Science Based Targets for Land

VERSION 0.3 – SUPPLEMENTARY MATERIAL

STEP

3

MEASURE, SET & DISCLOSE

LAND

SCIENCE BASED TARGETS NETWORK
GLOBAL COMMONS ALLIANCE

Contents

This document contains additional information supporting the SBT Land v0.3 guidance. The supplementary material is structured as follows:

- General alignment of SBTN Land Targets with other frameworks.
  - This section details and highlights how the three targets are built upon and complement internationally recognized frameworks such as CBD GBF and UNCCD.
- Crosswalk sector classification guidance.
  - This section outlines the alignment of ISIC sector classifications with NAICS, GICS and NACE industry sector classification systems.
- Deep dives on the SBTN Land Targets.
  - This section contains additional information for each of the target and, specifically, the scientific basis for the targets and details on specific metrics for measuring ecosystem conditions for the Landscape Engagement target.

General Alignment of SBTN Land Targets

Alignment with the Convention on Biological Diversity (CBD)

With the finalization of the CBD's Kunming–Montreal Global Biodiversity Framework (GBF) in December 2022, SBTN Land can also finalize its alignment with global goals on biodiversity. At each stage of the process leading up to the GBF, the SBTN Land Hub worked to best align the development of its corporate target-setting methodology with sequential drafts leading up to the final negotiation.

Below, an outline of the beta version of corporate targets for land is provided with an explanation on how they specifically relate to the goals and targets outlined in the Final GBF.[1]

The land targets do not attempt, nor do they achieve, a comprehensive target-setting approach for land and biodiversity. For now, they allow companies to set quantifiable targets to avoid and reduce company impacts on several major pressures to land systems and terrestrial biodiversity. They also require companies with material impacts on land to engage in landscape initiatives and create the enabling conditions that will permit the regeneration of working lands, the restoration of degraded ecosystems, and a transformation of landscapes, including the factors that have driven their degradation. These targets are a meaningful step for companies toward a comprehensive science-based target-setting approach to nature.

> **No Conversion of Natural Ecosystems:** Land use change (LUC) is one of the primary drivers of recent and historical biodiversity loss. This target limits further loss of biodiversity due to conversion of natural ecosystems attributed to company activities or sourcing. It relates to Targets 1, 2, 3, 10, 11, 15, 16, 19, 20, 21 of the GBF.
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> **Land Footprint Reduction:** The Land Footprint Reduction target liberates agricultural land from production, relieving pressures from the leading driver of biodiversity loss. It relates to Targets 2, 3, 10, 15, 19, 20, 21 of the GBF.
>
> **Landscape Engagement:** The Landscape Engagement target encompasses a variety of potential actions that companies can implement for achieving holistic environmental and social outcomes within collaborative landscape initiatives. Specifically, the intention of landscape engagement is to enable regenerative, restorative, and transformational actions in landscapes that are relevant for a company's operations and supply chains. In addition to biophysical impacts on GBF objectives, this target promotes company engagement in the transformational processes necessary to realize landscape objectives. The implementation of this target also asks companies to explore ecosystem restoration in agricultural areas taken out of production through the Land Footprint Reduction target. It relates to Targets 2, 3, 10, 11, 15, 16, 19, 20, 21, 22, 23 of the GBF.

A key feature of the GBF (and all CBD decisions) is that it is agreed on, implemented by, and reported by national governments. However, achieving GBF goals and targets requires a concerted efforts across whole of society. Companies are central to the ability of countries to support this process . Differences between country and company contributions are reflected in the coverage of SBTs for Land and the monitoring framework of the GBF. Many of the indicators used with the GBF apply only to national-level reporting and are not as relevant for companies. Despite the mismatch between monitoring and corporate target setting, there are many direct overlaps and many instances where corporate nature targets on land will likely make significant contributions to the goals and targets of the GBF. However, these may initially be monitored at the landscape scale, rather than for national reporting to the CBD. That said, governments would be incapable of delivering on the suite of goals and targets without strong and dedicated participation by the private sector—such that in many places in the GBF targets this is explicitly acknowledged.

Of specific relevance for corporate land targets are Goal A and B, and Targets 1, 2, 3, 10, and 15. of the GBF. Throughout target development, the SBTN Land Hub has worked to align with draft versions of this Framework and now squarely aligns with many of its goals and targets. Companies setting targets for land through the v0.3 methodology can be confident that progress on these targets will contribute to and align with the GBF. This alignment will only increase from this point as more specific methods are developed for subsequent versions of SBTN Land targets.

[1] https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222

Table SM 1: Demonstration of which goals and targets of the CBD's Kunming–Montreal Global Biodiversity Framework are relevant and aligned with SBTN Land's science-based targets.

		Science-Based Targets for Land			GBF Monitoring Framework Alignment		
Kunming–Montreal Global Biodiversity Framework (GBF)		No Conversion of Natural Ecosystems	Land Footprint Reduction	Landscape Engagement	Headline indicators	Component indicators	Complementary indicators
GOAL A	Biodiversity existence	✓	✓	✓	●	●	●
GOAL B	Biodiversity use		✓	✓			●
GOAL C	Biodiversity benefit sharing						
GOAL D	Framework implementation				●		
Target 1	No conversion	✓			●	●	●
Target 2	Restoration	✓	✓	✓	●	●	●
Target 3	30% protected by 2030	✓	✓	✓	●	●	●
Target 4	Save species						
Target 5	Intl. trade in species						
Target 6	Invasives						
Target 7	Pollution						
Target 8	Climate and adaptation	✓	✓	✓		●	●
Target 9	Species management						●
Target 10	Working lands	✓	✓	✓	●	●	●
Target 11	Nature's contributions to people	✓	✓	✓	●		
Target 12	Urban nature						
Target 13	Fair and equitable benefit sharing						
Target 14	Transformation and integration						●
Target 15	Corporate disclosure	✓	✓	✓	●	●	●
Target 16	Overconsumption and waste	✓	✓	✓			●
Target 17	Biosafety						
Target 18	Harmful subsidies				●		
Target 19	Financial flows	✓	✓	✓	●		●
Target 20	Capacity and innovation	✓	✓	✓			
Target 21	Transparency and data	✓	✓	✓			
Target 22	Socially responsive/inclusive			✓			
Target 23	Gender equality			✓			

Annotated guide to the relevance of SBTN Land Science-Based Targets to the Convention on Biological Diversity's Kunming–Montreal Global Biodiversity Framework (GBF)

Language in bold indicates passages that are more relevant to SBTN Land targets. When necessary, a description of their relevance is included as boxed text below each goal/target.

Text as it appears in the Kunming–Montreal Global Biodiversity Framework.:

The Kunming-Montreal Global Biodiversity Framework has four long-term goals for 2050 related to the 2050 Vision for Biodiversity.

GOAL A

The integrity, connectivity and resilience of all ecosystems are maintained, enhanced, or restored, substantially increasing the area of natural ecosystems by 2050;

Human induced extinction of known threatened species is halted, and, by 2050, the extinction rate and risk of all species are reduced tenfold, and the abundance of native wild species is increased to healthy and resilient levels;

The genetic diversity within populations of wild and domesticated species, is maintained, safeguarding their adaptive potential.

No Conversion of Natural Ecosystems
Land Footprint Reduction
Landscape Engagement

GOAL A is broadly supported by all three land targets. Land-use change is identified as the most substantial cause of human-induced extinction and a No Conversion of Natural Ecosystems target supports the maintenance of ecosystem integrity, existing connectivity, and ultimately resilience. The Land Footprint Reduction and Landscape Engagement targets also help to enhance and restore degraded ecosystems, with the Landscape Engagement target specifically addressing the restoration of ecosystem structure, composition, and function at the sourcing area or landscape scale.

GOAL B

Biodiversity is sustainably used and managed and nature's contributions to people, including ecosystem functions and services, are valued, maintained and enhanced, with those currently in decline **being restored**, supporting the achievement of sustainable development for the benefit of present and future generations by 2050.

Land Footprint Reduction
Landscape Engagement

While this goal, as written, most supports company efforts to sustainably manage areas and the ecosystems they represent through reductions in areas under production, for those areas identified for landscape interventions under the Landscape Engagement target, they will likely also contribute to the restoration of ecosystem functions and services in decline.

GOAL C

The monetary and non-monetary benefits from the utilization of genetic resources, and digital sequence information on genetic resources, and of traditional knowledge associated with genetic resources, as applicable, are shared fairly and equitably, including, as appropriate with indigenous peoples and local communities, and substantially increased by 2050, while ensuring traditional knowledge associated with genetic resources is appropriately protected, thereby contributing to the conservation and sustainable use of biodiversity, in accordance with internationally agreed access and benefit-sharing instruments.

GOAL D

Adequate means of implementation, including financial resources, capacity-building, technical and scientific cooperation, and access to and transfer of technology to fully implement the Kunming-Montreal global biodiversity framework are secured and equitably accessible to all Parties, especially developing countries, in particular the least developed countries and small island developing States, as well as countries with economies in transition, progressively closing the biodiversity finance gap of 700 billion dollars per year, and **aligning financial flows with the Kunming-Montreal Global Biodiversity Framework and the 2050 Vision for Biodiversity.**

Global Targets for 2030

The framework has 23 action-oriented global targets for urgent action over the decade to 2030. The actions set out

> The focus of SBTN is to provide a vehicle for the alignment of corporate financial flows and effort toward the 2050 Vision for Biodiversity. Through the target-setting and implementation steps of SBTN, companies will deploy financial and technical resources, cooperate with scientists, and build capacity within the conservation community regarding the challenges that companies face, both short and long term, through becoming faithful actors and stakeholders in nature.

in each target need to be **initiated immediately** and completed by 2030. Together, the results will enable achievement towards 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 circumstances, priorities and socioeconomic conditions.

1. Reducing threats to biodiversity

TARGET 1

Ensure that all areas are under participatory, integrated and biodiversity inclusive spatial planning and/or effective management processes **addressing land and sea use change, to bring the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity, close to zero by 2030, while respecting the rights of indigenous peoples and local communities.**

> No Conversion of Natural Ecosystems
>
> As a voluntary corporate framework, SBTN can meet the ambition of this target and provide sector-specific guidance on the appropriate level of ambition in addressing land-use change. It is recommended that those sectors that are unable to satisfy a no-conversion target (e.g., metals and mining, infrastructure development) still work to achieve this target—they are still held to the standard indicated in Target 1. However, for most sectors land targets require no conversion of natural forests by 2025 and no conversion of any natural ecosystems for all required sectors by 2030. Integrated and biodiversity-inclusive spatial planning will also be relevant for determining where a company's Land Footprint Reduction target is most beneficial as well as in the identification of areas that would benefit a Landscape Engagement target.

TARGET 2

Ensure that by 2030 at least **30 per cent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration**, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.

> ALL LAND TARGETS
>
> An important caveat of this target is the "under effective restoration" clause. Here the GBF relies on a broader definition of restoration than it might seem at first glance. This target does not mean that 30% of degraded areas are restored by 2030, it means that by 2030, 30% of degraded ecosystems are covered under an active restoration plan. At a landscape scale this will necessitate that natural ecosystems covered in the No Conversion of Natural Ecosystems target will be critical in providing locally adapted native species for restoration, even if they are degraded. It will also likely require that existing agricultural land, especially degraded land, be liberated and restored—both of these actions are directly relevant to the Land Footprint Reduction and Landscape Engagement targets.

TARGET 3

Ensure and enable that by 2030 at least 30 per cent of terrestrial and inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and **other effective area-based conservation measures**, recognizing indigenous and traditional territories, where applicable, and **integrated into wider landscapes**, seascapes and the ocean, while **ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognizing**

No Conversion of Natural Ecosystems
Land Footprint Reduction
Landscape Engagement

The inclusion of other effective area-based conservation measures (OECMs) in this target opens the door for the relevance of land targets in this protected area target. OECMs are places not within a protected area, that deliver long-term biodiversity conservation under equitable governance and management. In both a No Conversion of Natural Ecosystems and Land Footprint Reduction context, this target is relevant. Companies that comply with a no-conversion target indirectly help ensure that areas of particular importance for biodiversity and ecosystem functions and services remain intact. This is crucial for the perpetuity of the 30x30 GBF target. Additionally, areas that are under current production that are liberated may have the capacity to support the reclamation of traditional territories and or support the landscape contexts within which protected area systems operate. Finally, the regeneration or restoration of ecosystem integrity may provide additional areas for consideration as part of the 30% area in national protected area/OECM accounting systems.

and respecting the rights of indigenous peoples and local communities, including over their traditional territories.

TARGET 4

Ensure urgent management actions to halt **human induced extinction** of known threatened species and for the **recovery and conservation of species**, in particular threatened species, to significantly reduce extinction risk, as well as to maintain and restore the genetic diversity within and between populations of native, wild and **domesticated species** to maintain their adaptive potential, including through in situ and ex situ conservation and sustainable management practices, and effectively manage human-wildlife interactions to minimize human-wildlife conflict for coexistence.

Land targets do not include species targets. However, the three Land targets, if implemented effectively, would likely support the recovery and conservation of species in specific landscape contexts through an elimination of conversion of natural ecosystems, a reduction in land occupation pressures, and improvements in ecosystem integrity at the landscape scale.

TARGET 5

Ensure that the use, harvesting and trade of wild species is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, and reducing the risk of pathogen spill-over, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities.

TARGET 6

Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent by 2030, and eradicating or controlling invasive alien species especially in priority sites, such as islands.

TARGET 7

Reduce pollution risks and the negative impact of pollution from all sources by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest

management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution.

TARGET 8

Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through **nature-based solution and/or ecosystem-based approaches**, while minimizing negative and fostering positive impacts of climate action on biodiversity.

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

TARGET 9

Ensure that the management and use of wild species are sustainable, thereby providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on biodiversity, including through sustainable biodiversity-based activities, products and services that enhance biodiversity, and protecting and encouraging customary sustainable use by indigenous peoples and local communities.

TARGET 10

Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, such **as sustainable intensification, agroecological and other innovative approaches, contributing to the resilience and long-term efficiency and productivity of these production systems and to food security**, **conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services**.

No Conversion of Natural Ecosystems
Land Footprint Reduction
Landscape Engagement

Squarely aligned with v0.3 of the land targets, Target 10 highlights sustainable management required by several specific sectors covered by the land targets. SBTN contends that No Conversion of Natural Ecosystems target is a necessary condition of sustainable management for these sectors. Furthermore, the Land Footprint Reduction target, always paired with the Landscape Engagement target, specifically incentivizes companies to adopt sustainable intensification, agroecological approaches, and other innovative solutions to increase production efficiency and improve ecosystem structure, composition, and function. This target will be a significant focus of future versions of the land targets as well.

TARGET 11

Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, **through nature-based solutions and/or ecosystem-based approaches** for the benefit of all people and nature.

No Conversion of Natural Ecosystems
Landscape Engagement

For existing contributions to people from nature, the *no-conversion* target provides continuity of these existing services. However, in many places land degradation has weakened these contributions. Within the implementation of land targets on improving ecological conditions, companies will likely deploy nature-based solutions and/or ecosystem-based approaches to both restore and enhance these contributions—with benefits flowing both to a company's dependencies within a landscape as well as people and nature.

TARGET 12

Significantly increase the area and quality and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas sustainably, by mainstreaming the conservation and sustainable use of biodiversity, and ensure biodiversity-inclusive urban planning, enhancing native biodiversity, **ecological**

connectivity and integrity, and improving human health and well-being and connection to nature and contributing to inclusive and sustainable urbanization and the provision of ecosystem functions and services.

TARGET 13

Take effective legal, policy, administrative and capacity-building measures at all levels, as appropriate, to ensure the fair and equitable sharing of benefits that arise from the utilization of genetic resources and from digital sequence information on genetic resources, as well as traditional knowledge associated with genetic resources, and facilitating appropriate access to genetic resources, and by 2030 facilitating a significant increase of the benefits shared, in accordance with applicable international access and benefit-sharing instruments.

3. Tools and solutions for implementation and mainstreaming

TARGET 14

Ensure the full integration of biodiversity and its multiple values into policies, regulations, planning and development processes, poverty eradication strategies, strategic environmental assessments, environmental impact assessments and, as appropriate, national accounting, within and across all levels of government and across all sectors, in particular **those with significant impacts on biodiversity,progressively aligning all relevant public and private activities, fiscal and financial flows with the goals and targets of this framework**.

No Conversion of Natural Ecosystems
Land Footprint Reduction
Landscape Engagement

The SBTN target-setting process will deliver on the transformational integration of companies as biodiversity actors and stakeholders. In addition, the spatial nature of land targets will require companies to understand their impacts in specific places, providing context and stakeholder engagement around their targets. During this action it may not be possible, and would not be advisable, for companies to act outside alignment with public institutions, policies, regulations, processes, strategies, and assessments.

TARGET 15

Take legal, **administrative or policy measures to encourage and enable business, and in particular to ensure that large and transnational companies and financial institutions:**

(a) Regularly **monitor, assess, and transparently disclose** their risks, dependencies and impacts on biodiversity, including with requirements for all large as well as transnational companies and financial institutions **along their operations, supply and value chains and portfolios**;

(b) Provide information needed to consumers to promote sustainable consumption patterns;

(c) Report on compliance with access and benefit-sharing regulations and measures, as applicable;

in order to **progressively reduce negative impacts on biodiversity, increase positive impacts, reduce biodiversity-related risks to business and financial institutions, and promote actions to ensure sustainable patterns of production**.

No Conversion of Natural Ecosystems
Land Footprint Reduction
Landscape Engagement

This target outlines the role of corporate disclosure and transparency, but also communicates that the outcome of these processes is to avoid and reduce impacts on biodiversity and to take action to regenerate and restore moving forward. Paired with target 14 on transformation, these targets outline SBTN's mitigation hierarchy and the framework on which land targets were selected. No Conversion of Natural Ecosystems (avoid); (reduce) Land Footprint Reduction; and Landscape Engagement (through regeneration and restoration).

TARGET 16

Ensure that people are encouraged and enabled to make sustainable consumption choices, including by establishing supportive policy, legislative or regulatory frameworks, improving education and access to relevant and accurate information and alternatives, and by 2030 **reduce the global footprint of consumption in an equitable manner**, including through halving global food waste, significantly reducing overconsumption and substantially reducing waste generation, in order for all people to live well in harmony with Mother Earth.

TARGET 17

Establish, strengthen capacity for, and implement in all countries, biosafety measures as set out in Article 8(g) of the Convention on Biological Diversity and measures for the handling of biotechnology and distribution of its benefits as set out in Article 19 of the Convention.

No Conversion of Natural Ecosystems
Land Footprint Reduction

Since the conversion of natural ecosystems is primarily driven by increasing agricultural land, a No Conversion of Natural Ecosystems target prevents the expansion of this footprint. Paired with a Land Footprint Reduction target, this land target quantifies the reduction in global footprint that is required by 2030 (500 million hectares) and asks large agricultural companies to commit to those reductions—directly in line with this GBF target.

TARGET 18

Identify by 2025, and eliminate, phase out or reform incentives, including subsidies, harmful for biodiversity, in a proportionate, just, fair, effective and equitable way, while substantially and progressively reducing them by at least 500 billion United States dollars per year by 2030, starting with the most harmful incentives, and **scale up positive incentives for the conservation and sustainable use of biodiversity**.

TARGET 19

Substantially and progressively increase the level of financial resources from all sources, in an effective, timely and easily accessible manner, including domestic, international, public and private resources, in accordance with Article 20 of the Convention, to implement national biodiversity strategies and action plans, by 2030 mobilizing at least 200 billion United States dollars per year, including by:

(a) Increasing total biodiversity related international financial resources from developed countries, including official development assistance, and from countries that voluntarily assume obligations of developed country Parties, to developing countries, in particular the least developed countries and small island developing States, as well as countries with economies in transition, to at least US$ 20 billion per year by 2025, and to at least US$ 30 billion per year by 2030;

(b) Significantly increasing domestic resource mobilization, facilitated by the preparation and implementation of national biodiversity finance plans or similar instruments according to national needs, priorities and circumstances;

(c) Leveraging private finance, promoting blended finance, implementing strategies for raising new and additional resources, and **encouraging the private sector to invest in biodiversity, including through impact funds and other instruments**;

(d) Stimulating innovative schemes such as payment for ecosystem services, green bonds, biodiversity offsets and credits, and benefit-sharing mechanisms, with environmental and social safeguards;

(e) Optimizing co-benefits and synergies of finance targeting the biodiversity and climate crises;

(f) **Enhancing the role of collective actions**, including by indigenous peoples and local communities, Mother Earth centric actions[2] and non-market-based approaches including community based natural resource management and civil society cooperation and solidarity aimed at the conservation of biodiversity;

(g) Enhancing the effectiveness, efficiency and transparency of resource provision and use;

No Conversion of Natural Ecosystems
Land Footprint Reduction
Landscape Engagement

Land targets form one of the types of positive incentives and "other instruments" for the conservation, sustainable use, and restoration of biodiversity. Moreover, they ask companies to avoid and reduce their impacts and then contribute to collective action pathways as part of the target on Landscape Engagement.

TARGET 20

Strengthen capacity-building and development, access to and transfer of technology, and promote development of and access to innovation and technical and scientific cooperation, including through South-South, North-South

[2] Mother Earth Centric Actions: Ecocentric and rights-based approach enabling the implementation of actions towards harmonic and complementary relationships between peoples and nature, promoting the continuity of all living beings and their communities and ensuring the non-commodification of environmental functions of Mother Earth.

and triangular cooperation, to meet the needs for effective implementation, particularly in developing countries, fostering joint technology development and joint scientific research programs for the conservation and sustainable use of biodiversity and strengthening scientific research and monitoring capacities, commensurate with the ambition of the goals and targets of the framework.

TARGET 21

Ensure that the best available data, information and knowledge, are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity, and to strengthen communication, awareness-raising, education, monitoring, research and knowledge management and, also in this context, traditional knowledge, innovations, practices and technologies of indigenous peoples and local communities should only be accessed with their free, prior and informed consent,[3] in accordance with national legislation.

No Conversion of Natural Ecosystems
Land Footprint Reduction
Landscape Engagement

The development of v0.3 of the land targets has already led to breakthroughs in data, research, analysis, and knowledge on how to engage the corporate sector in setting targets for nature and supporting biodiversity. The structure of SBTN provides a platform for this transparency and will continue to evolve to be more useful in quantifying what nature needs and the responsibility of companies in delivering their contribution to solutions. Land methods are built on freely and publicly available data sources. Through the target-setting process it is likely that companies acting as stakeholders and actors in the biodiversity space will drive innovation and respond to the ambition of the biodiversity crisis, aligned with, but beyond the scope of the GBF.

TARGET 22

Ensure the full, equitable, inclusive, effective and gender-responsive representation and participation in decision-making, and access to justice and information related to biodiversity by indigenous peoples and local communities, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge, as well as by women and girls, children and youth, and persons with disabilities and ensure the full protection of environmental human rights defenders.

TARGET 23

Ensure gender equality in the implementation of the framework through a gender-responsive approach where all women and girls have equal opportunity and capacity to contribute to the three objectives of the Convention, including by recognizing their equal rights and access to land and natural resources and their full, equitable, meaningful and informed participation and leadership at all levels of action, engagement, policy and decision-making related to biodiversity.

[3] Free, prior and informed consent refers to the tripartite terminology of "prior and informed consent" or "free, prior and informed consent" or "approval and involvement.

Alignment with United Nations Convention to Combat Desertification

The United Nations Convention to Combat Desertification (UNCCD) is focused on combating desertification and mitigating the effects of drought in countries experiencing serious drought, land degradation, and/or desertification (DLDD), particularly in Africa. To facilitate the achievement of this objective, the UNCCD 2018–2030 Strategic Framework[4] was adopted by the 197 parties to the Convention at the 13th Conference of the Parties to the UNCCD (COP 13) in Ordos, China, in 2017.

The Strategic Framework identifies five strategic objectives (SOs), focused around ecosystems, degradation, and sustainable land management (SO1), affected populations (SO2), drought (SO3), global environmental benefits (SO4), and finance (SO5). The Strategic Framework is strongly linked to Sustainable Development Goal (SDG) 15 and target 15.3 to "by 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world". In addition, the Convention has a focus on "improving the living conditions of affected populations" (where "affected populations" are those affected by land degradation) and on "enhancing ecosystem services".

The Strategic Framework's focus on arresting land degradation by 2030 is closely aligned with the land targets. The targets complement corporate climate targets by incentivizing activities related to wider, non-GHG impacts on land, such as actions that promote biodiversity and ecosystem integrity—objectives consistent with the Strategic Framework.

The SOs guide the actions of all UNCCD stakeholders and partners (including national governments) to achieve a land degradation-neutral world consistent with the 2030 Agenda for Sustainable Development, including ecosystem services. Hence, corporate sourcing areas (or jurisdictions) and related traceability efforts would benefit from a national government's UNCCD ratification and land degradation neutrality strategies. Further detail on alignment between the land targets and the UNCCD's SOs is given in Table SM 2.

Table SM 2: United Nations Convention to Combat Desertification and its alignment with SBTN Land targets.

UNCCD Strategic Objective (SO) and Expected Impact (EI)	Target 1: No Conversion of Natural Ecosystems	Target 2: Land Footprint Reduction	Target 3: Landscape Engagement
SO1: Improve the condition of affected ecosystems, combat desertification/land degradation, promote sustainable land management, and contribute to land degradation neutrality			
EI 1.1: Land productivity and related ecosystem services are maintained or enhanced.	✓	✓	✓
EI 1.2: The vulnerability of affected ecosystems is reduced, and the resilience of ecosystems is increased.		ü	
EI 1.3: National voluntary land degradation neutrality targets are set and adopted by countries wishing to do so, related measures are identified and implemented, and necessary monitoring systems are established.	N/A		
EI 1.4: Measures for sustainable land management and the combating of desertification/land degradation are shared, promoted, and implemented.	✓	✓	✓
SO2: Improve the living conditions of affected populations			
EI 2.1: Food security and adequate access to water for people in affected areas is improved.	✓	✓	✓
EI 2.2: The livelihoods of people in affected areas are improved and diversified.	✓		✓
EI 2.3: Local people, especially women and youth, are empowered and participate in decision-making processes in combating DLDD.	✓		✓
EI 2.4: Migration forced by desertification and land degradation is substantially reduced.			
SO3: Mitigate, adapt to, and manage the effects of drought in order to enhance resilience of vulnerable populations and ecosystems			
EI 3.1: Ecosystems' vulnerability to drought is reduced, including through sustainable land and water management practices.	✓		
EI 3.2: Communities' resilience to drought is increased.			
SO4: Generate global environmental benefits through effective implementation of the UNCCD			
EI 4.1: Sustainable land management and the combating of desertification/land degradation contribute to the conservation and sustainable use of biodiversity and addressing climate change.	✓		
EI 4.2: Synergies with other multilateral environmental agreements and processes are enhanced.	✓		
SO5: Mobilize substantial and additional financial and non-financial resources to support the implementation of the UNCCD by building effective partnerships at global and national level			
EI 5.1: Adequate and timely public and private financial resources are further mobilized and made available to affected country parties, including through domestic resource mobilization.	✓		

[4] https://www.unccd.int/sites/default/files/inline-files/ICCD_COP%2813%29_L.18-1716078E_0.pdf

EI 5.2: International support is provided for implementing effective and targeted capacity-building and "on-the-ground interventions" in affected country parties to support the implementation of the UNCCD, including through North–South, South–South, and triangular cooperation.	✓
EI 5.3: Extensive efforts are implemented to promote technology transfer, especially on favorable terms and including on concessional and preferential terms, as mutually agreed, and to mobilize other non-financial resources.	✓

Alignment of Land targets with existing corporate commitments

Land targets will rely on the familiarity of companies with climate targets as defined by the Science Based Targets initiative (SBTi) and will build on existing corporate accountability commitments for deforestation and conversion of land. These existing commitments are the result of decades of work to understand climate change and deforestation, its sources, and who bears responsibility. This work has led to significant innovation both in science and in the capacity of the private sector to respond to its responsibility for past and ongoing emissions and impacts.

The targets link to and build on existing and emerging initiatives and frameworks and are not intended to lead to parallel or asynchronous processes that confuse or undermine existing quality work on corporate sustainability.

Box SM 1: Alignment of SBTN Land targets with existing initiatives

The following initiatives, developed as guidance and standards for companies, are designed to be used in parallel with SBTN Land targets:

The Science Based Targets initiative (SBTi) has developed a methodology for Forest, Land and Agriculture (FLAG) companies to set 1.5°C aligned climate targets for land-based emissions and removals.

The Accountability Framework initiative (AFi) supports the process of defining targets, accounting, and disclosure related to deforestation and ecosystem conversion in commodity supply chains. The Framework provides a reference for best practice on no-deforestation and no-conversion policies that is used by SBTi, the GHG Protocol, and SBTN. Valid SBTi FLAG targets require companies to set no-deforestation commitments in alignment with the Accountability Framework, by specifying details for commitments to eliminate land use change, which the SBTi FLAG methodology requires.

The Draft Greenhouse Gas Protocol Land Sector and Removals Guidance instructs users on how to carry out emissions inventories needed to set valid SBTi FLAG targets and to monitor progress toward meeting them.

These three initiatives have also worked in collaboration to align on definitions, targets, and many aspects of accounting at different scales of analysis and for different types of land use change.

To achieve this, land targets reflect an integrated approach to target setting, accounting, and reporting.

V0.3 of the land targets is built on and written in collaboration with the experts and institutions that developed key existing data and environmental initiatives that cover land-related impacts, namely:

- Greenhouse Gas Protocol Land Sector and Removals Guidance.[5]
- SBTi Forest, Land and Agriculture (FLAG) Guidance.[6]
- Accountability Framework Initiative (AFi) Guidance.[7]

Additionally, the guidance on Landscape Engagement has been developed with important contributions from CDP, ISEAL, Proforest, and Rainforest Alliance.

The development of the land targets in connection with the above-listed initiatives helps ensure alignment, strengthens the target approaches, and reduces the burden for companies who are already working or will work with these initiatives. Many companies will already be familiar with these initiatives and will have collected requisite data and information that they can repurpose to set land targets and calculate baselines. There will, however, be some data and conditions that are more specific to SBTN Land.

[5] https://ghgprotocol.org/land-sector-and-removals-guidance
[6] https://sciencebasedtargets.org/sectors/forest-land-and-agriculture
[7] https://accountability-framework.org/

Details of associated frameworks

This annex provides a more detailed overview of the three frameworks:

- Greenhouse Gas Protocol Land Sectors and Removals Guidance
  - The GHG Protocol will provide guidance for companies on **how to account for emissions and removals in the land system**. V0.3 of the land targets align with the scope and boundaries developed within the GHG Protocol as much as possible to make data collection and management easier for companies.

- SBTi Forest, Land and Agriculture Guidance (SBTi FLAG)
  - SBTi FLAG, led by World Wildlife Fund (WWF), provides climate ambition pathways, tools, and guidance for companies in land-intensive sectors (e.g., forest products, food production, processing, retailing, and food service sectors) which fully incorporate land-related GHG emissions and removals (such as those related to deforestation).
  - SBTi FLAG addresses the lack of an **internationally recognized methodology for accounting and reporting on land sectors' emissions and removals**. WWF's technical staff are the leaders of the SBTi FLAG initiative and play key technical roles in SBTN's Network Hub and Land Hub. The FLAG project is developing SBTi-compliant pathways for land-intensive sectors for 1.5°C pathways.
  - FLAG brings forward lessons from this experience to inform how SBTi and SBTN can align on a target-setting method that contributes toward improvements for climate and nature in unison, and will develop specific guidance on restoration and regeneration actions.
  - The FLAG methodology provides two approaches to target-setting:
    - a sector approach for companies with diversified FLAG emissions, and
    - a commodity approach that includes 11 commodity pathways: beef, chicken, dairy, corn/maize, leather, palm oil, pork, rice, soy, wheat, and timber and wood fiber.
  - Both sector-based and commodity-based FLAG targets are consistent with scenarios that limit global temperature increase to 1.5°C. A company's overall target classification (1.5°C or well below 2°C) will be determined based on the ambition of its non-FLAG scope 1, 2 & 3 target. Companies may combine multiple commodity pathways and the sector pathway as appropriate for target setting.
  - The mitigation activities that companies will have to introduce in their operations and supply chains to meet their FLAG target can be seen as a sub-set of response options to reduce and revert impacts on land that will be necessary to meet SBTN land transformation and land occupation targets.

- Accountability Framework initiative
  - The Accountability Framework initiative (AFi) is a globally recognized framework with guiding principles and definitions for supply chains free from deforestation and conversion of other natural ecosystems. It sets **2025 as the end date for stopping deforestation** and **conversion in alignment with IPCC evidence that loss of forests and natural ecosystems should end well before 2030**, to have nature on the path of recovery by 2030, which are key conditions for keeping global warming below 1.5°C.
  - Protecting remaining forests and stopping the conversion of other natural ecosystems will be fundamental conditions for meeting SBTN land transformation and land occupation targets, hence the Land Hub developed a target-setting methodology to operationalize zero-deforestation and no-conversion commitments in accordance with AFi's guiding principles and definitions (e.g., cut-off dates, target dates)

Crosswalk sector classification guidance

Table SM 3: alignment of ISIC sector classifications with three alternative industry sector classification systems.

ISIC Sector	NAICS Sector	GICS Sector	NACE Sector
Manufacture of food products	311 - Food Manufacturing	302020 - Food Products	10 - Food and beverage manufacturing
Manufacture of beverages	3121 - Beverage Manufacturing	302010 - Beverages	11 - Beverage manufacturing
Manufacture of tobacco products	3122 - Tobacco Manufacturing	302030 - Tobacco	12 - Tobacco products manufacturing
Manufacture of textiles	314 - Textile Product Mills	25203030 - Textiles	13 - Textile manufacturing
Manufacture of wearing apparel	315 - Apparel Manufacturing	25203010 - Apparel, Accessories & LuxuryGoods	14 - Wearing apparel manufacturing
Manufacture of leather and related products	316 - Leather and Allied Product Manufacturing	2520 - Textiles, Apparel & Luxury Goods	15 - Leather and related products manufacturing
Biofuel*	324199 - All Other Petroleum and Coal Products Manufacturing	N/A	19.20 - Manufacture of refined petroleum products
Agriculture	111 - Crop Production and 112 - Animal Production	30202010 - Agricultural Products	01 - Crop and animal production, hunting and related service activities
Wholesale trade	42 - Wholesale Trade	25501010 - Distributors	46 - Wholesale trade
Retail trade	44-45 - Retail Trade	2550 - Retailing	47 - Retail trade
Accommodation and food service	72 - Accommodation and Food Services	253010 - Hotels, Restaurants & Leisure	55 - Accomodation; 56 - Food and beverage service activities
Fishing and aquaculture	1141 - Fishing and 1125 - Aquaculture	N/A	3 - Fishing and aquaculture
Real estate activities	531 - Real Estate	6010 - Real Estate	68 - Real estate activities
Forestry and logging	113 - Forestry and Logging	N/A	2 - Forestry and logging
Sports activities and amusement and recreation activities	713 - Amusement, Gambling and Recreation Industries	N/A	93 - Sports activities and amusement and recreation activities
Support activities for crop production	1151 - Support Activities for Crop Production	N/A	1.61 - Support activities for crop production
Manufacture of chemicals and chemical products	325 - Chemical Manufacturing	151010 - Chemicals	20 - Chemical and chemical product manufacturing
Manufacture of basic pharmaceutical products	3254 - Pharmaceutical and Medicine Manufacturing	352020 - Pharmaceuticals	21 - Basic pharmaceutical products manufacturing
Manufacture of furniture	337 - Furniture and Related Product Manufacturing	25201020 - Home Furnishings	31 - Manufacture of furniture
Manufacture of rubber and plastics products	326 - Plastics and Rubber Products Manufacturing	2520 - Consumer Durables & Apparel	22 - Rubber and plastics product manufacturing
Manufacture of machinery and equipment	333 - Machinery Manufacturing	201040 - Machinery	28 - Manufacture of machineryand equipment n.e.c.
Manufacture of computer, electronic and optical products	334 - Computer and Electronic Product Manufacturing	25504020 - Computer & Electronics Retail	26 -Manufacture of computer, electronic and optical products
Manufacture of refined petroleum products	3241 - Petroleum and Coal Products Manufacturing	10102010 - Integrated Oil & Gas	19.2 - Manufacture of refined petroleum products
Manufacture of wood and of products of wood	321 - Wood Product Manufacturing	15105010 - Forest Products	16 - Wood and of products of wood manufacturing
Manufacture of paper products	322 - Paper Manufacturing	15105020 - Paper Products	17 - Paper product manufacturing
Other consumer goods manufacturer	3399 - Other Miscellaneous Manufacturing	2520 - Consumer Durables & Apparel	32 - Other Manufacturing
Manufacture of basic metals	331 - Primary Metal Manufacturing	151040 - Metals & Mining	24 - Basic metals manufacturing
Manufacture of coke and refined petroleum products	324110 - Coke, petroleum, made in petroleum refineries	10102050 - Coal & Consumable Fuels	19 - Manufacture of coke and refined petroleum products
Manufacture of other non-metallic mineral products	327 - Nonmetallic Mineral Product Manufacturing	15104020 - Diversified Metals & Mining	23 - Other non-metallic mineral product manufacturing
Manufacturing, other	339 - Miscellaneous Manufacturing	N/A	32 - Other Manufacturing
Manufacture of fabricated metal products, non-machinery	332 - Fabricated Metal Product Manufacturing	151040 - Metals & Mining	25 - Manufacture of fabricated metal products, except machinery and equipment
Mining of coal and lignite	2121 - Coal Mining	10102050 - Coal & Consumable Fuels	5 - Coal mining and peat extraction
Extraction of crude petroleum and natural gas	211 - Oil and Gas Extraction	10101010 - Oil & Gas Drilling	6 - Crude petroleum and natural gas extraction
Mining of metal ores	2122 - Metal Ore Mining	151040 - Metals & Mining	7 - Mining of metal ores
Other mining and quarrying	2123 - Nonmetallic Mineral Mining and Quarrying	151040 - Metals & Mining	08 - Other mining and quarrying
Electricity, gas, steam, and air conditioning supply	221 - Utilities	55 - Utilities	35 - Electricity, gas, steam and air conditioning supply
Construction	23 - Construction	201030 - Construction & Engineering	41 - Construction of buildings
Civil engineering	237 - Heavy and Civil Engineering Construction	201030 - Construction & Engineering	42 - Civil engineering
All other sectors*	All other sectors*	All other sectors*	All other sectors*
NAICS = North American Industry Classification System			
GICS = Global Industry Classification Standard			
NACE = Nomenclature of Economic Activities	From the EU		

SBTN Land Targets

Target 1 - No Conversion of Natural Ecosystems

Conversion is defined[8] as a change of a natural ecosystem to another land use or profound change in a natural ecosystem's species composition, structure, or function. Deforestation is one form of conversion (conversion of natural forests). Conversion includes severe degradation or the introduction of management practices that result in substantial and sustained change in the ecosystem's former species composition, structure, or function. Change to natural ecosystems that meets this definition is considered to be conversion regardless of whether or not it is legal.

Humans have converted between a third and a half of habitable land for crop and livestock production. Globally, agriculture and forestry are the primary drivers of ecosystem conversion—90% of recent deforestation across the tropics has been driven by agriculture.[9] The majority of this conversion is caused by seven commodities: cattle, palm oil, soy, cocoa, rubber, coffee, and plantation wood fiber, with cattle having by far the largest impact.

Cattle pasture has replaced 45.1 million hectares (Mha) of forest,[10] and also has led to the destruction of woodlands, savannas, and grasslands in South America and elsewhere. Many natural grasslands around the world are used for livestock grazing. As global demand for meat products increases, this will drive both conversion of natural grasslands into planted pastures as well as the conversion of other ecosystems for both pasture and feed.

Oil palm has replaced 10.5 Mha from 2001 to 2015, with soy replacing 7.9 Mha. Over the same period, cocoa, rubber, coffee, and wood fiber have each led to the conversion of around 2 Mha of forest.[11] Other commodities are responsible for pressure on specific natural ecosystems; for example, rice and shrimp production are primary drivers of conversion of mangroves, which are being lost at a similar rate to that of tropical forests.[12, 13, 14, 15, 16, 17]

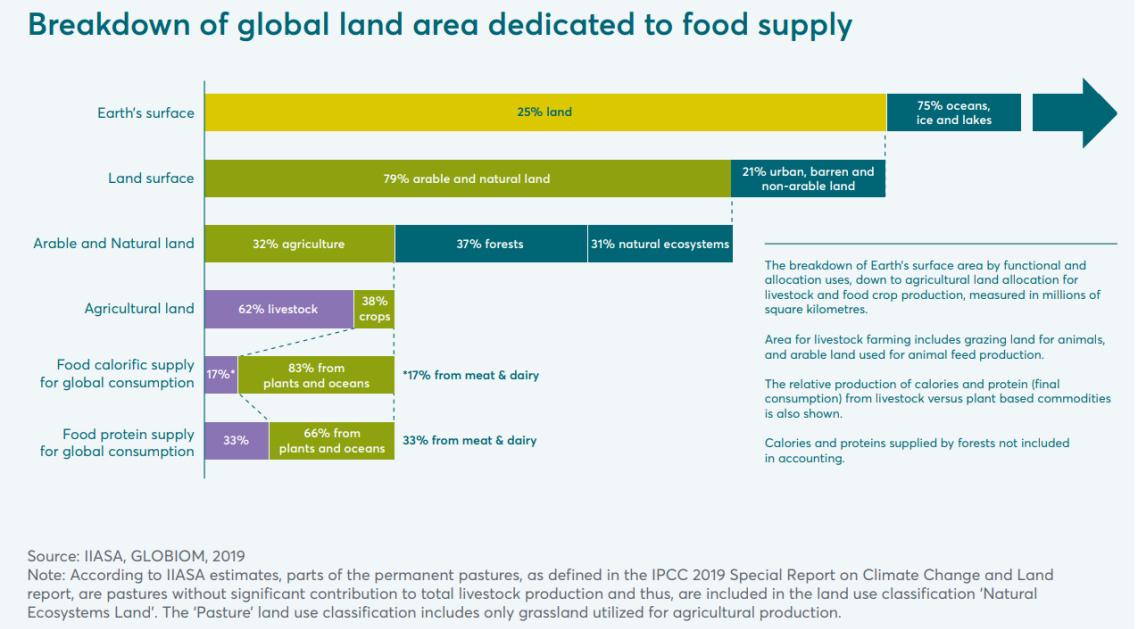

Figure SM 1: Global land area dedicated to food supply.

Source: IPCC, 2022.

Note: Cropland includes all land in food, feed, and fodder crops, as well as other arable land (cultivated area). This category includes first-generation non-forest bioenergy crops (e.g., corn for ethanol, sugarcane for ethanol, soybeans for biodiesel), but excludes second-generation bioenergy crops. Pasture includes categories of pasture land, not only high-quality rangeland, and is based on the FAO's definition of

[8] https://accountability-framework.org/wp-content/uploads/2022/09/AFI-LUC-and-Emissions-Guidance-09_2022.pdf

[9] Pendrill, F., Gardner, T. A., Meyfroidt, P., Persson, U. M., Adams, J., Azevedo, T., ... & West, C. (2022). Disentangling the numbers behind agriculture-driven tropical deforestation. Science, 377(6611), eabm9267.

[10] https://www.globalforestwatch.org/topics/commodities/#intro

[11] https://deforestation-free.panda.org/wp-content/uploads/2021/07/WWF-Deforestation-2021.pdf

[12] https://pure.iiasa.ac.at/id/eprint/16091/1/Deppermann%20et%20al%202019-FOLU-GR-IIASA-Supplementar-Paper_final.pdf

[13] Global Forest Watch. 2018. World Resources Institute.

[14] Kissinger, G., Herold, M., De Sy, V. 2012. Drivers of Deforestation and Forest Degradation: A Synthesis Report for REDD+ Policymakers. Lexeme Consulting, Vancouver Canada. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/65505/6316-drivers-deforestation-report.pdf

[15] Pendrill, F., Persson, U., Godar, J., Kastner, T., Moran, D., Schmidt, S., Wood, R. 2019. 'Agricultural and forestry trade drives large share of tropical deforestation emissions'. Global Environmental Change 56:1-10; Eurostat. 2019. Available online at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Total_greenhouse_gas_emissions_by_countries,_1990-2017_(Million_tonnes_of_CO2_equivalents).png.

[16] https://www.globalforestwatch.org/blog/commodities/global-deforestation-agricultural-commodities/

[17] Hosonuma, N., Herold, M., De Sy, V., De Fries, R. S., Brockhaus, M., Verchot, L., ... & Romijn, E. (2012). An assessment of deforestation and forest degradation drivers in developing countries. Environmental Research Letters, 7(4), 044009.

"permanent meadows and pastures." Bioenergy cropland includes land dedicated to second-generation energy crops (e.g., switchgrass, miscanthus, fast-growing wood species). Forest includes managed and unmanaged forest. Natural land includes other grassland, savanna, and shrubland.

Table SM 4: Amount of conversion of the world ecosystems, grouped by their vegetation/land-cover attribute.

Vegetation/land cover	Current (actual) area (thousand ha)	Converted (potential) area (thousand ha)	Conversion (%)
Forestlands	4,377,500	1,501,203	25.5
Shrublands	1,632,918	202,040	11
Grasslands	1,267,528	891,752	41.3
Sparsely or non-vegetated	2,967,203	58,316	1.9
Snow and ice	228,479	10	0.005

Source: Sayre et al., 2020.

Note: The original distribution of the forestlands, shrublands, grasslands, bare areas, and snow and ice was calculated as the sum of their current distribution plus the area of those classes that have been converted into croplands and settlements.

Contribution of No Conversion of Natural Ecosystems to other global targets

This section provides an overview of the importance of natural ecosystems and lays out the basis for supporting their conservation to achieve environmental goals such as climate change mitigation, preservation of biodiversity, preservation of freshwater, improvement of nature's contributions to people, and improvement of soil quality and net primary productivity.

Role of no-conversion in achieving climate targets

According to the IPCC, plausible pathways to achieving 1.5°C goals require that CO_2 emissions from the land sector reach net zero by or before 2030. This includes the near-term elimination (well before 2030) of emissions from all land-use change (LUC), including deforestation as well as conversion of wetlands, peatlands, savannas, and natural grasslands. Applying these projections to corporate supply chains similarly indicates that actions required for companies to pursue a 1.5°C target must include eliminating all LUC associated with agricultural and forest commodities.

In the IPCC 2018 Special Report on Global Warming of 1.5°C, median scenarios for 1.5°C pathways with no or low overshoot have agriculture, forestry, and other land use (AFOLU) CO_2 emissions going to zero by or before 2030 and dropping to net negative emissions thereafter (see Annex 1). Because the aggregate AFOLU figure includes some sources of emissions that are more difficult to mitigate, sources that can be mitigated more rapidly—such as avoidance of emissions from LUC linked to corporate supply chains—must be eliminated sooner to meet the overall AFOLU mitigation contribution.

The findings of the IPCC report are also reflected in the SBTi FLAG guidance and tool, which indicate corporate emissions reduction pathways that support these 1.5°C trajectories, including elimination of LUC associated with conversion of forests, wetlands and peatlands, grasslands, and savannas (see Table 5 of the SBTi FLAG guidance).

While agricultural expansion at a global level is currently linked to greater carbon emissions from forest conversion than from conversion of other ecosystems, the opposite is true in key agricultural frontiers. In the Cerrado between 2003-2013, conversion of non-forest ecosystems accounted for more than 70%[18] of emissions from cropland expansion, with deforestation (removal of forests with 10% or more tree canopy cover) accounting for less than 30% of emissions.

[18] Noojipady, P., Morton, C. D., Macedo, N. M., Victoria, C. D., Huang, C., Gibbs, K. H., & Bolfe, L. E. (2017). Forest carbon emissions from cropland expansion in the Brazilian Cerrado biome. Environmental Research Letters, 12(2), 025004.

Table SM 5: Estimated carbon value of different ecosystems.

Ecosystem	Peatland	Grasslands and savannas	Mangroves	Tropical rainforest
Area (HA)	423,000,000	5,250,000,000	14,717,000	940,000,000
Average organic carbon stock (T C/HA)	1,450	150	856	320
Total organic carbon stock (Gt C)	613	788	13	301
Plant carbon density as a share of plant and soil carbon (%)	2%	20%	15%	68%
Soil carbon density as a share of plant and soil carbon (%)	98%	80%	85%	32%

Source: WWF, 2022.

WWF (2022)[19] understands grasslands as a broad term with varying definitions. Dominance of grasses is the unifying trait of these definitions, although it is widely acknowledged that grasslands may also include vegetation such as trees and shrubs. Grasslands are rich in endemic, specialized biodiversity, and they have been found to store approximately the same amount of carbon as forest ecosystems—as much as 30% of total terrestrial carbon. In addition, grassland ecosystems are often more stable sinks of carbon than forests, as the vast majority is stored below ground, meaning it is less vulnerable to disturbance by droughts and fires than forests.

Broadly speaking, savannas can be considered a type of grassland with a greater presence of trees and shrubs, and they are sometimes included within the category of woodlands.

According to Bardgett et al. (2021)[20], there has been a global trend of grasslands transitioning toward a net warming effect on climate: grasslands in fact, according to the author, have been increasingly contributing to global warming due to increased GHG emissions that overcompensate their storage and absorption potential of carbon. Goldstein et al. (2020)[21] highlight that natural and sparsely grazed grasslands contain "irrecoverable carbon" that is vulnerable to land use conversion; once lost, this carbon is not recoverable over timescales relevant to climate mitigation. Nevertheless, there is high potential for increasing soil carbon sequestration in grasslands via improved grazing and by arresting grassland conversion and degradation.

Peatlands are important natural wetland ecosystems with high value for biodiversity, climate regulation, and human welfare. Although they cover less than 3% of the Earth's surface, they store one third of total global soil carbon. Peatlands are the most carbon-dense of any terrestrial ecosystem in the world, storing twice as much carbon per hectare as forests. Peatlands globally hold an average of approximately 1,375 tonnes of carbon per hectare.

Mangrove forests occur along sheltered tropical and subtropical shorelines including the west and east coasts of Africa, Asia, and North and Central America. The total carbon storage potential of mangroves (above and below ground) is considerable and roughly 50% higher than that of tropical rainforests (470 tonnes C/ha compared with 320 tonnes C/ha). The majority of the carbon is held in the waterlogged, peaty soils where it can remain stored for centuries if not disturbed.

In general, more evidence is mounting that some ecosystems can be more resilient carbon sinks than forests. For example, Bardgett et al. (2021) highlight how afforestation can cause soil carbon loss, soil acidification, and nutrient depletion, especially when trees are planted in natural grasslands, which can make them prone to carbon loss from fires. According to the authors, moreover, large-scale afforestation also leads to changes in surface albedo, given that forests absorb more short-wave radiation than grasslands, thereby creating a warming effect. As such, changes in albedo resulting from afforestation can reduce or even negate benefits of increased carbon capture, potentially leading to a net warming effect of tree planting.

Another issue is that policies such as REDD+ focus primarily on carbon sequestration in above-ground tree biomass, while healthy and restored grasslands can store comparable amounts of organic carbon as forests can, but mainly below ground. Grasslands have also been shown to be more effective than forests in providing soil erosion control and water protection in semi-arid ecosystems, and in some situations the conversion of grassland to forest, either through natural regeneration or afforestation, can be highly detrimental to people who depend on grasslands for foraging, game habitat, water reserves, and cultural services.

[19] WWF (2022) Living Planet Report 2022 – Building a nature- positive society. Almond, R.E.A., Grooten, M., Juffe Bignoli, D. & Petersen, T. (Eds). WWF, Gland, Switzerland.
[20] Bardgett, R. D., Bullock, J. M., Lavorel, S., Manning, P., Schaffner, U., Ostle, N., ... & Shi, H. (2021). Combatting global grassland degradation. Nature Reviews Earth & Environment, 2(10), 720-735.
[21] Goldstein, A., Turner, W. R., Spawn, S. A., Anderson-Teixeira, K. J., Cook-Patton, S., Fargione, J., ... & Hole, D. G. (2020). Protecting irrecoverable carbon in Earth's ecosystems. Nature Climate Change, 10(4), 287-295.

Role of no-conversion in biodiversity targets

Land-use change is one of the primary drivers of recent and historical biodiversity loss, not only directly, but also indirectly because of increased emissions that have a higher impact on climate change. In addition to their importance for mitigating climate change, grasslands and savannas are home to incredible global biodiversity and support extremely rich flora and fauna. Moreover, grasslands and savannas are not only significant for ecological reasons—they are also home to more than 1 billion people around the world for whom they provide essential ecosystem services.

Strassburg et al. (2020)[22] highlight how restoring 30% of lands that have been converted for farming in priority areas, while retaining natural ecosystems, would prevent over 70% of projected extinctions of mammals, birds, and amphibians. At the same time, restoring these priority lands would put the world on track to sequester almost half of all the CO2 increase in the atmosphere since the Industrial Revolution—more than 465 billion tons. Restoring just half of these lands (15% of priority areas) could avoid over 60% of expected extinctions while sequestering 30% of the total CO2 increase.

Following this study, UNEP (2020)[23] has highlighted that, while many restoration targets are focused on forests, the evidence demonstrates the importance of restoring many different types of natural ecosystems. It has also stated that, of the 2,870 Mha of converted lands identified in its research, it is estimated that 54% were originally forests, 25% grasslands, 14% shrublands, 4% arid lands, and 2% wetlands.

Aware of the critical need to halt, prevent, and reverse ecosystem degradation, and to effectively restore degraded terrestrial, freshwater, and marine ecosystems across the globe, the United Nations General Assembly declared 2021–2030 as the United Nations Decade on Ecosystem Restoration (UN Decade). To support the implementation of the UN Decade, UNEP has put forward some principles for ecosystem restoration, defined as "the process of halting and reversing degradation, resulting in improved ecosystem services and recovered biodiversity. Ecosystem restoration encompasses a wide continuum of practices, depending on local conditions and societal choice" (UNEP, 2021[24]).

Biodiversity loss is also compromising the resilience of agricultural systems. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) synthesis report, released in May 2019[25], found that LUC and ocean exploitation are together by far the leading drivers of the current unprecedented loss of biodiversity, posing a serious risk to global food security. The loss of agrobiodiversity (the species, varieties, and breeds of animals, plants, and micro-organisms used in agriculture to produce food) is also of high concern for the global population as it greatly increases agriculture's vulnerability to pests and local weather extremes. Crop diversity has declined by 75% during the 20th century, to the extent that just four crops—wheat, rice, corn, and potatoes—now provide 40% of global calories.

Additionally, the near extinction of certain pollinators jeopardizes 5–8% of agricultural production and US$235–577 billion worth of annual output (FAO, 2016[26]). Pollination is particularly important for the production of fruits, nuts, and many vegetables. Production of these foods needs to increase by approximately 95% by 2050 to provide healthy diets (ibid).

Contribution to other environmental and societal goals (freshwater, nature's contributions to people)

As very well explained by Ellis et al. (2019),[27] land is increasingly managed to serve multiple societal demands. Beyond food, fiber, habitation, and recreation, land is now being called on to meet demands for carbon sequestration, water purification, biodiversity conservation, and many others. Meeting these multiple demands requires negotiating trade-offs among the choices and differing values placed on them by diverse stakeholders and institutions.

Recent work by IPBES (2018)[28] and others has recognized the need to accommodate a greater diversity of values into decision-making through the framework of nature's contributions to people (NCP), providing a perspective on human–nature relations that goes beyond a stock-flow, ecosystem services, decision-making framing. According to the authors of the article (ibid), NCP offers real potential to enable land system science to better integrate the many diverse value systems of stakeholders and institutions into efforts to better understand and more fairly govern the trade-offs of land systems in the Anthropocene, especially under conditions of less-well-functioning institutions and governance.

Grasslands and savannas are not only significant for ecological reasons, they are also home to more than 1 billion people around the world for whom they provide essential ecosystem services. Peatlands are important for the long-term storage of water, globally, as they consist of about 90% water and thus act as vast water reservoirs. Worldwide, peatlands contain 10% of global freshwater reserves, contributing to the water security of human populations and

[22] https://www.nature.com/articles/s41586-020-2784-9%20

[23] https://www.unep-wcmc.org/en/news/ecosystem-restoration-could-prevent-over-70-of-extinctions

[24] United Nations Environment Programme (UNEP). 2021. Becoming #GenerationRestoration: Ecosystem restoration for people, nature and climate [online]. Nairobi. [Cited 10 August 2021]. https://wedocs.unep.org/bitstream/handle/20.500.11822/36251/ERPNC.pdf

[25] https://www.ipbes.net/global-assessment

[26] https://www.fao.org/news/story/en/item/384726/icode/

[27] https://www.sciencedirect.com/science/article/pii/S1877343518301635

[28] https://www.science.org/doi/10.1126/science.aap8826?siteid=sci&keytype=ref&ijkey=%2FvA6P5O%2Fb2eSM

ecosystems downstream. Mangroves provide a critical source of livelihoods, food, construction materials, and fuel for local populations, particularly in rural coastal areas with high rates of poverty, as well as providing employment and income opportunities through fishing and tourism.

In general, as also highlighted by Williams et al. (2020),[29] although the loss of intact ecosystems to agricultural expansion has been inevitable in certain regions, development must be strategically planned in order to avoid unnecessary impacts on biodiversity and ecosystem services. Given that the magnitude of the impacts on biodiversity and ecosystem services are driven primarily by targets for land conversion, the key policy decision is what those targets should be.

[29] https://iopscience.iop.org/article/10.1088/1748-9326/ab5ff7/pdf

Target 2 – Land Footprint Reduction

The scientific basis for the Land Footprint Reduction target

Terrestrial ecosystems such as forests, grasslands, savannahs and peatlands are critical to planetary and human health. They provide climate regulation, protection, livelihoods, materials, food, freshwater, and a sense of cultural identity to billions of people, including Indigenous peoples and local communities.[30, 31] They are also critical habitats that sustain the rapidly declining biodiversity on earth (forests alone provide habitats for about 80% of amphibian species, 75% of bird species, and 68% of mammal species).[32]

Yet humans have converted almost a third of the global land area in just six decades (1960-2019) for crop and livestock production, forestry and other human land uses such as mining and infrastructure.[33] Production areas now account for the majority of the world's land, with only 16% of land remaining as intact and primary forests and other natural ecosystems as of 2015 (see Figure SM 2).[34]

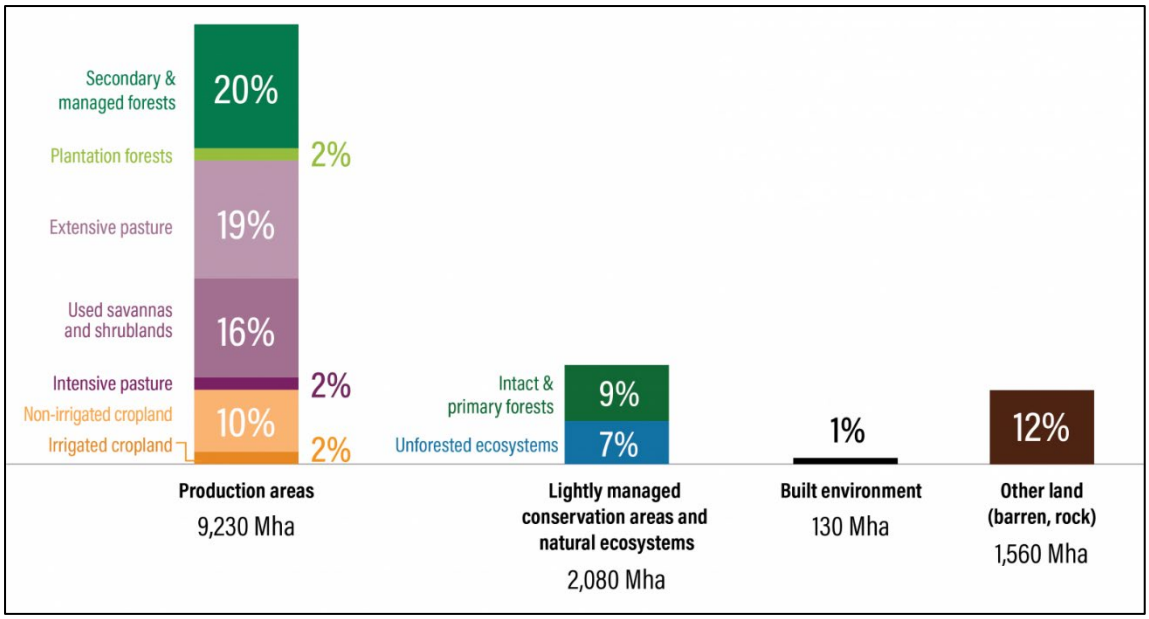

Figure SM 2: Global land use (2015). Adapted from IPCC Special Report on Climate Change and Land, 2019

Moreover the land that is under production is increasingly depleted of soil fertility, water, and biodiversity undermining its capacity to support people and nature; according to FAO, human-induced degradation affects 34% (1,660 million hectares) of agricultural land.[35] In sub-Saharan Africa, up to two thirds of productive land is degraded, undermining the livelihoods of at least 450 million people.[36] The European Union estimates its total annual societal losses from soil degradation at about $100 billion.[37] Degradation of productive land drives further conversion of natural ecosystems for food production in a vicious cycle which undermines the critical ecosystem services on which humans rely, driving escalating climate change and biodiversity loss.[38, 39, 40]

And yet the global population is expected to grow from approximately 8 billion in 2022 to nearly 10 billion by 2050.[41] Under business as usual scenarios, production areas are therefore projected to expand to fulfill growing human demands for food, feed, fiber, fuel, and shelter. Global food demand is projected to grow by 45% between 2017 and 2050[42] and global demand for wood products by a similar amount during that time. Bioenergy policies to dedicate cropland and forest land for energy production threaten to further increase land-use competition and reduce the

[30] Beatty, C.R., Stevenson, M., Pacheco, P., Terrana, A., Folse, M., and Cody, A. 2022. The Vitality of Forests: Illustrating the Evidence Connecting Forests and Human Health. World Wildlife Fund, Washington, DC, United States
[31] Chaplin-Kramer et al.: Chaplin-Kramer, Rebecca, Rachel A. Neugarten, Richard P. Sharp, Pamela M. Collins, Stephen Polasky, David Hole, Richard Schuster, et al. "Mapping the Planet's Critical Natural Assets." Nature Ecology & Evolution, November 28, 2022, 1–11. https://doi.org/10.1038/s41559-022-01934-5.
[32] https://www.fao.org/3/cb9360en/cb9360en.pdf
[33] https://www.nature.com/articles/s41467-021-22702-2
[34] https://www.ipcc.ch/srccl/
[35] https://www.fao.org/3/cb7654en/online/cb7654en.html
[36] UNEP. 2015. *The Economics of Land Degradation in Africa.* Bonn: ELD Initiative. Available online at: https://www.nmbu.no/sites/default/files/pdfattachments/eld-unep-report_05_web_b-72dpi_1.pdf
[37] McKinsey. 2014; IPES. 2016; SOIL Capital OPL Estimates.
[38] https://www.nature.com/articles/s41467-021-22702-2
[39] https://www.fao.org/food-agriculture-statistics/en/
[40] IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. https://doi.org/10.5281/zenodo.3831673
[41] https://population.un.org/wpp/
[42] Searchinger et al. 2021—https://www.wri.org/research/pathway-carbon-neutral-agriculture-denmark; this annualized level of increase is similar to projections in Leclere et al. 2020 (supplement).

extent of unused natural ecosystems. And while the built environment occupied only about 1% of the world's ice-free land in 2015, urban expansion is projected to add pressure as well.

Against this backdrop of ongoing increases in demand for land for human needs, it is perhaps unsurprising that goals to end deforestation by 2020 were not met—and that achieving the Glasgow Leaders' Declaration on Forest and Land Use[43] goal to halt and reverse forest loss and land degradation by 2030 will be extremely challenging. In order to end ecosystem conversion and provide opportunities for restoration, protect biodiversity and nature's contributions to people (including, critically, food production), and meet climate change mitigation and adaptation goals, a shift in the other direction is urgently necessary: peaking and then reducing the amount of land occupied by human activities.

To keep global warming below 1.5°C and bend the curve on biodiversity while feeding and housing a growing global population, models generally agree that significant reductions in land dedicated to food and feed crops, as well as to pasture, will be necessary between now and 2050, alongside increases in the extent of natural ecosystems. Several recent examples are listed in Table SM 6.

Table SM 6: Recent studies which define the amount of agricultural land which needs to be freed up globally to achieve nature, climate and sustainable development goals

Source	Reduction in land dedicated to cropland (food and feed) and pastureland by 2050 (Mha)	Base year	How does this study integrate climate, nature and sustainable development goals?
Griscom et al. (2017).[44]	678 (95% uncertainty bound: 230-1,125)	2016	Estimated a total maximum reforestation potential of 678 Mha (by 2030), when taking into account biodiversity, food security, and fiber production safeguards—along with sustainable intensification of livestock production and dietary shifts. (SBTN authors assume the reforestation will need to occur on freed up agricultural land.)
IPCC (2018).[45]	500 in SSP1 "sustainability" scenario (0-1,150 across multiple scenarios)	2010	The IPCC Special Report on Global Warming of 1.5°C found that 1.5°C pathways included decreases of up to 800 Mha of pastureland and up to 450 Mha of cropland dedicated to food and feed crops, and included increases of up to 950 Mha in forestland (Figure 2.24). The SSP1 scenario, which is aligned with the Sustainable Development Goals (and therefore balances human needs with goals for nature and climate), includes a decrease of 200 Mha of agricultural land (cropland plus pastureland) by 2030 and a decrease of 500 Mha by 2050. These changes are generally driven by demand changes, increased production efficiency, and policy changes.
Searchinger et al. (2019).[46]	611	2010	The World Resources Report: Creating a Sustainable Food Future estimated that fully reforesting 585 Mha of liberated agricultural lands by 2050, along with 26 Mha of peatland restoration, could offset global agricultural production emissions for many years and achieve a net-zero-emissions land sector, provided agricultural emissions could be greatly reduced to below 5 GtCO2e/year by 2050. This scenario also required agricultural intensification, reduction of food loss and waste, and dietary shifts. The model assumed the restored forests and peatlands were no longer used for productive purposes.
Food and Land Use Coalition (2019).[47]	1,184	2010	The Growing Better report included a "Better Futures" scenario in which nearly 200 Mha of croplands and about 1 Bha of pasturelands are freed up for restoration of natural ecosystems by 2050, through a combination of productivity gains, reduced food loss and waste, dietary shifts, and supportive policies. Under this scenario, biodiversity declines also halt and begin to reverse between 2020 and 2050 and healthy diets are provided to the projected global population.
Leclère et al. (2020).[48]	690 (reduction in agricultural and forestry land; IAP scenario)	2010	The authors use land-use and biodiversity models to assess how humanity can ensure the provision of food for the growing human population while reversing the global terrestrial biodiversity trends caused by habitat conversion. Actions in the "integrated action portfolio" (IAP) scenario, which include sustainable agricultural intensification, reduced food waste, dietary shifts, ecosystem protection, and restoration of degraded lands, address the largest threat to biodiversity—habitat loss and degradation—and are projected to reverse declines for five aspects of biodiversity, leading to restoration of 430-1,460 Mha of land by 2050.
Roe et al. (2021).[49]	~300 (cost-effective potential), ~1,000 (technical potential)	2020	Estimated potentials of afforestation and reforestation, noting that trade-offs include competition with food production and biodiversity, depending on location and methods of implementation (e.g., natural regeneration, monoculture plantations, mixed species planting). (SBTN authors assume the afforestation/reforestation will need to occur on liberated agricultural land.)

[43] https://ukcop26.org/glasgow-leaders-declaration-on-forests-and-land-use/
[44] https://www.pnas.org/doi/abs/10.1073/pnas.1710465114
[45] https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/
[46] https://research.wri.org/sites/default/files/2019-07/creating-sustainable-food-future_2_5.pdf
[47] https://www.foodandlandusecoalition.org/wp-content/uploads/2019/09/FOLU-GrowingBetter-GlobalReport.pdf
[48] https://www.nature.com/articles/s41586-020-2705-y#Sec12; supplement notes that areas dedicated to agriculture and forestry in the IAP scenario decreased by 690 Mha on average by 2050 relative to 2010 across the various models.
[49] https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.15873

Although most of the examples in Table 21 include mitigation of climate change as a primary lens, it is clear that halting further agricultural expansion and instead allowing for restoration of some amount of liberated agricultural lands into natural ecosystems is also necessary for curbing and reversing biodiversity loss. To this end, Leclère et al. (2020) analyze a number of scenarios to reverse declines in terrestrial biodiversity, and show that reduction of agricultural land footprint through food system transformation is a necessary ingredient to achieve global biodiversity goals by 2050.[50]

SBTN has based the Land Footprint Reduction Target on the SSP1 scenario in the IPCC's Special Report on Global Warming of 1.5°C (2018), which achieves the Sustainable Development Goals (SDGs) and thereby delivers on climate, nature and sustainable development goals including SDG Goal 2 on zero hunger. This scenario requires a 200 Mha decrease in cropland and pasture area by 2030 and a 500 Mha decrease by 2050.[51] The 500 Mha reduction in global agricultural land occupation corresponds to 10.6% of the world's roughly 4.7 billion hectares of agricultural land as of 2020.[52] This study was selected as the basis of the target given the integration of nature, climate and sustainable development goals and the extensive peer review processes underpinning IPCC publications. It also falls roughly in the midpoint of the various estimates listed in the table. Although the IPCC report used a base year of 2010, SBTN uses 2020 as the base year and thus aims for the 500 Mha reduction in agricultural land to be achieved in 30 years instead of 40.

SBTN has focused the v0.3 of the Land Footprint Reduction target solely on agricultural land (including cropland and pastureland) since it is the world's largest user of land, and there is a wealth of evidence (as summarized in the table above) which have modelled needed reductions in agricultural land occupation and thus provide a scientific basis for the target. There is less clear evidence about the extent to which other land-intensive sectors would need to reduce their land footprints. That said, since agriculture is only one user of land, subsequent versions of land targets will explore the applicability of this target-setting methodology for other major land users.

Further research

SBTN Land is continuing to conduct research to support future development of this target, including:

- Exploration of the scientific basis for expanding this target to include other productive lands such as forestry, mining and infrastructure.
- An assessment of geography-, ecoregion-, and/or product-specific yield gaps and the potential for defining disaggregated targets (e.g., yield gains or land footprint intensity reductions by geography and/or product).
- Consideration of other normalization metrics for intensity targets beyond product weight (e.g., indices that account for the nutritional value of food produced), as well as normalization metrics for sectors beyond agriculture.

[50] https://www.nature.com/articles/s41586-020-2705-y#Sec12; supplement notes that areas dedicated to agriculture and forestry in the IAP scenario decreased by 690 Mha on average by 2050 relative to 2010 across the various models.

51 Figure 2.24 of IPCC (2018) includes ranges for both cropland and pastureland area reductions in its SSP1 pathways, with roughly 250 Mha reductions each of cropland and pastureland area in the "archetype pathway" for SSP1. Because of the many uncertainties inherent in modeling and the ranges shown in the figure, we combine cropland and pastureland into a total reduction target of 500 Mha rather than requiring separate cropland and pastureland reduction targets. Furthermore, this SSP1 "archetype pathway" includes roughly 100 Mha of cropland expansion for bioenergy. However, because dedicating land to bioenergy production competes with food and nature goals, and does not advance climate goals (Searchinger and Heimlich 2015), we do not include bioenergy expansion in our target. Instead, bioenergy produced on agricultural lands is included in the overall global reduction target of 500 Mha.

[52] https://www.fao.org/faostat/en/

Target 3 – Landscape Engagement

The Ecosystem Integrity Index

The Ecosystem Integrity Index (EII)[53] provides a simple, yet scientifically robust, way of measuring, monitoring and reporting on ecosystem integrity at wide geographical scales. It is formed of three components, structure, composition, and function, and measured against a natural (current potential) baseline on a scale of 0 to 1:

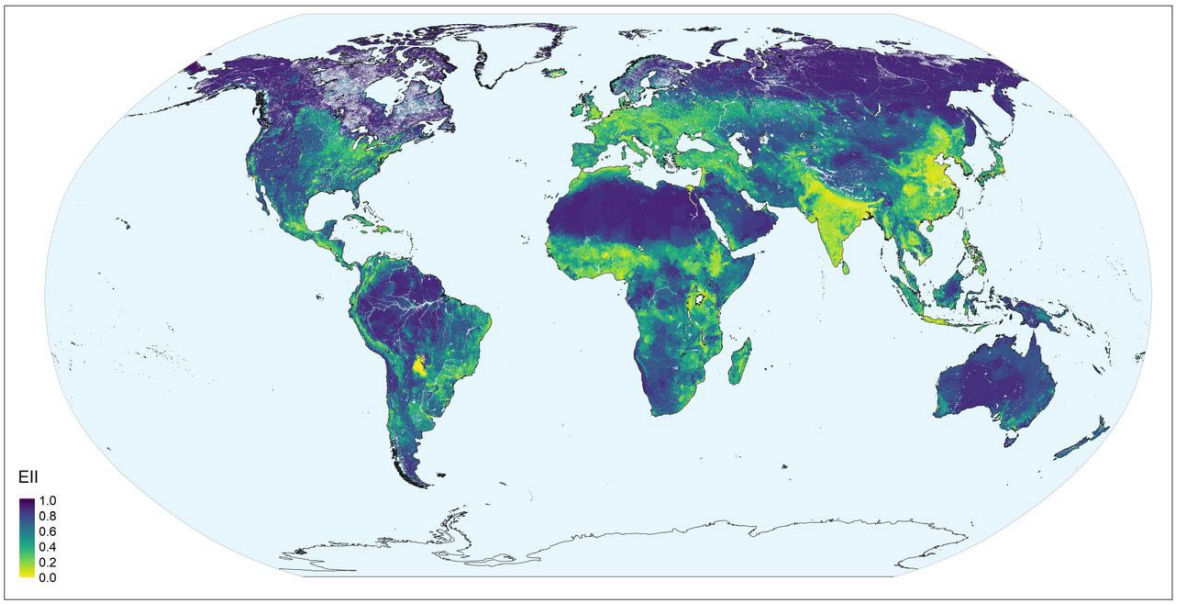

Figure SM 3: The Ecosystem Integrity Index. Areas in red designate areas with low ecosystem integrity and those in green and blue are areas of higher ecosystem integrity based on an assessment of ecosystem structure, composition, or function.

Data are available upon request from SBTN on behalf of the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC).

- The metric for structure is derived from a total of 12 spatial layers of features associated with anthropogenic pressure on biodiversity, including population density, built-up areas, agriculture, roads, railroads, mining, oil wells, wind turbines and electrical infrastructure.
- The metric for composition is a combination of the assessment of the impact of human pressures on the total abundance of species within a community and the assessment of the similarity between the relative abundance of each of the species in a community in a non-natural landscape with those in a natural landscape.
- The metric for function is estimated using the difference between potential natural and current net primary productivity (NPP) within each 1km grid cell.

It follows that any measurement of ecosystem integrity should encompass all three components; however, it should be noted that the components are interdependent and are likely to covary with varying pressures on the system.

The index has been developed to help national governments measure and report on various of the goals and targets being developed within the draft post-2020 Global Biodiversity Framework negotiated under the Convention on Biological Diversity, and for non-state actor contributions to also be recognized.

What makes an ecosystem integrity indicator relevant to businesses?

Ecosystem integrity encompasses the full complexity of an ecosystem, including the physical, biological and functional components, together with their interactions, and measures these against a 'natural' (i.e. current potential) reference level (Carter et al., 2019)[54]. Ecosystem integrity is fundamental to the stability of Earth systems on which humanity depends.

[53] Hill, S. L. L., J. Fajardo, C. Maney, M. Harfoot, M. Harrison, D. Guaras, M. Jones, M. J. Oliva, F. Danks, J. Hughes, and N. D. Burgess. 2022, August 22. The Ecosystem Integrity Index: a novel measure of terrestrial ecosystem integrity with global coverage. https://www.biorxiv.org/content/10.1101/2022.08.21.504707v1.full

[54] Carter, S. K., Fleishman, E., Leinwand, I. I., Flather, C. H., Carr, N. B., Fogarty, F. A., ... & Wood, D. J. (2019). Quantifying ecological integrity of terrestrial systems to inform management of multiple-use public lands in the United States. Environmental management, 64, 1-19.

Ecosystem health has relevance to businesses and cities. The loss of ecosystem integrity reduces the provision of ecosystem services upon which businesses and cities are dependent, including the provision of clean water, a regulated climate, and the pollination of crops among many others.

Calculating the EII baseline score at the landscape level

Companies setting a landscape engagement target will engage with stakeholders within their landscape initiatives on boundaries. Companies will overlay these boundaries in a geographic information system with the spatially explicit EII layer provided by SBTN. Companies may then use the GIS to calculate descriptive statistics across their landscape(s) (e.g, mean, median, mode, range, standard deviation).

The EII baseline score should be calculated only using areas that are below the 0.7 "natural threshold" to avoid skewing both the initial assessment and/or a company's progress based on the inclusion of areas that already have high ecosystem integrity.

Example: for a landscape with an average EII score of 0.15, the desired threshold of 0.7 is subtracted, resulting in a deficit in EII of 0.55. A hypothetical 5% increase equates to an increment of 0.0275 EII, increasing the average to 0.1775 across holdings. SBTN expects that this increase would be spread relatively evenly across the grid cells across the landscape (accepting a certain degree of variance, considering the different land-uses within a landscape). This avoids the concentration of efforts in just one region as a means of raising EII across the landscape, maximizing the benefits of an increment in ecological integrity. While the utility of EII is explored in SBTN it will be important to understand how company actions within landscapes may improve EII and where these actions will have the most geographic impact in addition to the improvement potential of the EII score.

Box SM 2: Naturalness threshold in the Ecosystem Integrity Index (EII)

To guide management actions, such as identification of areas in which degradation should be avoided, it is useful to distinguish high integrity or "natural" areas from lower integrity or "non-natural" areas. Although the EII provides a continuous scale of naturalness, for simplicity we can adopt a threshold value that distinguishes high-integrity areas. The threshold of what is considered to be natural has been set at an EII of 0.7. Above this threshold we expect land cover to fall into categories such as primary forest and natural grasslands where degradation is lower. Below this threshold we expect land-use classes with lower integrity, such as pasture and cropland, to occur.

Spatial analyses have been undertaken to validate the position of this naturalness threshold at 0.7. The EII has been overlaid with spatially explicit land-use layers (Global land cover and land use 2019, GLAD (umd.edu)) to check the consensus between these layers when the natural threshold is set to 0.7. These land-use data offer a viable option for robust validation as they have not been included as an input into any of the three EII component layers. Both the structural and composition layers take alternative land-use data, while the functioning layer relies on climatic variables and remotely sensed net primary productivity. We found that 99.1% of all cropland was concentrated in areas with EII values below the 0.7 threshold, while for urban areas this was 96.3%. The high level of agreement between the EII layer and the independent land-use layer validates the position of this naturalness threshold.

Additional considerations around ecosystem integrity targets

An ecosystem's area itself, though extremely relevant, is a challenging indicator. Where a particular ecosystem begins and ends is complex—the functional unit of an ecosystem will not be constant over space or time and will transform across a gradient to a neighboring ecosystem. Furthermore, climate change is constantly altering ecosystem boundaries, and people have also been altering ecosystem boundaries for thousands of years. The factors can make it difficult to define the desirable extent of an ecosystem.

Ecosystem connectivity focuses on the internal makeup of an ecosystem, evaluating patchiness and links within the ecosystem. Connectivity requires a detailed understanding of the construction of the ecosystem down to landscape-level dynamics.

Ecosystem integrity is multi-faceted and a suitable target should represent both biotic and abiotic elements of ecosystems as well as ecosystem structure and functioning. Any metric of ecosystem integrity should be sensitive to pressures imposed by cities and companies and should be able to disentangle the interaction of pressures on the various elements, and should be meaningful when calculated over time.

Table SM 7: Metrics commonly used in screening ecosystem components (provided as a comparison with EII).

Indicator metric/approach	Overall ecosystem or component?	Biodiversity focus	Scope of pressures included	Usability by companies and cities
The Living Planet Index	Component: biotic integrity	Vertebrate populations	Disaggregation to specific pressures not possible	Not applicable
The Biodiversity Intactness Index	Component: biotic integrity	Local community intactness	Land-use focus but responses to a wider range of pressures are estimated	Applicable by businesses and used in financial portfolio impact methods
Multi-dimensional Biodiversity Index	Ecosystem	Quantitative and qualitative measures of biodiversity	Metric still in development	Metric still in development
Mean Species Abundance	Component: biotic integrity	Relative abundance of species within a community	Based on the GLOBIO model - 5 key drivers of biodiversity change	Applicable by businesses and used in financial portfolio impact methods
Global Biodiversity Score	Component: biotic integrity	Changes to relative abundances estimated within an area	Based on the GLOBIO model - 5 key drivers of biodiversity change	Method specifically developed for corporate biodiversity foot printing
The Healthy Ecosystem Metric	Component: biotic integrity	Alpha diversity impacted within an area	Land-use focus	Specifically designed for corporate use
BILBI	Ecosystem	Beta-diversity patterns and compositional turnover	Measures impact of changing habitat condition and climate change	Challenging to apply models to corporate level impacts
Forest Landscape Integrity Index	Component: structural integrity	Habitat condition	Both inferred and observed pressures are assessed	Challenging to understand corporate/sectoral impact on index
Ecosystem Area Index	Ecosystem	Spatial extent of ecosystem	State indicator responsive to a wide range of pressures	Metric still in development
Ecosystem Health Index	Ecosystem	Ecosystem functioning	State indicator responsive to a wide range of pressures	Metric still in development; Challenging to understand corporate/sectoral impact on index

Why work at the landscape scale?

According to ISEAL,[55] landscape investments and actions aim to have impacts beyond individual supply chains. A key differentiating factor of landscape investments and actions is that they seek to improve conditions in the landscape as a whole, and they aim to tackle root causes of biodiversity loss and decrease in ecological integrity that cannot be tackled by individual companies.

When investing in production landscapes, companies at all stages of the supply chain prioritize support for those enterprises that are producing their raw materials, whether that is focused on improved productivity, quality, or livelihoods.

Landscape investments and actions complement supply chain investments by creating a more resilient environment and better conditions for the long-term well-being of local communities.

Target setting in a landscape context allows the company freedom to allocate responses aligned with existing landscape initiatives where they choose. This may result, for instance, in selecting investments and actions that mutually benefit the companies themselves and the broader landscape.

Multi-stakeholder approaches at the landscape level, therefore, help ensure that the social, economic, and cultural needs of local communities are taken into account when defining such actions and how they should be implemented for achieving landscape goals.

Figure SM 4: Key issues addressed in a Landscape and/or Jurisdictional Initiative. Figure taken from Proforest (2023)

Landscape investments and actions can include support to supply chain enterprises where it is clear how this will deliver on the landscape initiative's goals and will have impacts beyond a company's supply chain.

For example, supporting producers to ameliorate or protect riparian zones for waterways on their properties can have wider impacts on water quality, while restoration of natural ecosystems on farmlands contiguous to natural areas of high conservation value will strengthen the resilience of that ecosystem (ISEAL, 2022).

Besides, corporate actions can be amplified and become more effective when implemented collectively and at a wider scale, as shown in the increasingly growing number of active landscape initiatives (Proforest, 2020[56]).

According to Sayer et al. (2013),[57] landscape approaches imply shifting from project- or site-oriented actions to process-oriented activities.

In this sense, the actions taken in a place help to satisfy the objectives in the context of broader landscape as well. This requires changes at all levels of interventions, from problem definition to monitoring and funding. It provides

[55] https://www.isealalliance.org/get-involved/resources/what-constitutes-company-landscape-investment-or-action-2022
[56] https://www.proforest.net/fileadmin/uploads/proforest/Documents/Publications/Engaging_with_landscape_initiatives_Indonesia.pdf
[57] https://www.pnas.org/doi/abs/10.1073/pnas.1210595110

local stakeholders with long-term, iterative processes, giving them responsibilities and empowering them. Moreover, it tends away from top-down engineered solutions toward emergent, negotiated actions and consultative, cooperative approaches that build the local ownership and governance essential to achieving ecological integrity goals.

Landscape initiatives can increase the efficiency in delivering company commitments by supporting the development of traceability or monitoring systems at the landscape level, which would also help sourcing companies to prove the deforestation- and conversion-free status of commodity volumes purchased from a landscape.

Companies can implement actions both within and beyond their own supply chains:

- Within supply chains, companies can require assurances from their suppliers that the volumes they purchase were produced responsibly, through certification or legal assurance. Companies can also engage with their suppliers to cascade commitments up the supply chain, driving changes in production practices.
- Beyond a company's own supply chain, collaboration and alignment at landscape, jurisdictional, or sectoral scale can address root causes of ecological degradation that require collective action and deliver wider impact (see, for example, Agricultural Commodity Responsible Sourcing[58], Proforest Responsible Sourcing and Production BN13[59]).

Figure SM 5: Examples of company actions within and beyond their supply bases. Figure taken from Proforest (2023)

[58] https://www.proforest.net/resources/publications/agricultural-commodity-responsible-sourcing-acres-taking-action-within-and-beyond-supply-chains-13426/
[59] https://www.proforest.net/news-events/news/responsible-sourcing-and-production-briefings-a-retrospect-11323/

How to establish a landscape initiative

For successful landscape approaches, companies should make sure that solid stakeholder engagement, sufficient institutional support, and effective structure of governance are in place (Reed et al., 2016[60]; Riggs et al., 2021[61]).

A large body of academic work has in fact highlighted how collective decision-making is a key characteristic in landscape approaches (Fischer et al., 2019[62]; Opdam et al., 2016[63]). Whether through village committees, multi-stakeholder forums, or cross-sectoral collaboration, integrated landscape approaches therefore depend on the capacity of people within the landscape to agree to and organize collective action (Kusters et al., 2020[64]; Riggs et al., 2021).

Several institutions and bodies have set out frameworks for the set-up, verification and monitoring of initiatives to, e.g., reduce emissions from deforestation and forest degradation.

As an example, Proforest (2020)[65] sets out the following steps before establishing a landscape/jurisdictional initiative:

1. Understand the supply base
    a. through supply base mapping, understand where the commodities are produced
2. Identify priority landscapes and underlying problems
3. Identify initiatives, understand local motivation, governance, and decision making
4. Decide on the specific initiatives and approach that are right for the area
5. Clarify resources available and scope of engagement
    a. level of funds and commitment over timescale
    b. scope of engagement
    c. decide time frame
6. Build trust across stakeholders
7. Plan and implement interventions
8. Communicate and coordinate across partners
9. Monitor and evaluate.

The assessment of a landscape initiative can then be done by applying the following framework:

- **Goals**
    - clear goals and milestones
    - coverage of important issues for the sector
    - tangible benefits at scale
    - safeguards in place to protect and advance human rights and protect vulnerable groups from harm
- **Governance and transparency**
    - clear governance process
    - appropriate incentives and sanctions
    - system to monitor process
    - transparency on finance
- **Mandate and inclusiveness**
    - engagement with relevant stakeholders
    - respect and recognition of local people's rights and interests
    - willingness to collaborate with the private sector
    - clear expectations on company's contribution.

Also, scholars have attempted to define the key steps and characteristics of integrated landscape approaches. Reed et al. (2016) highlight that, due to the dynamic nature of living landscapes, there should be no defined end point to a landscape approach but rather it should be an iterative process of negotiation, trial, and adaptation.

The scholars list the key aspects of an effective landscape approach:

- **Evaluation of progress**
    - right balance between participatory engagement and scientific rigor
    - metrics must be specific to the landscape context, including social, environmental, production, and governance aspects

[60] https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.13284
[61] https://link.springer.com/article/10.1007/s11625-021-01035-5
[62] https://journals.sagepub.com/doi/pdf/10.1177/1940082919872634
[63] https://www.sciencedirect.com/science/article/abs/pii/S187734351530018X
[64] https://www.mdpi.com/2073-445X/9/4/128
[65] https://www.proforest.net/fileadmin/uploads/proforest/Documents/Publications/Engaging_with_landscape_initiatives_Indonesia.pdf

- **Establishment of good governance**
    - adapt structures across landscapes
    - constant re-evaluation of governance structures across time
- **Evolvement from panacea solutions**
    - contextualization is key to success
    - align specific framework to specific goals
- **Engagement of multiple stakeholders**
    - need for ongoing, inclusive, participatory negotiation processes
    - stakeholders should be able to identify objectives, develop synergies, and account for trade-offs
    - align local socio-cultural and global environmental concerns
- **Embracing of dynamic processes**
    - implementation of dynamic frameworks
    - built-in mechanisms to deal with unpredictability.

Sayer et al. (2017)[66] show that the scope of situations where landscape approaches have been used includes landscapes or seascapes where land claims are contested, where objectives diverge, and where there is a need to optimize production and minimize environmental degradation and the loss of biodiversity.

The spectrum of situations where landscape approaches can be used is varied: transitions occur when management intensity might increase and infrastructure might expand across different development gradients, from remote hinterlands to more-developed regions (Sayer et al., 2017).

Different key participants and objectives might be pursued in different landscapes:

- In **hinterlands** where logging and/or smallholder agriculture happens, the key aspects might be to deal with international conservation NGOs, industrial land conversion consequences, and REDD+ activities.
- In a **landscape transition area**, where agricultural intensification persists with estate crops and agroforestry, the key participants might be development NGOs and industrial corporations, while the key aspects to consider might be infrastructure expansion and conflicts over land rights.
- In an area where **agricultural consolidation and/or urbanization** is happening, different aspects might need to be considered, from industrial crops, to tree planting, going all the way to recreation and amenity. This situation might include aspects such as consolidation of land rights and infrastructure development (Sayer et al., 2017).

Unlike traditional projects, landscape approaches are **long-term evolving activities**, so attempting to assess their impact at a single end point is problematic. Stakeholders will continuously alter their views on desirable outcomes and the goalposts will continually move (Kutter and Westby 2014).[67]

CDP (2022)[68] gives two examples of a landscape approach applied at local level to protect habitats and ecosystems at scale, but also to protect assets in relation to supply chains.

- The Coalition for Sustainable Livelihoods (CSL) is an initiative focused on improving collaboration and collective action to achieve shared goals for strengthening smallholder livelihoods, sustainable production, and natural resources management in the Indonesian provinces of North Sumatra and Aceh.
    - By aligning landscape and supply chain efforts with existing national and regional platforms and policies, CSL aims to create a needed pathway to scale sustainable production on the ground while also generating lasting social, economic, and environmental benefits in the two provinces. The initiative demonstrates collective action on sustainable shared goals, long-term engagements, action plans aligned with development policies, social inclusion, and systems to monitor progress.
- The Produce, Conserve, and Include (PCI) Institute is a jurisdictional approach established by Mato Grosso State in Brazil. The aim is to fill an estimated funding gap of US$30 billion to finance its strategy by 2030—80% of which needs to be filled by the private sector for activities such as pasture restoration and planted forests. CDP has worked with the PCI Institute to present the key factors needed to implement a jurisdictional approach that engages with private sector investments and REDD+. CDP is therefore presenting four main learnings for a successful jurisdictional approach:
    - Establishing a decentralized governance structure—such as the PCI Institute—has been key to reinforcing the medium- and long-term Jurisdictional Approach goals (JAs) from political cycle changes.
    - Multiple funding streams from public and private sector investments, including international cooperation, can enable the establishment and implementation of these initiatives. Moreover, blended finance for JAs allows different interests and objectives to be harmonized and help guarantee the long-term stability of the JA.

[66] https://link.springer.com/article/10.1007/s11625-016-0415-z
[67] https://www.tandfonline.com/doi/abs/10.1080/09614524.2014.907241
[68] https://jaresourcehub.org/wp-content/uploads/2023/01/CDP_CM_Factsheet_2022.pdf

- An open and recurrent multi-stakeholder dialogue with the government, producers, and traders has been key to ensuring government targets and the production of deforestation-free commodities and supply chains. In the case of the PCI Institute, the establishment of the Corporate Working Group has provided a safe space for the concertation of those collective goals.
- Tracking and transparently disclosing information on progress toward the collective goals is essential to the credibility of a JA. Therefore, the PCI Institute has established monitoring tools and has partnered with several worldwide organizations, such as CDP, to improve and adapt its monitoring systems.

For CDP (2022)[69], moreover, a robust JA requires a monitoring and evaluation system. Both time (to agree with all stakeholders) and investment (to fund the platform and data analysis required) need to be considered when developing a comprehensive monitoring and evaluation system. Tracking information is critical to learn and understand what areas are progressing and what areas need more attention.

[69] https://cdn.cdp.net/cdp-production/cms/reports/documents/000/006/134/original/CDP_Brazil_PCI_Case_Study_Jurisdictional_Approaches_Final_Version.pdf?1646824791