Achieving global biodiversity goals by 2050 will require transformative action on all drivers

Supporting Material

Supplement S1 - Description of GBF goals, milestones, targets and background on process
Supplement S2 - Synthesis of global sustainability scenarios

Supplement S1: Description of GBF goals, milestones, targets and background on process

At COP14 in Egypt, countries adopted a preparatory process for the development of the post-2020 Global Biodiversity Framework, and established an Open-Ended Working Group (OEWG), co-chaired by Francis Ogwal, Ghana and Basile van Havre, Canada. The preparatory processes is participatory, aiming for comprehensive consultation with a broad range of stakeholders across regions and themes. The first OWEG meeting was held in Nairobi, 27-30 August 2019, at which the scope of the framework was discussed, and the co-chairs were requested to prepare the zero order draft (ZOD) of the framework. A schedule for consultations was also set out at this meeting.

The second OEWG meeting took place in Rome, 24 - 29 February 2020. Participants reviewed the ZOD, and commented on the proposed goals and targets. SBSTTA was requested to provide a technical and scientific review, and the co-chairs tasked to prepare a first draft for the next meeting. This first draft is available as CBD/WG2020/3/3[1]. Due to the COVID pandemic, part I the 3rd meeting of the OEWG was conducted virtually from 23 August to 3 September 2021, providing an opportunity for parties and stakeholders to exchange views, and to prepare for part II of OEWG-3, to take place in Geneva, March 2022.

Elements of the post-2020 Global Biodiversity Framework

<u>2050 Vision</u>

The vision of the framework is a world of living in harmony with nature where: “By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.”

<u>2030 Mission</u>

The mission of the framework for the period up to 2030, towards the 2050 vision is: “To take urgent action across society to conserve and sustainably use biodiversity and ensure the fair and

[1] CBD 2021: First Draft of the post-2020 Global Biodiversity Framework. CBD/WG2020/3/3, issued 5 July 2021. https://www.cbd.int/doc/c/914a/eca3/24ad42235033f031badf61b1/wg2020-03-03-en.pdf

equitable sharing of benefits from the use of genetics resources, to put biodiversity on a path to recovery by 2030 for the benefit of planet and people."

2050 Goals and 2030 Milestones

The framework has four long-term goals for 2050 related to the 2050 Vision for Biodiversity. Each 2050 goal has a number of corresponding milestones to assess, in 2030, progress towards the 2050 goals. The four goals and their associated milestones are:

Goal A. The integrity of all ecosystems is enhanced, with an increase of at least 15 per cent in the area, connectivity and integrity of natural ecosystems, supporting healthy and resilient populations of all species, the rate of extinctions has been reduced at least tenfold, and the risk of species extinctions across all taxonomic and functional groups, is halved, and genetic diversity of wild and domesticated species is safeguarded, with at least 90 percent of genetic diversity within all species maintained.

Milestone A.1 - Net gain in the area, connectivity and integrity of natural systems of at least 5 percent.

Milestone A.2 - The increase in the extinction rate is halted or reversed, and the extinction risk is reduced by at least 10 per cent, with a decrease in the proportion of species that are threatened, and the abundance and distribution of populations of species is enhanced or at least maintained.

Milestone A.3 - Genetic diversity of wild and domesticated species is safeguarded, with an increase in the proportion of species that have at least 90 per cent of their genetic diversity maintained.

Goal B. Nature's contributions to people are valued, maintained or enhanced through conservation and sustainable use supporting the global development agenda for the benefit of all.

Milestone B.1 - Nature and its contributions to people are fully accounted and inform all relevant public and private decisions.

Milestone B.2 - The long-term sustainability of all categories of nature's contributions to people is ensured, with those currently in decline restored, contributing to each of the relevant Sustainable Development Goals.

Goal C. The benefits from the utilization of genetic resources are shared fairly and equitably, with a substantial increase in both monetary and non-monetary benefits shared, including for the conservation and sustainable use of biodiversity.

Milestone C.1 - The share of monetary benefits received by providers, including holders of traditional knowledge, has increased.

Milestone C.2 - Non-monetary benefits, such as the participation of providers, including holders of traditional knowledge, in research and development, has increased.

Goal D. The gap between available financial and other means of implementation, and those necessary to achieve the 2050 Vision, is closed.

Milestone D.1 - Adequate financial resources to implement the framework are available and deployed, progressively closing the financing gap up to at least US $700 billion per year by 2030.

Milestone D.2 - Adequate other means, including capacity-building and development, technical and scientific cooperation and technology transfer to implement the framework to 2030 are available and deployed.

Milestone D.3 - Adequate financial and other resources for the period 2030 to 2040 are planned or committed by 2030.

2030 Action Targets

The framework has 21 action-oriented targets for urgent action over the decade to 2030. The actions set out in each target need to be initiated immediately and completed by 2030. Together, the results will enable achievement of the 2030 milestones and of the outcome-oriented goals for 2050. Actions to reach these targets should be implemented consistently and in harmony with the Convention on Biological Diversity and its Protocols and other relevant international obligations, taking into account national socioeconomic conditions.

1. Reducing threats to biodiversity

Target 1. Ensure that all land and sea areas globally are under integrated biodiversity-inclusive spatial planning addressing land- and sea-use change, retaining existing intact and wilderness areas.
Target 2. Ensure that at least 20 percent of degraded freshwater, marine and terrestrial ecosystems are under restoration, ensuring connectivity among them and focusing on priority ecosystems.

Target 3. Ensure that at least 30 per cent globally of land areas and of sea areas, especially areas of particular importance for biodiversity and its contributions to people, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Target 4. Ensure active management actions to enable the recovery and conservation of species and the genetic diversity of wild and domesticated species, including through ex-situ

conservation, and effectively manage human-wildlife interactions to avoid or reduce human-wildlife conflict.

Target 5. Ensure that the harvesting, trade and use of wild species is sustainable, legal, and safe for human health.

Target 6. Manage pathways for the introduction of invasive alien species, preventing, or reducing their rate of introduction and establishment by at least 50 per cent, and control or eradicate invasive alien species to eliminate or reduce their impacts, focusing on priority species and priority sites.

Target 7. Reduce pollution from all sources to levels that are not harmful to biodiversity and ecosystem functions and human health, including by reducing nutrients lost to the environment by at least half, and pesticides by at least two thirds and eliminating the discharge of plastic waste.

2. Meeting people's needs through sustainable use and benefit-sharing

Target 9. Ensure benefits, including nutrition, food security, medicines, and livelihoods for people especially for the most vulnerable through sustainable management of wild terrestrial, freshwater and marine species and protecting customary sustainable use by indigenous peoples and local communities.

Target 10. Ensure all areas under agriculture, aquaculture and forestry are managed sustainably, in particular through the conservation and sustainable use of biodiversity, increasing the productivity and resilience of these production systems.
Target 11. Maintain and enhance nature's contributions to regulation of air quality, quality and quantity of water, and protection from hazards and extreme events for all people.

Target 12. Increase the area of, access to, and benefits from green and blue spaces, for human health and well-being in urban areas and other densely populated areas.

Target 13. Implement measures at global level and in all countries to facilitate access to genetic resources and to ensure the fair and equitable sharing of benefits arising from the use of genetic resources, and as relevant, of associated traditional knowledge, including through mutually agreed terms and prior and informed consent.

3. Tools and solutions for implementation and mainstreaming

Target 14. Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts, and assessments of environmental impacts at all levels of government and across all sectors of the economy, ensuring that all activities and financial flows are aligned with biodiversity values.

Target 15. All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts, by at least half and increase positive impacts, reducing biodiversity-related risks to businesses and moving towards the full sustainability of extraction and production practices, sourcing and supply chains, and use and disposal.

Target 16. Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives, taking into account cultural preferences, to reduce by at least half the waste and, where relevant the overconsumption, of food and other materials.

Target 17. Establish, strengthen capacity for, and implement measures in all countries to prevent, manage or control potential adverse impacts of biotechnology on biodiversity and human health, reducing the risk of these impacts.

Target 18. Redirect, repurpose, reform or eliminate incentives harmful for biodiversity, in a just and equitable way, reducing them by at least US$ 500 billion per year, including all of the most harmful subsidies, and ensure that incentives, including public and private economic and regulatory incentives, are either positive or neutral for biodiversity.

Target 19. Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilization, taking into account national biodiversity finance planning, and strengthen capacity-building and technology transfer and scientific cooperation, to meet the needs for implementation, commensurate with the ambition of the goals and targets of the framework.

Target 20. Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous peoples and local communities with their free, prior, and informed consent, guides decision-making for the effective management of biodiversity, enabling monitoring, and by promoting awareness, education and research.

Target 21. Ensure equitable and effective participation in decision-making related to biodiversity by indigenous peoples and local communities, and respect their rights over lands, territories and resources, as well as by women and girls, and youth.

Supplement S2 - Synthesis of global sustainability scenarios

This supplement consists of verbatim extracts from CBD/SBSTTA/24/INF/31 (14 January 2022)

"Scenarios on land for the period 2030-2050 show:

- Continued trends in direct and indirect drivers result in rapid degradation of all dimensions of biodiversity (although genetic diversity is rarely addressed).
- Strong conservation actions, including protected areas, can play a very important role in reducing biodiversity loss. However, protected areas with weak levels of protection, weak management or placement in areas of low biodiversity value are of little, or no, help in slowing biodiversity loss.
- Expansion of protected areas to 50% of land ("half Earth") may substantially increase the risk of food insecurity.
- Limiting global warming to 1.5°C or below is essential to meeting ambitious biodiversity goals, especially for 2050 and beyond.
- Conservation and restoration can slow biodiversity loss, but only transformative changes of underlying drivers such as unsustainable production and consumption can halt and reverse biodiversity loss over the long term.
- Limiting global warming to 1.5°C or below is essential to meeting ambitious biodiversity goals, especially for 2050 and beyond.
- Conservation and restoration can slow biodiversity loss, but only transformative changes of underlying drivers such as unsustainable production and consumption can halt and reverse biodiversity loss over the long term."

"Table S1 provides a qualitative synthesis of six very recent scenario studies that are relevant to setting ambition for the GBF goals, milestones and targets for terrestrial biodiversity (see also Appendix 1.3 of CBD/SBSTTA/24/INF/31 for a quantitative analysis of the land use impacts on species extinction risk). We compare four scenarios that have a basis in the relatively complex Shared Socio-economic Pathways developed in support of the IPCC. Three of these, Leclère *et al*. (2020), Kok *et al.* (2020) and Soergel (*et al.* 2021), have made significant modifications to increase the representation of sustainability and explicitly add biodiversity conservation. Two of the scenarios (Williams *et al.* 2021 and Fastré *et al.* 2021) use statistical extrapolations of land use trends along with relatively simple assumptions about the land use implications of protected areas and food systems. These scenarios highlight the importance of i) well-implemented conservation and restoration and ii) transformations of agricultural production, sustainable diets and reducing food waste. Only two of the studies include climate change impacts on biodiversity (IPBES 2019; Kok *et al.* 2020) and both indicate that even low levels of climate change greatly increase the risks for biodiversity."

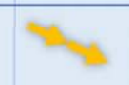
"In addition to these global sustainability scenarios, other scenarios, models and observations indicate that expansion of protected areas in the future could help slow biodiversity loss, but not halt it, and are only beneficial when properly placed and well-managed. Observations show that species abundance within protected areas has continued to decline, the placement and resourcing of the majority of protected areas has been poor, and more than half of recent

protected areas have had significant increases in threats to biodiversity (Visconti *et al.* 2019; Bhola *et al.* 2021). Scenarios and models suggest that substantial increases in protected areas on land could be beneficial for biodiversity (table S1), but most of these scenarios assume that protected areas in the future are well-managed, well-placed and properly resourced. Scenarios with non-optimal placement, or weak management indicate that increasing protected area coverage will be of little value and even counter-productive (Nicholson *et al.* 2012; Visconti *et al.* 2019; Woodley *et al.* 2019). Scenarios and models also suggest that expansion to 50% global coverage of land area could compete for land with agriculture and substantially increase the risk for food security, especially in sub-Saharan Africa (Table S1)."

"At regional scales, Williams *et al.* (2021) and Leclère *et al.* (2020) also point to the regional diversity of what constitutes the most efficient combinations of actions on direct and indirect drivers, and spillovers across regions via trade. Direct actions to stop habitat loss in one region are ineffective if the harmful activities relocate to another region as many of these activities are tightly linked to international value chains (Hoang & Kanemoto 2021). Direct actions to stop habitat loss are, thus, best complemented with action to replace these commodities by lower footprint alternatives to decrease the overall pressures, and thus decrease the risk of spillovers across regions. Sustainability scenarios and models for terrestrial systems at local scales show that a combination of careful spatial planning, the introduction of sustainable or regenerative production practices and a decrease of overall pressure through the value chain."

"An important caveat concerning these scenarios is that they do not consider invasive alien species, pollution from fertilizers, pesticides and light (see Appendix 1.6 for discussion of future light impacts on species), bushmeat hunting, and many other factors that will increase human impacts on biodiversity. In addition, only two studies take into account climate change impacts on biodiversity."

Table S1 - Analysis of six global sustainability scenarios. The four studies at the top of the table are based on the Shared Socio-economic Pathways (SSP) scenarios developed in support of the Intergovernmental Panel on Climate Change (IPCC). Background color: continued trends = grey, conservation and restoration only = blue, transformative change = green. Arrows indicate the qualitative response of biodiversity for habitat area, biodiversity intactness and extinction risk (downward arrows indicate more species threatened with extinction). Short arrows indicate responses for "current" to 2030 (first arrow) and then 2030 to 2050 (second arrow). Long arrows indicate responses for "current" to 2050. Color and angle of arrow indicate direction of response compared to reference date which is 2010 or 2015 for the long arrows and first short arrow, 2030 for second short arrow: black = very negative ; red = negative; orange = negative but slower than current trend; yellow = stabilization; green = slight improvement; blue = substantial improvement. In the "Scenario assumptions" column: SE = socio-economic scenario; CC = climate change scenario and projected 2050 global warming.

Study	Scenario name	Scenario assumptions	Protected Areas	Restoration	Food Systems	Climate impact	Habitat Area	Intactness	Extinction Risk	Comments
IPBES (2019), Kim et al. (2019) Biodiversity model = Multi-model	Continued trends	SE = SSP3 CC = RCP6.0 ≈ 3-4°C by 2100	None explicit	None explicit	Continued trends	no				
	Continued trends	SE = SSP3 CC = RCP6.0 ≈ 3-4°C by 2100	None explicit	None explicit	Continued trends	yes				
	Sustainability	SE = SSP1 CC = RCP 2.6 ≈ 2°C, stable	30%, reduced deforestation	Not explicit	Close yield gaps Sustainable consumption	no				Weaker land use constraints than other sustainability scenarios
	Sustainability	SE = SSP1 CC = RCP 2.6 ≈ 2°C, stable	30%, reduced deforestation	Not explicit	Close yield gaps Sustainable consumption	yes				idem
Leclere et al. (2020)	Continued trends	SE = SSP2 CC = NA	no further expansion beyond 2010	None explicit	Continued trends	no				
Biodiversity model = Multi-model	Conservation and restoration	SE = SSP2 CC = NA	40% by 2020 (KBAs & Wild. areas)	≈5 million km² by 2050 (≈ 4%)	Continued trends	no				Also includes land-use planning over all land
	+ Sustainable production & consumption	SE = SSP1 CC = NA	40% by 2020 (KBAs & Wild. areas)	≈10 million km² by 2050 (≈ 8%)	Close yield gaps; Healthy diet, -50% meat; -50% food waste	no				Also includes land-use planning over all land
Kok et al. (2021)	Continued trends	SE = SSP2 CC ≈ 2,1°C rising	17% by 2020, no further expansion	None explicit	Continued trends	yes				
Biodiversity model = GLOBIO	Conservation = "Sharing the Planet Earth"	SE = SSP2 CC = 2,1°C rising	30% by 2050, focus ES	Rehabilitation	Continued trends	yes				
	Conservation ="Half Earth"	SE= SSP2 CC = 2,1°C rising	50% by 2050, focus BD	Ecological restoration	Continued trends	yes				Food security risk above SSP-2 baseline; highest food security risk
	Conservation = "Sharing the Planet" + Sustainability	SE = SSP2 CC = 1.6°C stable	30% by 2050, focus ES	Rehabilitation	Close yield gaps; Sustian diet, -50% animal products; -50% food waste	yes				Lowest food security risk Largest improvement regulating services

Study	Scenario name	Scenario assumptions	Protected Areas	Restoration	Food Systems	Climate impact	Habitat Area	Intactness	Extinction Risk	Comments
Soergel et al. (2021)	Continued trends	SE = SSP2 CC = NDC ≈ ??°C	None explicit	None explicit	Continued trends	no			—	Nat. habitat = primary and secondary vegetation?
Biodiversity model = BII	Sustainability + Climate mitigation	SE = SSP1 CC ≈ <1.5°C	Increase in forest protection	?	Close yield gaps Global equity	no			—	
	+ SDG package	+ try to meet all SDG objectives CC ≈ <1.5°C	Above + expansion to biodiversity hotspots	?	Close yield gaps Sustain. diets (EAT) Reduce food waste Global equity	no			—	Actions have strong synergies across multiple SDG goals. Lower food security risk
Fastré et al. (2021)	30% Strict Protected Area	SE = PA optimization CC - none	34% by 2030	19 million km²	Continued trends	no		—		Arrows use 2015 baseline.
Biodiversity model = habitat suitability	100% Spatial planning	SE = land use optimization CC - none	17% + Spatial planning	14.5 million km²	Continued trends	no		—		Lowest trade-off between biodiversity and food security
	30% Strict PA + spatial planning everywhere else	SE = both of above CC - none	34% by 2030	18 million km²	Continued trends	no		—		Highest food security risk
Williams et al. (2021)	Continued trends	SE = Statistical extrapolation of land use trends	Continued trends	Continued trends	Continued trends	No		—		
Biodiversity model = habitat suitability	Spatial planning	SE = Global land use planning	Protect high priority areas	Not explicit	Continued trends	No		—		
	+ Sustainable production and consumption	SE = above + Sustainable agriculture and consumption	idem	Regrowth on abandonned land	Close yield gaps Sustain. diets Reduce food waste	No		—