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Perspective

Achieving a nature- and people-positive future

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https://doi.org/10.1016/j.oneear.2022.11.013

SUMMARY

Despite decades of increasing investment in conservation, we have not succeeded in "bending the curve" of biodiversity decline. Efforts to meet new targets and goals for the next three decades risk repeating this outcome due to three factors: neglect of increasing drivers of decline; unrealistic expectations and time frames of biodiversity recovery; and insufficient attention to justice within and between generations and across countries. Our Earth system justice approach identifies six sets of actions that when tackled simultaneously address these failings: (1) reduce and reverse direct and indirect drivers causing decline; (2) halt and reverse biodiversity loss; (3) restore and regenerate biodiversity to a safe state; (4) raise minimum wellbeing for all; (5) eliminate over-consumption and excesses associated with accumulation of capital; and (6) uphold and respect the rights and responsibilities of all communities, present and future. Current conservation campaigns primarily address actions 2 and 3, with urgent upscaling of actions 1, 4, 5, and 6 needed to help deliver the post-2020 global biodiversity framework.

INTRODUCTION

Conservation actions expanded in scope in the last 50 years, achieving some successes in putting 17% of land area and 10% of marine area under legal protection by 2020,[1] preventing the extinction of at least 32 bird and 16 mammal species,[2,3] improving the conservation status of 16% of species listed by the Alliance for Zero Extinction,[4] and improving many species populations and ecosystems in previously impacted regions.[5–9] Nevertheless, the overall rate of decline of biodiversity has accelerated[1,10–12] across the globe, driven by land and sea use changes, direct exploitation, nutrient enrichment and pollution, exotic species invasions, and climate change.[10] Overall, approximately half of terrestrial land is considered to be in a "natural" state,[13,14] of which about half is noticeably disturbed or degraded.[15,16] The other half of terrestrial land is considered "converted" or "modified," where food production and other human uses are prioritized[10] such that natural functions are limited to patches of (semi)natural habitat. This has affected not only the integrity of ecosystems but has also reduced the ability of nature to support species and provide benefits on which humans depend.[10,17] In 20%–40% of the converted land, natural ecosystem function is near-absent, e.g., in mining areas and densely populated urban settlements, while in others it is significantly reduced e.g., in intensively exploited crop land, heavily fished and/or polluted water bodies, or cleared pastures.

The Strategic Plan for Biodiversity for 2011–2020 of the Convention on Biological Diversity (CBD)[18] was established to halt and reverse this trend. However, of its 20 targets and 67 sub-targets (the Aichi Targets), no full targets and just six sub-targets were met.[1,10] Two of the successful sub-targets included the commitments to gazette 17% of land and 10% of ocean area under protection. However, a large proportion of areas designated were in lower priority locations for biodiversity,[19,20] had inadequate management capacity[21] and/or were implemented at significant cost to local people.[22] The successor to this plan, the post-2020 global biodiversity framework (GBF),[23] takes up this challenge with four outcome goals to be achieved by 2050 supported by 22 shorter-term action targets to be met by 2030. Delayed by the COVID-19 global pandemic, the GBF had an additional 2 years of preparation and will culminate in the Conference of the Parties (COP15) of the CBD in December 2022.

Projections of the future state of biodiversity and the outcomes of the GBF, show a broad scope of potential outcomes, from continued unabated loss to net biodiversity gain.[24] For maximum gain, losses should be avoided and minimized, and gains maximized through restoration. However, the GBF inherits the underlying challenges of the prior strategy and the 50-year history of conservation between the 1972 and 2022 Stockholm Conferences on the Environment.[25,26] These challenges boil down to addressing the real and perceived trade-offs between eradicating poverty and hunger and ensuring well-being for all versus protecting nature. Conventionally, conservation actors focused on the urgency of direct actions against biodiversity loss (e.g., protected areas, species conservation). However, in recent decades there has been a strong pivot toward addressing the more complicated root causes of loss that include overconsumption of resources, polluting technologies, increasing inequality, and weak governance.[27] Agenda 2030 and its 17 Sustainable Development Goals identify just access and benefit sharing from nature as a right for all people and are used as foundations of the theory of change of the GBF (see paras 5–8 in its draft of 5 July 2021[23]). As the urgency and challenges in resolving the biodiversity crisis increase, actions to conserve biodiversity must broaden to address root causes and the entire scope of human-nature interactions, and engagement of the full spectrum of actors across all domains of the SDGs, as we develop further in the challenge and solution sections below.

Here, we address the dominant global conservation discourse, led by campaigns emerging through the extended negotiation of the post-2020 GBF. We are concerned that they tend to focus on simplified or selected targets of the GBF, belying the growing momentum toward more holistic conservation approaches.[28,29] In the Anthropocene, our Earth-systems-science approach integrated with justice reinforces the need to apply holistic conservation approaches that give as much importance to the human context as the biodiversity one, recognizing differential responsibilities among actors and countries. We call for full acknowledgment and commitment to the full range of biodiversity and human-centered actions needed to enable a "safe and just" future for all.

THE CHALLENGE

The challenge facing the CBD is to develop a strategy "for all" (i.e., all institutions, countries, peoples, see paras 5–8[23]) that secures biodiversity and the natural assets that support economic and social well-being across the planet. As outlined above, a protectionist approach dominated efforts for the last 50 years, although in the last decades there has been a shift toward greater integration of people with nature[28] and consideration of sustainable use and the access, tenure rights, and knowledge of Indigenous peoples and local communities.[10,30,31] Adoption of the SDGs in 2015 injected sustainable development concepts into conservation discourse, with a nature–society–economy framing[32,33] supporting a conservation paradigm that nature is foundational to development.[34]

Major approaches to conservation informing the GBF have been grouped into four "camps."[29] Two, described as "Aichi+" and "ambitious area-based targets" represent intensification/expansion of the Aichi Targets approach from 2011 to 2020, with a focus on Aichi Target 11 on expanding areas under protection. The other two approaches, "new conservation" and "whole earth," seek to more comprehensively address nature and people together, the first from a market perspective, the second representing more diverse values including those from Indigenous peoples and local communities, more varied approaches among countries, as well as integrating social sciences (and see IPBES[30]). Overall, there has been a shift from historic focus on protected biodiversity particularly in "hotspots" of richness,[35] to achieving net positive outcomes for biodiversity,[36,37] reflected in the net positive framing of goal A of the GBF.

Protagonists predominantly from the Aichi+, ambitious area-based targets, and new conservation camps have developed science and campaigns building on "no net loss,"[38] "bending the curve,"[39] and most recently "nature-positive"[33,40] concepts. Dominant campaigns include those on "30 by 30" (30% of all area protected by 2030, one of the 22 targets of the GBF), the Campaign for Nature, the High Ambition Coalition for Nature and People, and Nature Positive. While the increased ambition and commitments to conservation are urgently needed, the need for campaigns to coin simplified slogans and priority targets raises concerns. Conservation campaigns have tended to insufficiently address complexities in natural systems,[13,41] lack sufficient assessment of impact,[21] focus on nature outcomes over social outcomes,[22,42,43] inadequately address inclusion of diverse perspectives and worldviews in their formulation,[10,30,43,44] inadequately address inequities and responsibilities for historical loss,[22,45] and risk being used as an umbrella for incomplete actions.[40,46]

We focus on a dominant narrative in the run-up to COP15 in December 2022, on "nature positive,"[33] to illustrate the pitfalls facing implementation of the GBF, and to contribute new insights on where to raise the ambition and transformational nature of current campaigns to support the strongest possible implementation of the GBF. The stakes are higher than ever, not just because the state of nature is worse than at the start of each previous decadal plan, with unprecedented extinction rates[10,47] and proximity to biosphere tipping points,[48,49] but also because the GBF sets goals for 30 years, compared to 10 for its predecessors.

Addressing direct and indirect drivers

Biodiversity decline is prolonged, and recovery is prevented, by continuing growing drivers such as climate change, fossil fuel energy use, unsustainable food systems, increasing water and resource over-extraction, land and sea conversion, pollution of land, air, and water, and human settlements. Indirect drivers include inequality, increasing per capita consumption of resources in many countries, unsustainable technologies, investment and trade patterns, and values and governance that do not promote care for nature.[10] Human population size and growth are indirect drivers that have fluctuated as priorities in global fora.[50,51] However, emerging evidence shows that the material production and consumption footprints of the wealthiest consumers far exceed those of the poorest, with high-income countries that hold 16% of the global population being responsible for 74% of resource use, in excess of their fair shares globally.[52]

No amount of conservation or restoration actions may be effective in stopping biodiversity loss if the accelerating drivers of decline continue and intensify, as has been the case to date[11] especially in wealthier countries and among elites, who often express commitment to conservation action.[43] This contradiction is visible in the primary conservation campaigns that treat reducing drivers as subsidiary to conservation actions. With increasing prevalence of ''eco-anxiety'' particularly among the youth, there is a growing need to deliver positive messages to motivate action rather than apathy[53,54]; however, this risks failing to highlight the need to reduce drivers. Drivers are referenced within campaign texts, but consistently fail to be in the headline alongside, or even before, the conservation message.[33] Promised actions focus more on biodiversity actions often in foreign countries and less on reducing excess material consumption at home that drives biodiversity loss abroad,[55] though this is beginning to change with growing awareness on multiple issues such as plastic pollution.[56] Resolving this contradiction should be a priority, particularly as the primary literature on mitigation and conservation hierarchies[57–59] and calculations of the trade-offs between losses and gains from restoration[60] emphasize the importance of minimizing drivers to halt losses in order to maximize gains.

Achieving net biodiversity outcomes

Species and ecosystems have innate rates at which they may recover toward a ''natural'' or functional state. In species, this is determined by life history and generation times and may be as long as centuries for large trees and mammals, establishing lengthy delays to full ecosystem recovery (see Figure 2.2 in CBD-SBSTTA[60]). The full recovery of complex natural ecosystems with lengthy succession sequences may take several centuries, and if environmental conditions have changed irreversibly—e.g., due to human encroachment, fragmentation, extinctions, or climate change—full recovery may never be possible. By contrast, restoration of certain aspects of ecosystems, or regeneration of functions and recovery of populations abundances may be achievable relatively rapidly, with less than two decades estimated for some marine systems.[61] Projecting the outcomes of multiple and different policy scenarios (Figure 1A) is necessary to explore options and commit to actions with such long-term outcomes for biodiversity.

Current conservation campaigns promise outcomes by 2030 and 2050 (Figure 1B) to match the policy milestones of the convention—a time frame that is short for ecological restoration and many biodiversity outcomes, but very long for political cycles. Part of the success of area-based conservation measures may be because they can be legislated within short political cycles, are easy actions to report, and fortunately they can establish protection relevant for longer biodiversity time frames. However, the most recent and comprehensive global projections of potential biodiversity outcomes[24] corroborate broad empirical experience, that the magnitude of recovery promised on these time scales is not possible (Figure 1A), even with combined actions on conservation, and reducing production and consumption drivers. And, as stated in the study, these scenarios (1) only account for a limited set of drivers, most significantly excluding climate change that is expected to increase in importance as the dominant global driver of biodiversity decline[10,62]; and (2) use relatively simple biodiversity indicators that don't reflect the complexity of ecological recovery processes. While ''stretch targets'' (i.e., highly ambitious targets that may not be achievable, but inspire behavior change) can play an important role in motivating action on difficult issues,[63] if high expectations fail, particularly the most immediate ones (to meet decadal targets in 2030, now only 8 years away), the over-reach in ambition (Figure 1C) may undermine both immediate and long-term actions and commitments needed to achieve success in more realistic time frames. Importantly, stretch targets may also distort priorities to actions producing short-term ephemeral wins over building foundations for long-term success.

Spatial and temporal scales are often correlated for natural systems[64–66]; natural recovery that may be possible within decades at the scale of a plot or individual habitat fragment (potentially 10s to 1000s of hectares) may require significantly longer times for aggregation of these properties across land- and seascape mosaics to larger scales. Even more so, sequenced restoration actions of multiple areas over time would likely be necessary due to logistical and financial constraints, further postponing the final outcome. Restoring interactions that take place over larger distances, such as for species migration or connectivity may also scale differently. While large-scale restoration is possible on land, restoration is more challenging in the ocean. For example, median sizes of coral reef restoration projects are under 300 m^2,[67] and projections made in 2020 of ''full recovery by 2050'' were made on the assumption of full removal of drivers (including climate change) and without discussing scaling from individual interventions to whole systems.[61]

Conservation actions should be highly targeted; systematic conservation planning tools to guide investment have been widely used in marine, terrestrial, and freshwater systems,[68] as well as for restoration.[69,70] To deliver on the GBF, global targets must be linked to subnational and local actors and their actions

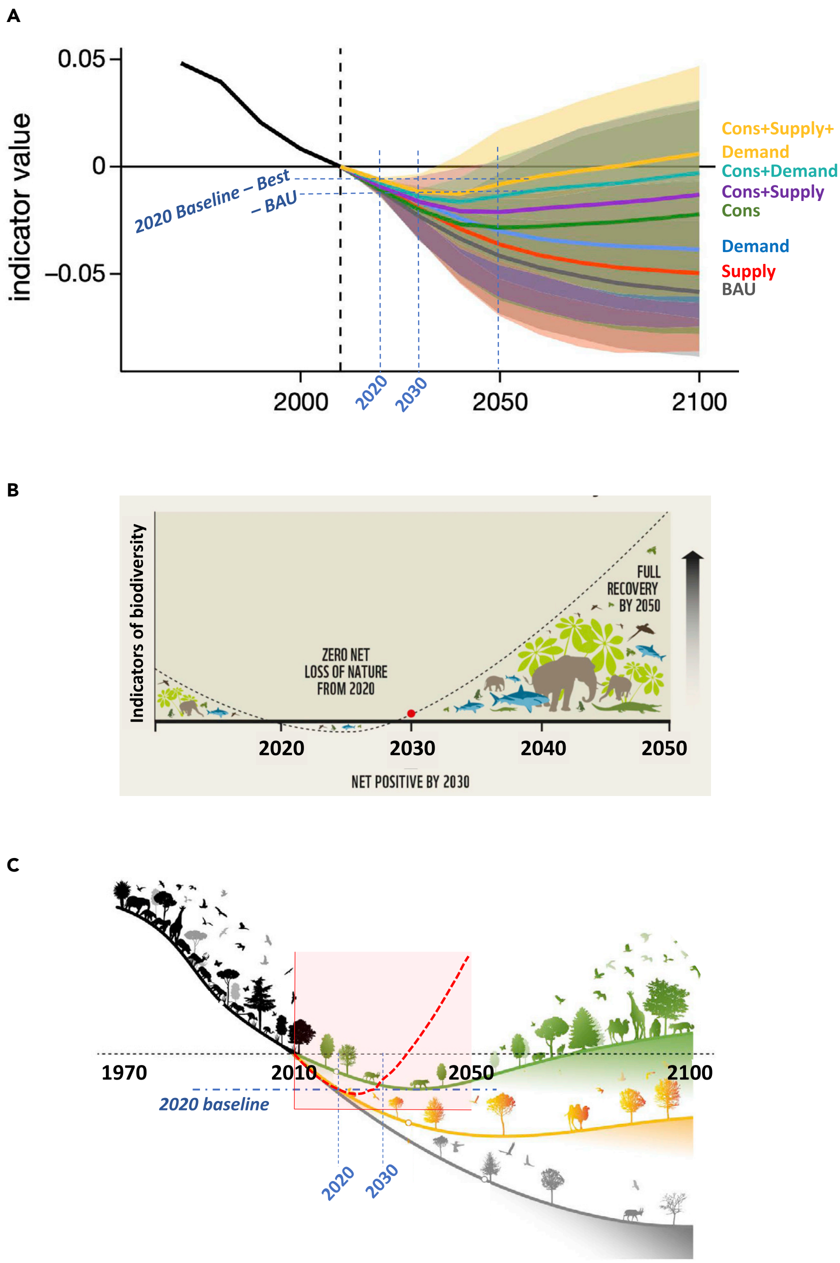

Figure 1. "Bending the curve" scenarios for potential outcomes of biodiversity

(A) The original figure in Leclere et al. 2020[24] shows modeled trajectories for one biodiversity indicator, mean species abundance. Scenarios shown are the baseline (BAU, business as usual), three individual actions (Cons, conservation; Demand, demand-side [consumption], Supply, supply side [production]) and then combining conservation with the others singly, then altogether.

(B) Biodiversity recovery curve as illustrated in the nature-positive campaign.[33]

(C) Illustration of selected biodiversity recovery curves for BAU (gray), conservation only (yellow), and integrated scenarios (green) from (A). The dashed red curve and red axes/shaded box super-impose the axes extent and "nature-positive" curve in (B).

In (A) and (C), blue dotted lines show 2020 and 2030 on the x axis and relevant 2020 biodiversity baselines on the y axis.

Note that x axes are on different time scales: (A) and (C), 1970–2100; (B), 2010–2050. Figure sources: (A) is reprinted with permission from Nature Publishing Group, License 5437030407382; (B) is from https://www.naturepositive.org/; and (C) is from https://www.eci.ox.ac.uk/news/2020/0911-bending-the-curve.html.

through cross-scale translations, and actions across multiple local spaces must be aligned and aggregated to national scales, and across all countries, for global delivery of the goals and targets.[44,71] To forge the multi-actor commitment and cooperation over multiple years and across scales, ambition must not only be high but realistic and accountable.[41]

Achieving equity and justice outcomes

Achieving conservation successes depends on socio-political contexts from local to global. There are synergies and tradeoffs between policy priorities that focus on increasing human well-being (such as eradicating poverty and hunger) and conserving natural ecosystems. Fundamental tradeoffs include increasing incomes resulting in greater resource consumption and increasing food security by taking land and water from nature.[72] Prioritizing the protection and restoration of nature has raised concerns over what this may mean for human well-being. The highest ambitions for protection, to 50% of land surface,[73,74] include areas in which 1 billion people live[75]; this would potentially remove 15%–31% of cropland, 10%–45% of pasture land, 3%–29% of food calories, and 23%–25% of non-food calories (used for feed, biofuel, and other purposes).[76] Agriculture is already practiced in 6% of areas already under protection (22% of high-priority areas) globally.[72]

Many of the factors causing global biodiversity decline are associated with economic growth and speculation.[77] The greatest drivers are from wealthier economies and individuals with large material, ecosystem, energy, and carbon footprints, high per-capita consumption, and resource accumulation, who have consumed a disproportionate share of nature, including beyond their own regions.[52,78,79] Their use already converted and consumed intact nature, driving depletion of species and ecosystems, pollution and climate change, and reaching dangerous tipping points.[10,49,80] Many of the more intact high-biodiversity ecosystems proposed for protection are in poorer economies with very low environmental footprints, modest or inadequate per-capita consumption, direct dependence on nature's benefits to people, and that prioritize development to escape from poverty.

The contradiction is clear, that actions to protect, or halt the conversion of, remaining intact nature are disproportionately located in those countries and communities that have contributed the least to drivers of global decline,[52] and are not matched with ambitious restoration efforts in regions where intact nature has been lost. Furthermore, continued high, wasteful, increasing, and increasingly inequitable levels of consumption undermine whatever direct protection or restoration actions may be implemented,[81] and resource flows to support commitments to conservation have been far below required levels.[82] More actions toward restoration within high-income countries and locations with more highly degraded nature are necessary, and reinvesting profits from excess extraction and speculation (exorbitant profits may be viewed as an indicator of the costs that were not incurred to prevent damage during production) to rebuild damaged nature wherever that may have occurred would redress the historical equity imbalance, although in many cases biodiversity loss may already be too severe to enable full redress of impacts.

Summing up, we identify three ambition and equity shortfalls in dominant conservation paradigms leading into final negotiations of the post-2020 GBF in December 2022: (1) insufficient attention to direct and indirect drivers of decline, (2) unrealistic biodiversity response objectives and timelines, and (3) failure to address fundamental inequities of past and current conservation and sharing of nature's benefits. These fundamentally undermine the potential for success of the GBF. They arise from continuing to apply outdated models of human-nature interactions, continuing narrow focus of actors at the expense of more systemic objectives, and from isolating "conservation" from the broader economic, social, and political domains.[77,83]

SAFE AND JUST BOUNDARIES FOR THE BIOSPHERE

Our approach to resolve this challenge uses an emerging synthesis of Earth system boundaries (ESBs) integrated with securing justice for all humans.[84,85] In this framing, the problem is staged as two inseparable faces of the same coin. On one side, what minimum level of biodiversity might be "safe" for a stable future? That is, what threshold of species and ecosystems condition, abundance, and diversity assures the full breadth of critical contributions from nature to people, for other species and for ecosystem resilience? And on the other side, how can we ensure equitable access to nature's benefits that assures that all humans can escape from poverty and hunger, and experience well-being from nature's benefits across generations?

A safe biosphere earth system boundary

There is strong evidence that the safe ESB for the area of (largely intact) nature ranges from 44% to 60% of land area,[16,86] where currently we are at approximately 50% globally.[13,14] Given margins of uncertainty and differences in methods among studies, we consider 50% as close to the safe boundary. This boundary is based on the amount of largely intact nature needed to strongly reduce current levels of species extinction and provide global Earth system functions such as carbon sequestration and atmospheric moisture recycling. Other functions act at local scales to support natural ecosystem processes and functions and human needs such as pollination, water regulation, biological control, and psychological, cultural, and physical health.[16,87] In addition to largely intact ecosystems, patches of (semi-) natural habitats in converted lands, coasts, and cities help conserve species diversity[88] and provide access to nature's benefits to people.[44,87,89,90] Commensurate figures for freshwater and ocean systems are as yet less developed.

In these terms, the biodiversity crisis is quantified as: of the 798 unique ecoregions globally, 371 have less than 10% of their area remaining largely intact,[16] and 64%–69% of modified lands have insufficient biodiversity to support provisioning of nature's contributions to people (NCP) and human well-being.[87] One-quarter of the 798 ecoregions are less than 1% intact,[16] likely making restoration impossible. Only 23% of rivers longer than 1,000 km flow uninterrupted to the ocean,[91] and up to 87% of global wetlands have been lost since CE 1700; 35% since 1970.[92] The area of natural ecosystems and flow alteration of rivers are currently below their respective safe ESBs, resulting in loss of species diversity and functions.[16] Loss of resilience in primary production globally is evident in 29% of terrestrial and 24% of marine biomes.[93]

On aggregate, to secure a buffer above the safe biosphere boundary, we must not only halt further losses but also restore a proportion of land area to its natural state, and regenerate environmental function on permanently modified lands. Studies using varied methods estimate restoration of approximately 10%–15% of land area being necessary for biodiversity recovery[13,94–96] and have informed the proposed global goal of restoring 15% of nature by 2050 under negotiation in the GBF.[23] With respect to NCP, we estimate it will be necessary to maintain, rehabilitate, or regenerate approximately 20%–25% of diverse semi-natural habitat per square kilometer in human-dominated (or modified) ecosystems.[87] This helps to maintain the minimum level of ecosystem functional integrity that supports biodiversity, human well-being, and the provisioning of multiple benefits of nature simultaneously.[87,89,90] Ecological and planetary boundary approaches are founded on the notion of assuring that drivers stay a safe distance from critical boundary thresholds.[80] Actors must thus "bend the curves" of drivers of biodiversity decline for them to return/remain within their safe boundaries and to have any chance of bending the curve of biodiversity loss.

Further, we know there will be time lags between when drivers are abated and biodiversity recovery is realized, notwithstanding that climate change and other drivers may move the goalposts,[62] and between initial restoration actions and full outcome of improved conditions. Acknowledging the time it takes for recovery of intactness and full function, recognizing an initial phase "under restoration,"[97] during which monitoring and effective management can assure recovery trends match expectations, can help to secure the long-term commitment needed for the restoration outcomes to be achieved. Regeneration or rehabilitation of environmental functions in working lands operate on much shorter timescales (5–20 years) and can reinforce rather than compromise production functions.[98,99] These can fall under the direct capabilities and agency of cities, companies, and citizens but require enabling institutions, policies, and markets to be aligned with GBF outcomes.[100]

Addressing the real causes and dynamics of biodiversity decline (reducing drivers, meaningful temporal and spatial scales of recovery responses, see actions 1, 2, and 3, Table 1) with accountability measures that document progress on short

Table 1. Ambition for a nature positive world based on interspecies, intergenerational and intragenerational Earth system justice

Set of Actions	Address shortfalls	Principal actors	GBF target	SD goals	Comments
Nature-positive focus/biodiversity outcomes (interspecies justice)					
1. Reduce and reverse direct and indirect drivers causing nature's decline	Reducing drivers – short term	Economic sectors and actors, all people	5, 6, 7, 8, 9, 10, 14, 15, 16, 18	7, 8, 9, 11, 12	Nature will not stop declining until direct and indirect drivers are brought below safe thresholds. All conservation actions, and achievement of goals, are undermined by failing to achieve this.
2. Halt and reverse biodiversity loss (i.e., "bend the curve" of decline).	Net nature positive outcome – mid-term	Biodiversity actors	2, 3, 4, 5, 6, 7, 8	14, 15	This action reflects the 10-year/2030 ambition for GBF goal A, to prevent further biodiversity losses beyond a baseline, set at 2020 and initiate recovery. For ecosystems, the goal has been framed as 5% net gain in the area, connectivity and integrity of natural ecosystems. The nature-positive campaign has framed this as nature being "better in 2030 than in 2020." In ESB terms, we are at or close to the biosphere ESB, so "halting and reversing" biodiversity decline would prevent crossing the ESB or going substantially below it. Given inertia in reducing drivers and the impact of this being reflected in biodiversity trends, it is highly unlikely to be achievable by 2030. But ensuring this is achieved as soon as possible is a highly ambitious goal and would far exceed level of achievement of the Aichi Biodiversity Targets.
3. Restore/regenerate biodiversity to a net positive state, to a safe buffer above the Earth system boundary.	Net nature positive outcome – long-term	Biodiversity actors	2, 3	14, 15	This action reflects the 30-year/2050 ambition for GBF goal A, to increase the state of biodiversity above baseline (2020) levels. For ecosystems, the goal has been framed as 15% net gain in the area, connectivity and integrity of natural ecosystems. The nature-positive campaign has framed this as "full recovery" of nature by 2050. In ESB terms, this could be framed as targeting a safe buffer above the ESB, so improving the state of biodiversity above 2020 or 2030 levels, consistent with the larger % net gain in the goal text. The timescale to achievement across many ecosystems is likely on the order of a century or more. A quantitative "safe buffer" cannot be estimated currently, but with advances could likely be identified in the future and to provide a measurable target.
People-positive focus/human outcomes (intra- and intergenerational justice)					
4. Raise minimum wellbeing to secure each person's fair share of the global biodiversity commons	Equity – from the bottom	State, regulators, employers, all people	9, 11, 12, 21, 22	1, 2, 3, 4, 5, 10, 16	This is a foundation of the Sustainable Development Goals, mirroring the phrases "for all" and "leave no-one behind." Raising welfare of close to a billion people globally will significantly increase their demands of, and impacts on biodiversity. Minimizing these impacts, particularly on irreplaceable biodiversity, will be essential. Two pathways can help achieve this: through technology and behavioral changes, and by making space for this expanded footprint through #5.
5. Eliminate overconsumption and excesses associated with accumulation of capital.	Equity and reducing drivers – from the top	Economic sectors and actors, all people	9, 10, 15, 16, 18	1, 2, 8, 12, 16	Reducing over-accumulation of capital and associated speculation, over-production, and overconsumption, are necessary for #1 (reducing drivers) and to make space for #4 (increased consumption by the most needy) without adding biodiversity impacts. This may also be seen as redress for historic appropriation of biodiversity and resources. Together, #4 and #5 correspond to a notion of biodiversity justice, complementary to that of climate justice.

(*Continued on next page*)

Table 1. *Continued*

Set of Actions	Address shortfalls	Principal actors	GBF target	SD goals	Comments
6. Uphold and respect the rights, responsibilities, and agency of all, in the present and future.	Equity – agency in conser-vation	State, stakeholders	21, 22	5, 10, 16, 17	With respect to biodiversity, this relates to upholding rights of people most directly associated to local conservation actions, commonly Indigenous people and local communities particularly in biodiversity-rich low-income countries, in leading actions and protecting biodiversity in their territories, preventing further displacement, and potentially redressing past displacement.

Six sets of actions are identified that address the three principal shortfalls in current conservation priorities. Actions 1, 2 and 3 derive from a focus on "safe" outcomes, and 4, 5, and 6 on "just" outcomes, though this distinction is graduated. The focus of conservation campaigns around the GBF is on actions 2 and 3, though with weaknesses as noted in the main text. The actions are mapped roughly to GBF targets and to Sustainable Development Goals.

time scales toward longer term goals may be more acceptable, successful, and sustainable to the many countries and actors that need to cooperate despite holding different values and expectations. Any delays in initial actions (for drivers as much as conservation actions) will not only result in postponement of final success but compromise recovery and potential end states through further, potentially irreversible impacts. On a positive note, once returned within a safe boundary, natural or regenerated recovery processes may reinforce and/or accelerate trajectories toward a more stable and resilient state.[101]

Earth system justice

Ensuring proposed boundaries are just as well as safe is a key to sustainable, acceptable, and equitable futures. Earth system justice embraces principles of interspecies, intergenerational, and intragenerational justice.[102] Interspecies justice is served when we, for example, prevent deleterious climate change or nutrient pollution that harms other living things and instead promote values and governance that conserve nature and consider its rights. Intergenerational justice[103] is served when the ability of the biosphere to provide for the needs of future generations is not undermined by meeting the needs of current generations, or when restoration improves future options. It also requires attention to the legacy of past actions that impact people and nature today, especially in terms of responsibility to act by those who caused historic damage. Intragenerational justice looks at current relationships[104] including between countries (international),[105] between communities (intercommunity),[106] and between individuals.[107] It includes justice issues where consumption of resources in or by one region harms biodiversity in another through trade or land grabs, for example. The concept of intersectional justice helps to understand how people's multiple identities, including those connected to culture, religion, ethnicity, gender, or age, can make them disproportionately vulnerable to the loss of nature's benefits.[108]

Intragenerational justice is a critical issue in current conservation discourse due to the inequity between the low-income countries targeted for greatest conservation action and the high-income countries who have over-consumed their fair share of nature's benefits.[52,55,77,79,109,110] A justice perspective also recognizes nuances: in between these extremes are many different combinations of economies, actors, and individuals with respect to their historical responsibility and the capability to act. The current spatial burden of conservation responses requires that we consider justice and fairness when understanding who lives in places where conservation can be implemented, who is impacted by conservation and how, and who is tasked with action. The just allocation of responsibility and capacity for action requires that those with historic, current, and future responsibilities for biodiversity decline should act, finance, or otherwise enable responses. Just responses must also meet social goals that are positive for all people such as those of the SDGs that seek to eradicate poverty and hunger and ensure access to energy, water, healthcare, and other keys to well-being. This includes securing rights and access to benefits from nature, particularly of people living in or near biodiversity hotspots and who are dependent on them, who have stewarded them for generations, and maintaining these rights and access while ensuring conservation outcomes.[111] There are multiple mechanisms for redistribution of responsibility and benefits such as taxation, internalizing costs, overseas aid, universal basic incomes, voluntary limits on consumption, and education. Importantly, these offer differential opportunities to target actors at the bottom versus the top of the wealth pyramid (see actions 4 and 5, respectively, Table 1)[112] and commonly applied in varied contexts. However, achieving large-scale reductions in disparities to the level required to avoid earth system limits is politically difficult within and between countries.[112]

Economic disparities produce complex causal chains. While trade provides income to exporting regions, the terms of trade are often unequal, and the environmental impacts in the exporting region represent the tele-coupled footprint of the importing or consuming region.[113,114] Resolving these disparities requires profound transformations of fundamental indirect, direct, and sectoral drivers, and can start first with the "avoiding-shifting-improving" model to avoid excess or unnecessary resource use through changes (behavior, technology, system), followed by a shift in remaining resource demand to more sustainable resources, services, and/or technologies, and for the remainder to improve technologies and uses to minimize demand.[109] Effort will be needed to redistribute authority, responsibility, values, effort, and benefits to meet justice expectations as expressed in the SDGs, while remaining or returning within ESBs. Many historic trade-offs between nature and people can be overcome and even become synergies,[115] such as shifting to healthier diets where a more plant-based diet and improved food systems improve human health while reducing land-use pressures associated with agriculture,[116] or where ecosystem-based solutions to protect coastal ecosystems also increase productivity of small scale-fisheries and reduce the human impacts of severe storms and sea level rise.

Ensuring sufficient access for all, with attention to local cultures, inclusive decision-making, and empowerment are necessary for acting on these synergies and ensuring that socio-economic and biodiversity goals are met together (action 6, Table 1).[10,117–119] This requires integrated, spatial and systemic planning, careful inclusive governance to optimize and reallocate use of natural resources and activities, and to identify strategies for sharing the required space for nature with people. Implementing these paradigms will require transformations away from using GDP as a measure of development and values that promote overconsumption and toward approaches that are in balance with natural systems.[77,120,121] Associated transformations include significant reforms within the economic sectors that are the dominant drivers of biodiversity, such as energy and agriculture, that must be adapted to finite resources and their redistribution.[26,122] Reducing excess production and consumption,[18] changing demand patterns,[109,123,124] and redesigning the built environment, cities, and infrastructure as regions of resource generation and reutilization (nitrogen, phosphorus, water), and pressure reduction (pollution reduction) are equally critical to transformation.[10,100]

Delivering nature-positive and people-positive GBF

To succeed, implementation of the GBF must fully commit to both (1) reversing the causal chains of biodiversity decline and (2) building the societal and political will to address inter- and intragenerational justice. Our Earth system justice framing identifies six actions on the two sides of the coin of "nature" and "people" and that relate to most of the GBF targets (Table 1).[28] This framing also expresses a causal chain consistent with the conceptual framework of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)[125]: nature generates benefits that are used by people, on the basis of which social goals can be met. This expresses a nature–economy–society theory of change and ordering of SDG goals,[126] as compared to the nature–society–economy framing that is explicit or implicit in conservation discourse.[32,33] Paradoxically, despite its foundations in the sustainable development agenda, the latter approach may have reinforced the historical focus on biodiversity actions (#2 halting decline of nature, and #3 restoring it to a healthy state) as foundational, at the expense of holistically addressing economic and social drivers as well.

By contrast, the nature–economy–society framing forges a focus on the causal chain of human-nature interactions from nature through use to benefits. This transactional focus emphasizes the need to address all six actions in Table 1 to manage all direct or damaging aspects of humanity's relationship with nature to be within sustainable limits. This transactional frame may not address many alternative worldviews nor intrinsic or non-transactional values of nature,[30] but it focuses squarely on those human actions that are driving biodiversity loss and change, shifts attention from attitudes and values (see Folke et al.[32]) to behaviors for greater effectiveness,[127] and shows potential for integrating common pool resource principles in governance models.[128]

The range of actions and actors (Table 1) reinforce the notion that the GBF is a "strategy for all," not just for biodiversity actors. As the current global policy framing of sustainability, the SDGs help to identify which actors are required for integrated action across the goals, and on what basis they must interact for joint success. For example, while biodiversity actors may hold responsibility for actions 2 and 3 (Table 1), i.e., protecting and restoring biodiversity in SDG 14 (life in the ocean) and 15 (life on land), other actors hold lead responsibility in other domains. Most obviously, the climate change convention and energy actors hold responsibility for achieving goal 13 on climate change and many economic actors hold responsibility for action 1 (reducing drivers). A wide range of actors—state and non-state—would hold responsibility for actions 4–6 (narrowing the equity gap, upholding rights). Table 1 specifies a formulation of the six actions as means to achieve success in the GBF. Different formulations of the same actions may be made from other domains beyond the CBD; for example, in the food, agriculture, and fishery communities engaged in SDG 2, actions 1 and 5 could be framed in terms of eliminating damaging, wasteful, unjust, and unhealthy overconsumption of food.[116,129] While actors have legitimacy and agency over specific actions, integrated implementation across the six actions is needed to ensure progress.

There are potent tradeoffs among actions, as is found with the SDGs.[130] Action 4 seeks to increase access to resources of the poorest to reach a "dignified" or "good" life. With over a billion people worldwide falling into this category, implementing this with no compensatory changes will entail a significant increase in impacts on biodiversity, often in already-stressed and biodiversity-important regions.[110] This highlights the "transformative change'' that is seen as necessary to achieve a future within planetary limits[10] and to achieve the GBF.[13,41] That is, the political will and cohesion on the part of wealthier nations to facilitate and enable this, by making space through action 5 and other measures such as those expressed in the GBF targets 18 (eliminating harmful subsidies) and 19 (fully resourcing the strategy), is understood by many as an unavoidable and necessary precondition for addressing these tradeoffs.

A positive point is that while the biodiversity-focused actions (2 and 3, Table 1) are constrained by natural processes and have long decadal response times for demonstrating success (as noted earlier), the other actions (1 and 4–6) are economic and societal in nature. While these may be characterized by great resistance to change, they may be responsive to interventions on shorter timescales if positive social tipping points are activated that trigger transformative change.[123,131] Consequently, although challenging, a focus on social and economic actions may provide substantially greater opportunities for success than maintaining the historic focus on biodiversity actions. Indeed, social and economic transformations may represent the ONLY pathways to implement the six actions.[10,83]

This ''safe and just'' model, integrating the state of nature, its contributions to people, and equitable sharing of those benefits, maps directly to goals A (state of nature), B (use by and benefits to people), and C (equitable sharing) of the GBF, and the three objectives of the Convention. Its framing of equity for all, and reinforcement of the message that Earth systems provide the primary foundation for meeting economic and societal goals, directly support commitments to goal D, i.e., full mobilization of the required financial and other resources to maintain a safe buffer to ESBs. Similarly, to interactions between people and nature, this model scales from local to global levels. It thus provides a coherent model for addressing interactions among the targets and goals of the GBF, and beyond immediate focus on design of the framework, to its implementation in the long term.

NEXT STEPS

As we approach the final negotiated text of the GBF, its adoption, and then implementation, we are looking at two worrying possibilities. First, if breakdown in cooperation among countries occurs, the final wording and text will be weak and fail to be both ambitious and realistic.[13,41] Second, that even if a strong GBF text emerges, implementation following its adoption may be under-resourced and siloed as in the past,[1,82] with a bias toward the easier and direct spatial allocation targets, and abdication of responsibility by those that need to reduce direct and indirect drivers, particularly inequalities. In this regard, the dominant conservation actors need to shift from critiquing deficiencies in the negotiated text to fully supporting the framework despite deficiencies imposed by the fraught negotiation process, and ensuring it is implemented to the level of ambition needed, i.e., as a ''better version of itself.''

An Earth systems governance framing helps highlight the role of non-state actors—such as international organizations, cities, businesses, and NGOs—in responding to global environmental changes. For instance, to achieve the goals of the Paris Agreement, governments must not only take action but also shape the delivery of actions by non-state actors.[132] Non-state actors e.g., businesses, cities, communities, conservation groups, land-owners, fishers, and others are potentially more agile and are increasingly taking action ahead of national governments.[100] Non-state actors far outside of the conventional biodiversity and conservation sectors must reduce their own footprints and impacts to the minimum, contribute to the biodiversity-positive actions that halt decline and restore nature, redistribute excess to those who have the least, and promote the inclusive governance systems necessary to deliver elements of justice identified here. Science-based targets can help guide actors toward such concerted and coherent action, to ensure contributions add up to meet common goals.[44,100,133] Governments have to lead in creating awareness and providing the enabling conditions for making this transformation possible, as well as improve the accountability of all actors. But all this is likely impossible without a transformative change in motivations to enable the scale, diversity, and depth of actions needed (Table 1).[10,134]

In this context, our Earth system perspective[84,85] provides some tangible framing on what it will take to make the transition toward a ''safe and just planet,'' for which biodiversity is a critical element. In the language of GBF proponents, following this approach can assure that ''nature positive'' is applied in its strongest form[36,40] and is ''people positive,''[22,43,44] in intent, delivery, and outcome. Informed by this approach, all can shoulder their just responsibilities in delivering solutions for the planet and for all people (Table 1). We call on the conservation community, in particular, but also all people and countries to strengthen and fully invest in the deeper societal transformations that all recent evidence shows are necessary for a safe and just future. All protagonists—countries and non-state actors—must shoulder their just responsibilities in delivering on a nature-positive and people-positive GBF.

ACKNOWLEDGMENTS

This work is part of the Earth Commission, which is hosted by Future Earth and is the science component of the Global Commons Alliance. The Global Commons Alliance is a sponsored project of Rockefeller Philanthropy Advisors, with support from Oak Foundation, MAVA, Porticus, Gordon and Betty Moore Foundation, Herlin Foundation and the Global Environment Facility. The Earth Commission is also supported by the Global Challenges Foundation. Support for D.O.O. was provided by the Norwegian Agency for Development Cooperation (Norad) to CORDIO East Africa, and for J.C.R. by Swedish Research Council for Sustainable Development (FORMAS). We are grateful to three anonymous reviewers and Sandra Díaz for improvements to the manuscript.

AUTHOR CONTRIBUTIONS

Conceptualization, D.O.O., F.D., P.H.V., J.G., and D.L.; methodology, D.O.O.; writing – original draft, D.O.O.; visualization, D.O.O.; writing – review & editing – all authors.

DECLARATION OF INTERESTS

The authors declare no competing interests.

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