023) Safe and just Earth system boundaries. *Nature* 619: 102–111.

Rouhi Rad, M., Manning, D.T., Suter, J.F. & Goemans, C. (2021) Policy Leakage or Policy Benefit? Spatial Spillovers from Conservation Policies in Common Property Resources. *Journal of the Association of Environmental and Resource Economists* 8: 923–953.

Roy, H.E., Pauchard, A., Stoett, P. & Renard Truong, T. (2024) IPBES Invasive Alien Species Assessment: Full report. Zenodo. https://zenodo.org/records/11629357

Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J.-L., Sheil, D., Meijaard, E., Venter, M., Boedhihartono, A.K., Day, M., Garcia, C., van Oosten, C. & Buck, L.E. (2013) Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proceedings of the National Academy of Sciences* 110: 8349–8356.

Schiel, D.R., Lilley, S.A. & South, P.M. (2018) Ecological tipping points for an invasive kelp in rocky reef algal communities. *Marine Ecology Progress Series* 587: 93–104.

Schläppy, M.-L. & Hobbs, R.J. (2019) A triage framework for managing novel, hybrid, and designed marine ecosystems. *Global Change Biology* 25: 3215–3223.

Science Based Targets Network (2020) SBTN Initial Guidance - Executive Summary. https://sciencebasedtargetsnetwork.org/wp-content/uploads/2021/03/SBTN-Initial-Guidance-executive-summary.pdf

Science Based Targets Network (2024a) Step 3: Freshwater: Measure, Set & Disclose (Version 1.1).

Science Based Targets Network (2024b) Step 3: Measure, Set & Disclose: Land (Version 1.0).

Science Based Targets Network (2025) Step 3: Measure, Set & Disclose: Ocean (Version 1.0). SBTN. https://sciencebasedtargetsnetwork.org/companies/take-action/set-targets/ocean-targets/

Seebens, H., Blackburn, T.M., Dyer, E.E., Genovesi, P., Hulme, P.E., Jeschke, J.M., Pagad, S., Pyšek, P., Winter, M., Arianoutsou, M., Bacher, S., Blasius, B., Brundu, G., Capinha, C., Celesti-Grapow, L., Dawson, W., Dullinger, S., Fuentes, N., Jäger, H., Kartesz, J., Kenis, M., Kreft, H., Kühn, I., Lenzner, B., Liebhold, A., Mosena, A., Moser, D., Nishino, M., Pearman, D., Pergl, J., Rabitsch, W., Rojas-Sandoval, J., Roques, A., Rorke, S., Rossinelli, S., Roy, H.E., Scalera, R., Schindler, S., Štajerová, K., Tokarska-Guzik, B., van Kleunen, M., Walker, K., Weigelt, P., Yamanaka, T. & Essl, F. (2017) No saturation in the accumulation of alien species worldwide. *Nature Communications* 8: 14435.

Seebens, H., Meyerson, L.A., Rahlao, S.J., Lenzner, B., Tricarico, E., Aleksanyan, A., Courchamp, F., Keskin, E., Saeedi, H., Tawake, A., Pyšek, P., Hughes, K. & Al, E. (2023) Chapter 2. Trends and status of alien and invasive alien species in: Hui, C., Werenkraut, V. (Eds) *IPBES Invasive Alien Species Assessment*. IPBES secretariat, Bonn, Germany.

Selkoe, K.A., Blenckner, T., Caldwell, M.R., Crowder, L.B., Erickson, A.L., Essington, T.E., Estes, J.A., Fujita, R.M., Halpern, B.S., Hunsicker, M.E., Kappel, C.V., Kelly, R.P., Kittinger, J.N., Levin, P.S., Lynham, J.M., Mach, M.E., Martone, R.G., Mease, L.A., Salomon, A.K., Samhouri, J.F., Scarborough, C., Stier, A.C., White, C. & Zedler, J. (2015) Principles for managing marine ecosystems prone to tipping points. *Ecosystem Health and Sustainability* 1: 1–18.

Sharma, R., Barange, M., Agostini, V., Barros, P., Gutierrez, N.L., Vasconcellos, M., Fernandez Reguera, D., Tiffay, C. & Levontin, P. (Eds) (2025) *Review of the state of world marine fishery resources – 2025*. FAO, Rome, Italy.

Smil, V. (2011) Harvesting the Biosphere: The Human Impact - Smil - 2011 - Population and Development Review - Wiley Online Library. *Population and Development Review*.

Smith, T., Beagley, L., Bull, J., Milner-Gulland, E.J., Smith, M., Vorhies, F. & Addison, P.F.E. (2020) Biodiversity means business: Reframing global biodiversity goals for the private sector. *Conservation Letters* 13: e12690.

Sobha, T.R., Vibija, C.P. & Fahima, P. (2023) Coral Reef: A Hot Spot of Marine Biodiversity. pp. 171–194 in: Sukumaran, S.T., T R, K. (Eds) *Conservation and Sustainable Utilization of Bioresources*. Springer Nature, Singapore.

Tickner, D., Opperman, J.J., Abell, R., Acreman, M., Arthington, A.H., Bunn, S.E., Cooke, S.J., Dalton, J., Darwall, W., Edwards, G., Harrison, I., Hughes, K., Jones, T., Leclère, D., Lynch, A.J., Leonard, P., McClain, M.E., Muruven, D., Olden, J.D., Ormerod, S.J., Robinson, J., Tharme, R.E., Thieme, M., Tockner, K., Wright, M. & Young, L. (2020) Bending the Curve of Global Freshwater Biodiversity Loss: An Emergency Recovery Plan. *BioScience* 70: 330–342.

TNFD (2023) Guidance for corporates on science-based targets for nature v1. https://tnfd.global/wp-content/uploads/2023/09/Guidance_for_corporates_on_science_based_targets_for_nature_v1.pdf

Turner, J.A., Starkey, M., Dulvy, N.K., Hawkins, F., Mair, L., Serckx, A., Brooks, T., Polidoro, B., Butchart, S.H.M., Carpenter, K., Epps, M., Jabado, R.W., Macfarlane, N.B.W. & Bennun, L. (2024) Targeting ocean conservation outcomes through threat reduction. *npj Ocean Sustainability* 3: 4.

UNCCD (2024) B4L Guide Corporate disclosures and target-setting for land. https://www.unccd.int/sites/default/files/2024-12/B4L%20Guide_Corporate%20disclosures%20and%20target-setting%20for%20land.pdf

Vijay, V., Fisher, J.R.B. & Armsworth, P.R. (2022) Co-benefits for terrestrial biodiversity and ecosystem services available from contrasting land protection policies in the contiguous United States. *Conservation Letters* 15: e12907.

Vörösmarty, C.J., McIntyre, P.B., Gessner, M.O., Dudgeon, D., Prusevich, A., Green, P., Glidden, S., Bunn, S.E., Sullivan, C.A., Liermann, C.R. & Davies, P.M. (2010) Global threats to human water security and river biodiversity. *Nature* 467: 555–561.

White, T.B., Bromwich, T., Bang, A., Bennun, L., Bull, J., Clark, M., Milner-Gulland, E.J., Prescott, G.W., Starkey, M., zu Ermgassen, S.O.S.E. & Booth, H. (2024) The "nature-positive" journey for business: A conceptual research agenda to guide contributions to societal biodiversity goals. *One Earth* 7: 1373–1386.


SCIENCE BASED
TARGETS NETWORK