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Forest Sector Nature-Positive Roadmap

Phase I: A shared definition of nature-positive

Forest Solutions Group

Contents

Foreword

Nature is under greater threat today than at any other time in human history. As the world rapidly awakens to the severity and urgency of the crisis, the level of global attention on nature loss is nearing that of climate change.

The "nature-positive" concept has begun to unite the business community in its efforts to protect and restore nature and the ecosystem services it provides. To leverage this accelerating momentum, it is critical to develop practical tools and frameworks that support businesses as they implement credible and impactful nature-related strategies.

The forest sector finds itself on the frontline of climate and nature action. Not only will it feel the impacts of both crises, the sector also faces the responsibility and opportunity to advance some of the solutions the world needs to minimize waste and ensure nature thrives. The forest sector is well-positioned to grow the circular bioeconomy based on wood from sustainable working forests as a renewable and recyclable material. Scaling-up this alternative economic model requires deliberate and collaborative action along the full forest products value chain and within the broader operating environment.

As forward-looking business leaders in the forest sector, we recognize the need to rally behind a shared definition of nature-positive to catalyze action on this common societal goal. We hope the Forest Sector Nature-Positive Roadmap will inspire peers to follow suit in order to build the critical mass needed to transform our individual companies, the sector and the broader economic system in which we operate. To achieve this, we call on value chain partners, investors and policy-makers to join the effort to halt and reverse nature loss now, when nature needs it most.

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About this report

This is the first of a series of nature-positive roadmaps by the World Business Council for Sustainable Development (WBCSD) aimed at supporting businesses in scaling up actions to halt and reverse nature loss, setting science-based nature-related goals and targets, and disclosing progress using quantifiable metrics. The Forest Sector Nature-Positive Roadmap is developed by members of the WBCSD's Forest Solutions Group (FSG).

This report is phase I of the roadmap. It is intended to offer a comprehensive definition of nature-positive and lay the foundations for further guidance on the implementation of nature-positive, which we will deliver in subsequent roadmap phases. The roadmap defines nature-positive as a global societal goal tied to achieving the Global Goal for Nature, with three measurable and timebound objectives: zero net loss of nature from 2020, net positive by 2030 and full recovery by 2050.

The report describes the key impacts and dependencies on nature along the forest products value chain, to bring to light the business risks associated with nature loss. Managing these risks is particularly important for the forest sector, which depends on thriving ecosystems and long time horizons for its prosperity. Beyond risk mitigation, the global transition to a nature-positive world brings unique opportunities for the forest sector to scale up the circular bioeconomy as an alternative, more regenerative economic model based on wood as a renewable and recyclable resource.

The report describes a comprehensive set of actions forest companies can take to halt and reverse nature loss along the full value chain. Using the Science Based Targets Network's (SBTN) mitigation hierarchy, the report distinguishes actions that contribute to halting nature loss (actions to avoid and reduce loss) and those that contribute to enhancing nature (actions to restore and regenerate nature). Most high-impact restorative and regenerative opportunities are located upstream in the forest production stage of the value chain, where the sector interacts most closely with nature. Combined with actions to avoid and reduce nature loss, these high-impact actions represent the forest sector's greatest opportunity to contribute to net gains for nature.

Delivering on the Global Goal for Nature requires more than the sum of an individual company's actions. It calls for system-level transformation to impact the underlying drivers of nature loss.

To achieve this, companies need to stretch beyond the boundaries of their business and engage in thoughtful and deliberate partnerships, invest in landscapes and regions of operations and advocate for governments to raise policy ambitions for nature. The report offers illustrative examples of forest companies driving system-level transformational change at all stages of the value chain.

To conclude, the report describes five enablers that will further contribute to accelerating the transition to a nature-positive world. It ends with a commitment by FSG members to rally behind a shared definition of nature-positive, and work toward the actions described in the report to accelerate the transformation of the forest sector. In order to catalyze system-level transformation FSG members also call on value chain partners, investors and policy-makers to join forces in building the right enabling conditions.

1 Introduction

Background

Nature is gradually rising in the global political arena, closely trailing behind the climate agenda. Well-established corporate accounting and disclosure frameworks in the climate space are inspiring equivalents for nature, including from the Science Based Targets Network (SBTN) and Taskforce on Nature-related Financial Disclosures (TNFD). Similarly, corporate nature-positive commitments are starting to match the recent surge in corporate net-zero commitments. For climate, there is a clear goal for carbon neutrality, articulated in the target of net-zero emissions by 2050, with the goal of keeping global warming below 1.5°C.

For nature, the Global Goal for Nature advocates for net-zero loss of nature from 2020, net-positive growth by 2030, and full recovery by 2050.[1] These recent developments signal that in the near future, corporations will face the same scrutiny and accountability for managing their impacts on nature as they do for their greenhouse gas (GHG) emissions.

Yet there is one key difference between the nature and climate agenda. Unlike GHG emissions, nature is not reducible to a single, fungible unit that can be aggregated at the global level to track progress on a collective goal. While nature-related accounting, target-setting and implementation methodologies and frameworks seek to address this complexity, business must act now to halt and reverse the loss of natural resources and ecosystem services on which the future of the forest sector and the wider economy depend.

The forest sector has the knowledge and resources to help bend the curve on nature loss and contribute to net gains. Through action spanning the full value chain and within their operating environment, leading forest companies are working to scale up an alternative economic model that puts nature back at the center – a model known as the circular bioeconomy.

Objectives

In January 2022, in collaboration with WBCSD's Nature Action team, the Forest Solutions Group (FSG) started a multi-year journey to develop the *Forest Sector Nature-Positive Roadmap* with technical support from Terranomics and input from stakeholders. The roadmap aims to support businesses in the forest products value chain to scale up actions to halt and reverse nature loss, set science-based nature-related goals and targets, and disclose progress using quantifiable metrics. Delivered in distinct phases, the roadmap's development will span several years to accompany releases of frameworks addressing the hurdles forest companies face in pursuing nature-positive strategies. The roadmap builds on our past publications, especially the *Forest Sector Guide to the Natural Capital Protocol*[2] released in 2018, and closely aligns with emerging guidance from SBTN[3] and TNFD,[4] the two global frameworks of reference for business action on nature.

The specific objectives of phase I of the roadmap are to:

- Provide a shared definition of nature-positive for the forest sector;
- Support businesses in the forest sector as they adopt and implement credible and impactful nature-positive strategies;
- Raise awareness of the role of sustainable working forests and forest products in nature recovery;
- Proactively contribute to developing the SBTN and TNFD frameworks through a sectoral interpretation of their guidance.

Approach

The *Forest Sector Nature-Positive Roadmap* is the first in a series of sectoral roadmaps being developed by WBCSD. This roadmap and other sectoral nature-positive roadmaps are based on WBCSD's foundation framework published as a practitioner guide: *What does nature-positive mean for business*.[5] This report lays out the building blocks any company needs to implement strategies that contribute to nature-positive. We derived them from common high-level actions[6] in existing frameworks from the Capitals Coalition, SBTN and TNFD (Figure 1).

This phase I report offers a shared definition of nature-positive for the forest sector as a bedrock for subsequent guidance and tools to support forest companies in implementing nature-positive strategies. In parallel, we are developing a *Net-Zero Roadmap* to address both topics separately to preserve the clarity of focus while aiming to deliver interconnected and mutually-reinforcing roadmaps.

Figure 1: Building blocks for nature-positive business contributions

ASSESS & PRIORITIZE

Assess realms of nature (biodiversity, freshwater, land, oceans) potentially relevant to operations and the value chain, and prioritize impacts, dependencies and opportunities for regeneration.

COMMIT

Set a baseline* and commit to ambitious, time-bound, science-informed goals and targets to both halt and reverse the loss of nature.

*The Global Goal for Nature suggests a baseline of 2020 for zero net loss of nature

MEASURE & VALUE

Use validated, inter-related indicators to measure nature outcomes that inform decision-making.

ACT

Systematically apply the mitigation hierarchy within and beyond corporate operations to reduce pressures and have positive contributions across your value chain.

TRANSFORM

Collaborate to achieve nature-positive outcomes across all spheres of control and influence, including policy, financing and capacity building.

DISCLOSE & REPORT

Prepare to disclose material nature-related information

Source: WBCSD [7]

We have developed this report in two consecutive stages, tied to the building blocks for nature-positive:

Stage 1: Identification of the main sector-level potential impacts and dependencies on nature along the forest products value chain. The content of this step informs company-level efforts on the 'Assess & Prioritize' building block (Figure 1).

Stage 2: Description of business actions to halt and reverse nature loss along the forest products value chain and actions to contribute to nature regeneration and restoration and system-level transformation. The content of this step guides companies through the 'Act' and 'Transform' building blocks. By offering visibility on the actions that will subsequently tie to indicators and targets, this step will then inform the 'Commit' and 'Measure & Value' building blocks (Figure 1).

We based the content of this report on the following key sources:

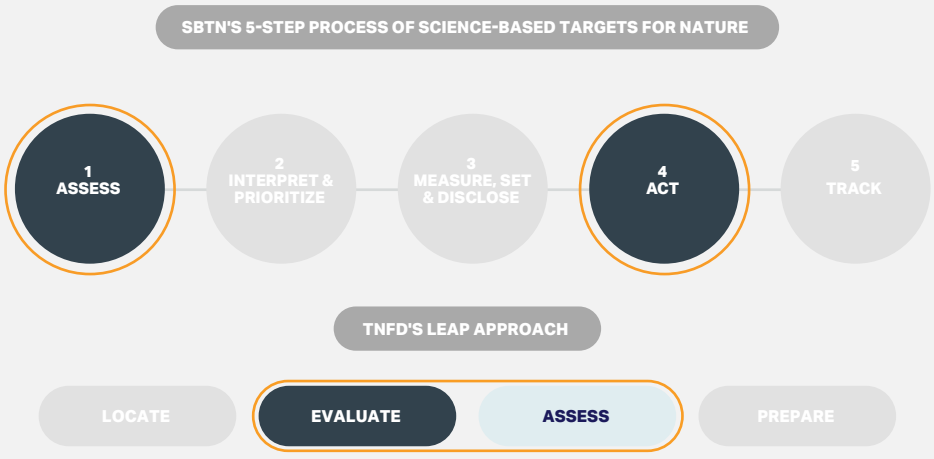
- Most recent guidance from TNFD (2022) and SBTN (2022) as well as other recent literature;
- Past reports from WBCSD and FSG, especially the *Forest Sector Guide to the Natural Capital Protocol*;[8]
- A series of workshops and consultations with FSG members;
- In-depth interviews with seven forest stakeholders (Appendix D);
- A broader stakeholder consultation.

Box 1: Connections to SBTN and TNFD - Overview

This report contains three boxes tying the content of the roadmap to the SBTN and TNFD frameworks. The approaches are often equivalent and otherwise complementary. TNFD focuses on assessing business risks and opportunities, while SBTN focuses on company contributions to a nature-positive economy.

In alignment with the roadmap's objective of providing a shared definition of nature-positive for the forest sector, this report addresses sector-level materiality (part of Step 1: Assess in SBTN's 5-step process; the Evaluate phase in TNFD's LEAP Approach), and the business actions to halt and reverse nature loss along the forest products value chain (similar to Step 4: Act in SBTN's 5-step process; the Assess phase in TNFD's LEAP Approach). The other steps of both frameworks are either for completion at the individual company-level or the roadmap will address them in subsequent phases in the coming years.

Figure 2: Connections to SBTN/TNFD - Overview



Source: Adapted from SBTN[9] and TNFD[10]

Scope

WBCSD's *Vision 2050*: *Time to transform* report[11] offers a shared vision of a world in which more than 9 billion people are able to live well, within planetary boundaries, by 2050. To achieve this vision, it is necessary to address three critical challenges: the climate emergency, nature loss and mounting inequality. To preserve clarity and focus, this roadmap maintains a strong focus on nature but recognizes the importance of addressing all three imperatives as part of a cohesive, multi-faceted corporate sustainability strategy.

Nature and climate:
There is an inextricable link between climate change and nature loss, meaning that it is not possible to achieve global climate goals without addressing nature loss and vice versa. Climate change is a primary driver of biodiversity loss; at the same time, failure to protect and restore nature will further exacerbate the impacts of climate change. For example, climate change threatens forests by exacerbating disturbances such as pests, diseases and wildfires. These disturbances cause the release of carbon into the atmosphere, which contributes to further accelerating climate change. It is, therefore, necessary to invest in nature's capacity to store carbon and support resilient societies to mitigate and adapt to the adverse impacts of climate change[12]

Nature and people:
The nature and people agendas are also intrinsically linked. Human activities drive nature loss through resource exploitation and waste, while wider society depends on ecosystems and their services for their livelihoods. But nature is more than an economic good: it also impacts people's well-being and health.[13] Finally and importantly, businesses must co-develop nature-positive strategies with indigenous peoples and local communities to recognize their inherent land-use rights and benefit from their deep, intergenerational knowledge of nature.

Global vs. local:
It is also important to note that nature-related interventions are intrinsically location-and context-specific. As this report provides a global perspective on the topic, it will be critical to interpret and implement its content considering regional and contextual specificities. The importance of a local assessment is a key element of both the SBTN and the TNFD framework.

Audience

This roadmap primarily aims to inspire and guide companies in the forest sector to adopt and execute ambitious nature strategies. As the forest sector cannot act in isolation, the report delivers a call to action to value chain partners, investors and policy-makers to join forces and help create the right enabling environment to accelerate progress to achieve a nature-positive world.

WBCSD's nature-related membership criteria

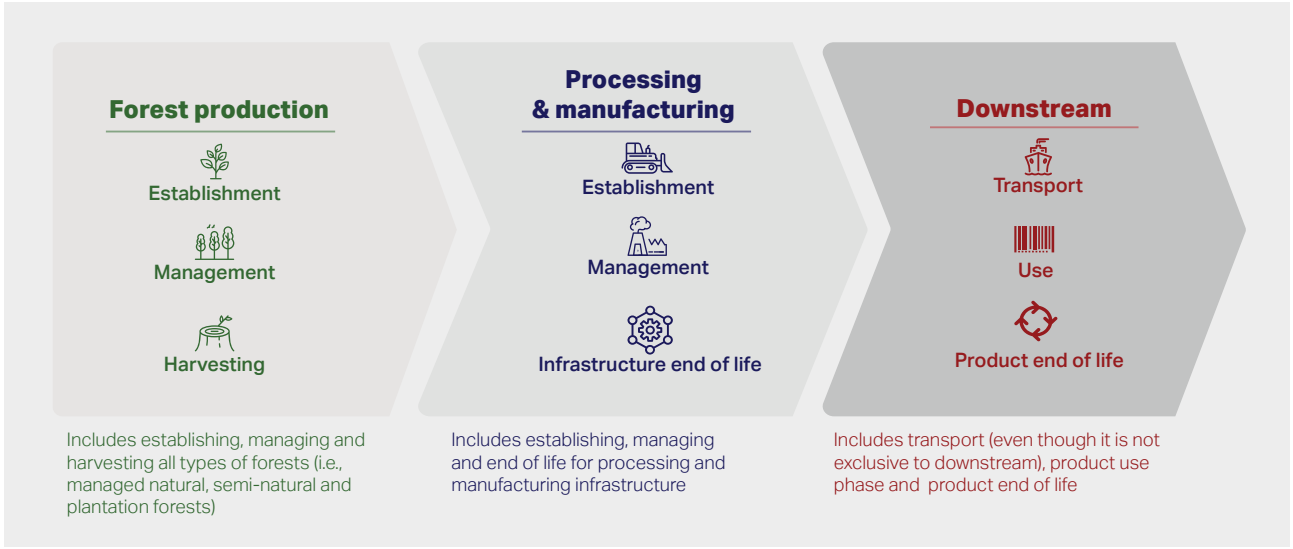
In alignment with WBCSD's membership criteria, upon completion of this roadmap, FSG members commit to setting ambitious, science-informed, short- and medium-term environmental goals that contribute to nature recovery by 2050. They also commit to reporting progress annually in the company's standard external communications.

The forest products value chain

In the scope of this roadmap, the forest sector includes all economic activities that generally depend on the production of goods and services from forests. The forest products value chain has three successive stages: forest production, processing and manufacturing, and downstream. Each stage has three consecutive management steps.

Even though transportation occurs at each stage of the value chain, we include it as part of the downstream in this report (Figure 3). Although we describe the value chain as linear, it is important to note that many circular loops occur within the stages of the value chain (for example, in forest production, companies replant the trees after harvest in a continuous cycle) and spanning the stages (for example, collecting and recycling forest products downstream provides recycled raw material inputs to manufacture new products).

Figure 3: Forest products value chain



② Nature-positive as a collective societal goal

The imperative for nature action

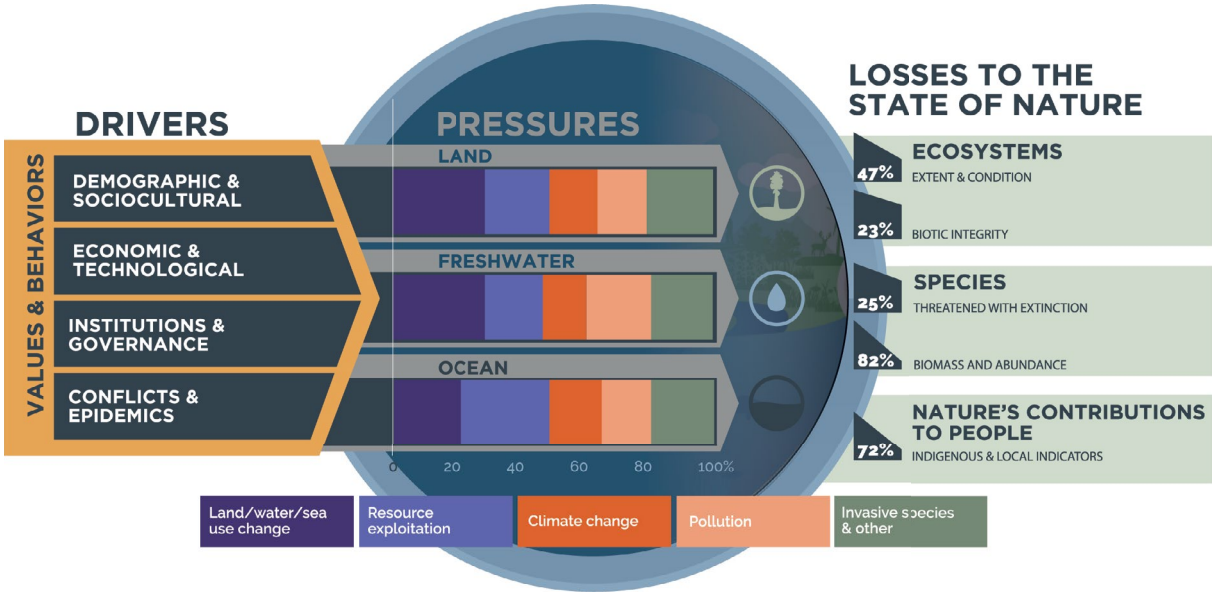
Nature worldwide is deteriorating at a faster pace today than at any time in human history. Due to anthropogenic activities, researchers estimate that humanity is already operating outside the safe zones for six of the nine planetary boundaries, critical to maintaining the Earth's stability: climate change, biodiversity, land-system change, freshwater change, novel entities and biogeochemical flows.[14]

Scientists are tracking various metrics to record the decline in nature. In Figure 4, we highlight some of the key numbers from the global assessment report produced by the Intergovernmental Science-Policy Platform on Biodiversity Ecosystem Services (IPBES)[15]

- The extent and condition of natural ecosystems have declined by 47%;
- The abundance of naturally-present species has declined by 23% in terrestrial communities;
- In most animal and plant groups studied, around 25% of species are threatened with extinction;
- The global biomass of wild mammals has declined by 82%;
- 72% of indicators developed by indigenous peoples and local communities show ongoing deterioration of nature.

IPBES has identified five direct drivers of nature loss that SBTN has adapted: land-/water-/sea-use change; resource exploitation; climate change; pollution; invasive species & other (Figure 4). It is important to note that climate change is one of the five pressures on nature, which intrinsically ties together nature and climate outcomes. Anthropogenic values and behaviors (indirect drivers of change) trigger these pressures (direct drivers of change).[16]

Figure 4: Drivers of, pressures on and losses to the state of nature



Source: SBTN[17]
Description: *The drivers feed into the pressures, which then fuel land, freshwater and ocean degradation and nature loss of (measured in state variables). The percentages on the bars represent the approximate global importance of different pressures in each realm. The right side highlights some of the states of nature loss related to ecosystems, species and nature's contributions to people.*

The Global Goal for Nature

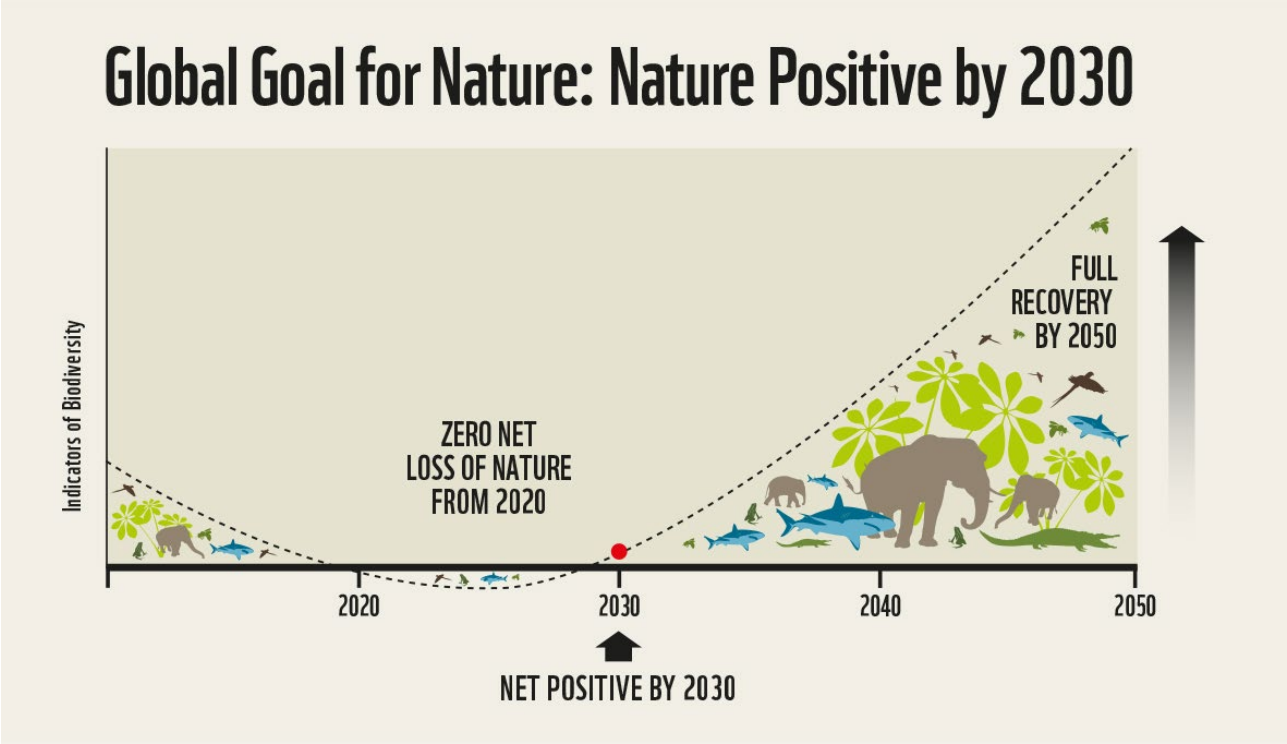
In 2021, a group of conservation and business organizations, including WBCSD, published the scientific argument for aiming for more nature by 2030 than there was in 2020.[19] The Global Goal for Nature (Figure 5) posits that business and other actors should collectively contribute to a net nature-positive world where:

1. There is zero net loss of nature measured from a 2020 baseline by increasing the health, abundance, diversity and resilience of species, populations and ecosystems;

2. By 2030, nature is measurably on the path to recovery, with human activity benefiting nature rather than depleting it;

3. By 2050, nature is fully recovered, with thriving ecosystems and nature-based solutions successfully supporting future generations and the diversity of life and playing a critical role in mitigating climate change.

Figure 5: The Global Goal for Nature



Source: Nature Positive[18]

Nature-positive defined

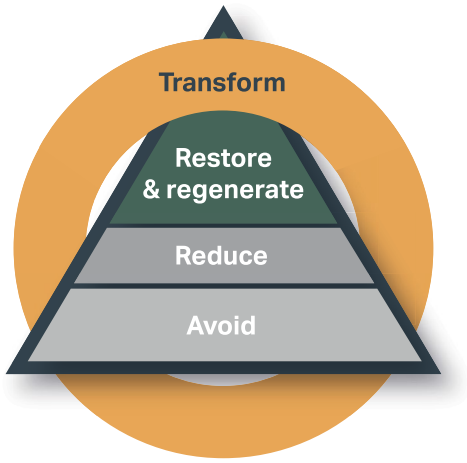
Nature-positive represents a new concept for business that is bound to evolve as key stakeholders adopt and operationalize the term. While recognizing this, in the context of this report, nature-positive represents a collective societal goal toward which all parts of society must contribute through collaborative action. In order to collectively contribute to bringing back more nature by 2030 than exists in 2020, it is the responsibility of each actor, including business, to identify, implement and disclose the actions taken to contribute.

SBTN's mitigation hierarchy (Figure 6) introduces a distinction between actions that contribute to halting nature loss (meaning actions to avoid and reduce loss) and those contributing to enhancing nature (meaning actions to restore, regenerate and transform). We define the different levers of the mitigation hierarchy in Table 1 below.

To achieve The Global Goal for Nature, the collective impacts from regenerative and restorative actions must outweigh those from avoiding and reducing nature loss.

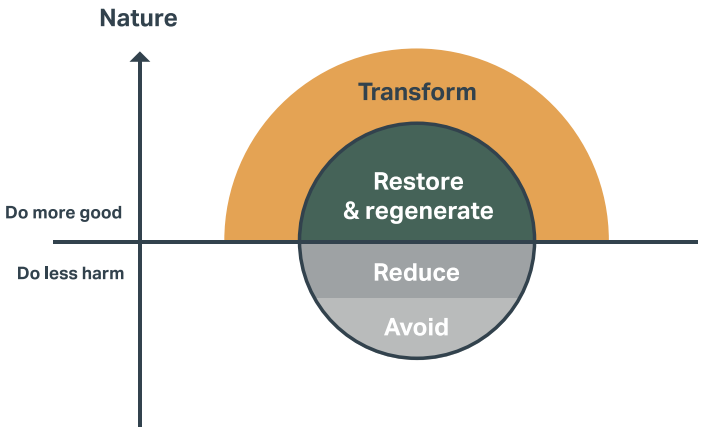
This means that individual companies must accelerate action to slow and halt nature loss while simultaneously bringing back more nature through regenerative and restorative actions, when available. Actions to do less harm alone would bring the world collectively to no net loss, so restorative, regenerative and transformative actions to do more good are critical to bending the curve toward net-positive by 2030 and full recovery by 2050 (Figure 7).

Figure 6: SBTN's Action Framework (AR3T)



Source: SBTN[20]

Figure 7: The positive balance of actions contributing to nature-positive



Source: Adapted from SBTN's Action Framework[21]

Nature-positive is a societal goal. But unlike net-zero in the climate space, it should not be a company-level goal due the practical difficulties in quantitively demonstrating overall net gain. For climate, there is a clear collective goal for carbon neutrality, articulated in the target of net-zero emissions by 2050, with the goal of keeping global warming below 1.5°C. This collective goal translates into company-level net-zero commitments where the company balances greenhouse gas (GHG) emissions into the atmosphere by removing them from the atmosphere within its operations and value chain. Unlike carbon, nature isn't reducible to a single, fungible unit that can be aggregated at the global or company level to track progress. The lack of availability and quality of state-of-nature data, which varies based on geography, realm, ecosystem type and the selected metrics, would complicate the integrity and accuracy of corporate-level nature-positive claims.

Table 1 defines the four levers of impact from the nature mitigation hierarchy (avoid, reduce, restore and regenerate, and transform) and their application to the forest sector.

Table 1: Definition of the levers of SBTN's Action Framework and their application to the forest sector

Levers	Definition	Application to the forest sector (examples, non-exhaustive)
 AVOID	Prevent the impact from happening or eliminate the impact entirely. Applies to new or potential impacts. This is achievable through spatial avoidance (e.g., sourcing from particular areas), technological avoidance (e.g., alternative project design), or temporal avoidance (e.g., during particular seasons).	In the forest sector, deforestation and the conversion of areas of significant biodiversity and carbon value to intensively managed forests are examples of impacts to be eliminated.
 REDUCE	Minimize existing impacts compared to a baseline value, where the company did previously have harmful impacts on nature but without necessarily eliminating the activity entirely. This is achievable through production and processing changes, product design, or sourcing/supplier engagement.	In the forest sector, reduce actions consist of minimizing or reversing specific impacts, such as excessive water consumption and waste discharge, while promoting others, such as the establishment of buffer zones around areas of significant biodiversity value or improving processes and product design to minimize resource use and pollution.
 RESTORE & REGENERATE	Restore: Increase the biophysical function and/or ecological productivity of an ecosystem or its components within existing land uses, often with a focus on nature's specific contributions to people (e.g., on carbon sequestration, food production). Regenerate: Initiate or accelerate the recovery of an ecosystem with respect to its health, integrity and sustainability, with a focus on permanent changes in state. In the context of this report, these two concepts fall under restore & regenerate.	Given its close relationship with nature, the forest sector has a crucial role to play in contributing to regenerating and restoring nature globally by meaningfully improving the health, abundance, diversity and resilience of ecosystems, species and populations. Restorative and regenerative actions include restoring peatlands and wetlands, reintroducing native and endangered tree species on degraded lands, creating wildlife corridors and enhancing soil carbon stocks.
 TRANSFORM	Contribute to systemic change within and beyond the value chain by altering the underlying drivers of nature loss, with positive impacts on climate change and inequality. These actions constitute a scalable collaborative investment in the landscape/region in which the company operates and combine with advocacy to raise policy ambition for nature. To reach economic sustainability and scale, a strong business case should underpin transformative actions.	In the forest sector, companies often implement transformative actions at the landscape or regional level, involving multiple land owners, value chain partners and stakeholders over a long period of time. To reach scale and impact, system-level transformation requires the right enabling environment built in collaboration with value chain partners, investors and policy-makers. Section V of this report shows illustrative examples of transformative action at different stages of the forest sector value chain.

Source: Definitions adapted from SBTN[22]

The forest sector's unique contribution

As the forest sector operates at the nexus of climate and nature, it is possible to draw insights related to the sector's overall ability to contribute to net gains for nature by comparing the climate and nature mitigation hierarchies (Figure 8).

Climate: The global goal is to reduce greenhouse gas emissions to keep rising temperatures well below 1.5°C by 2050. To achieve this, all sectors must work to avoid and reduce GHG emissions in their operations and across value chains (lever A in Figure 8). The forest sector's unique contribution consists of:

- Increasing carbon removals through sequestration in sustainable working forests and storage in forest products (lever B);
- Growing the circular bioeconomy by substituting non-renewable and fossil-based materials with forest products (lever C).

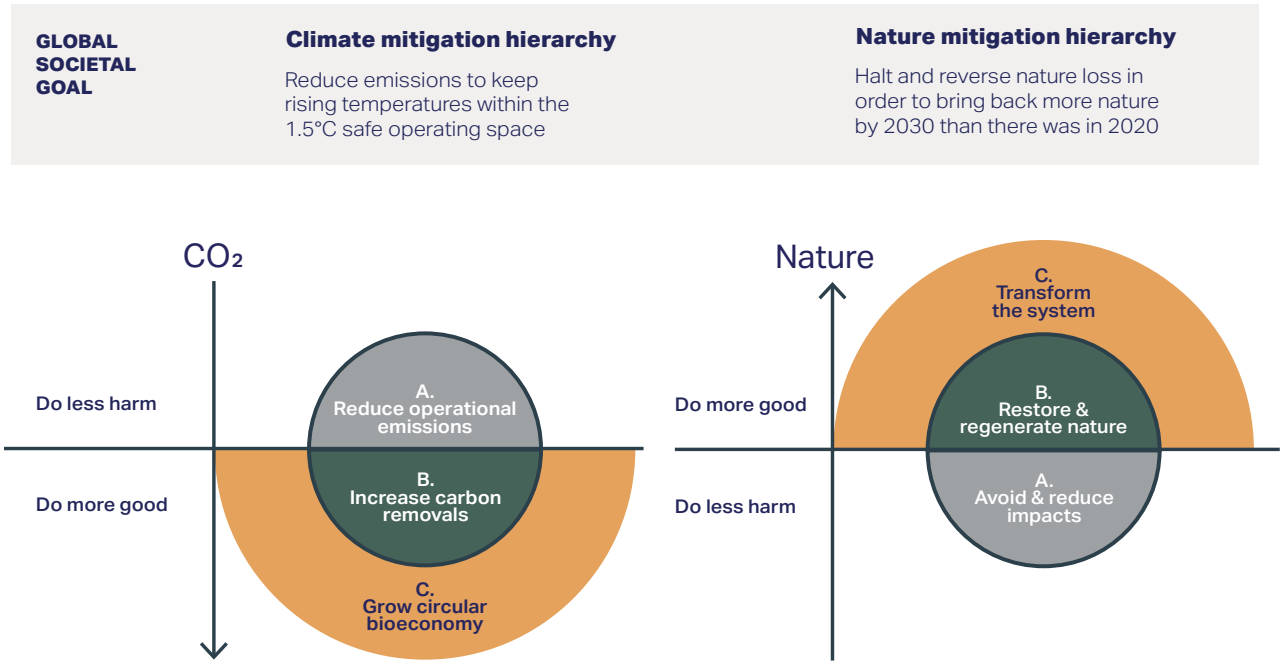
While all sectors must work on lever A to do less harm, the forest sector is in a unique position to do more good through levers B and C.

Nature: The global goal is to halt and reverse nature loss to bring back more nature by 2030 than in 2020. To achieve this, all sectors must primarily work to avoid and reduce the decline in nature (lever A). The forest sector's unique contribution consists of:

- Restorative and regenerative forestry practices (lever B);
- Catalyzing system-level transformation at the landscape level (lever C).

While all sectors must work on lever A to do less harm, the forest sector is uniquely positioned to do more good through levers B and C.

Figure 8: Nature and climate mitigation hierarchies



Source: adapted from WBCSD[23] and SBTN[24]

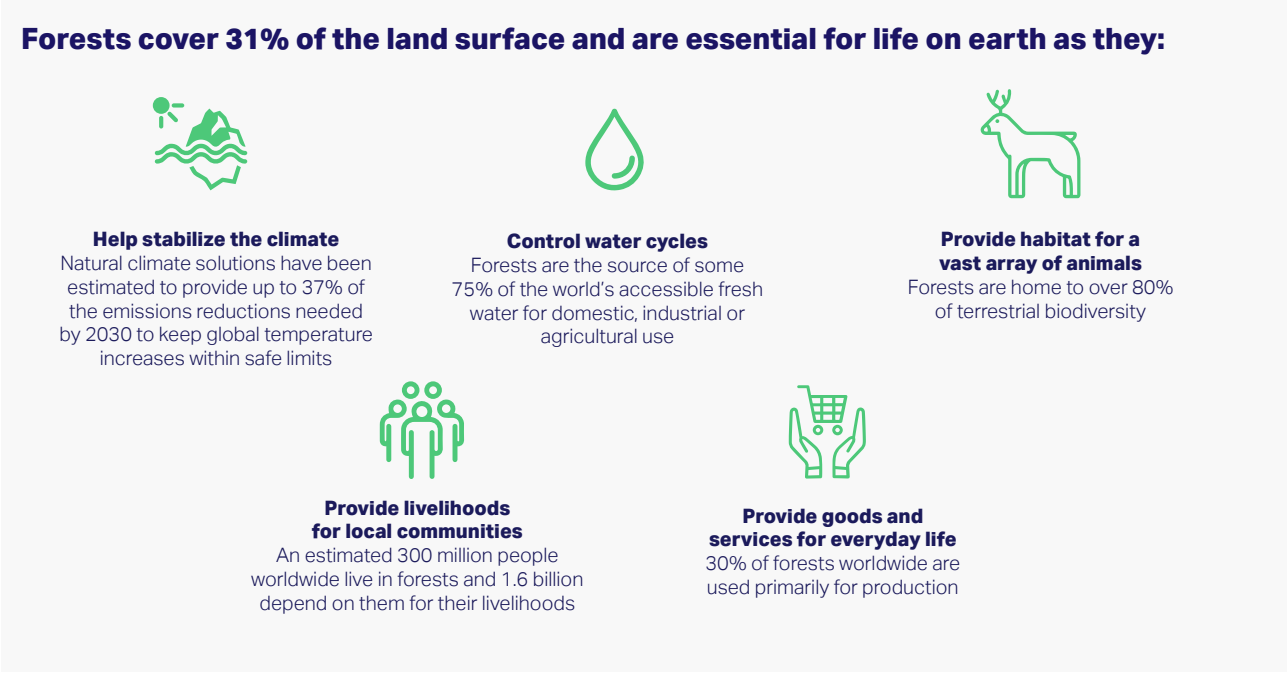
③ Understanding the business risks from nature loss

Forests cover 31% of land surface and are essential to maintaining life on Earth.[25] They stabilize climate, control water cycles, provide habitat for a vast array of animals, support the livelihoods of local communities, and provide goods and services for everyday life (Figure 9).The management of approximately 30% of the world's forests is primarily for the production of forest products, with an additional 20% designated for multiple use, which often includes production.[26] As stewards of these working forests, companies in the forest sector play a critical role in maintaining and enhancing their valuable ecosystem services, while delivering a renewable supply of wood to feed the growing demand for forest products.

Nature loss is already disrupting business through material risks in operations and value chains that stem in part from companies' impacts and dependencies on nature. While all businesses must work to quantify and manage their nature-related risks, this is particularly relevant for the forest sector as it is highly dependent on thriving ecosystems for its prosperity, most notably for the wood fiber that flows throughout production process. Long time horizons also characterize the sector, dictated by the length of harvest cycles. Trees planted today need to be resilient to changing climatic conditions as their harvesting will take place in a time span ranging from a decade to over a century, depending on the type of forestry.

This section provides an overview of the nature-related impacts, dependencies and resulting risks that are the most relevant for the forest sector. Individual companies can translate sector-level data into company-specific nature-related risks and implement tailored mitigation strategies. Although this section focuses on risks, the following sections of the report highlight some of the unique opportunities facing the forest sector that derive from its close interaction with nature, such as growing the circular bioeconomy as an alternative economic model that thrives with nature and not at its expense.

Figure 9: Forests are essential for life on Earth



Source: Griscom et al.,[27] Food and Agriculture Organization of the United Nations (FAO)[28] and United Nations[29]

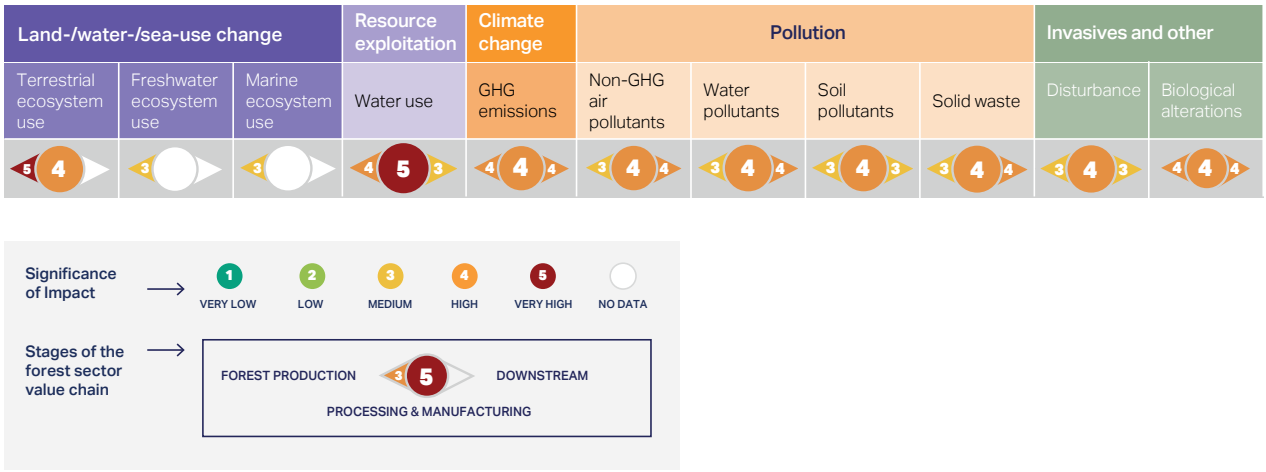
Impacts on nature

Despite increasing attention to nature loss over the past few years, there is still limited understanding of how nature loss affects business, as dependency on nature is often hidden or incorrectly priced. If not managed well, negative impacts on nature caused by business create direct and indirect regulatory, legal, reputational and market risks.

The first step of a comprehensive corporate-level nature strategy consists of identifying a company's impacts on nature throughout the value chain to adequately assess and disclose them, as is now routinely the case for climate risks. Figure 10 provides a preliminary version of a sector-level overview of the potential impacts on nature along the forest products value chain. Conservative scenarios are generally the basis for theoretical sector-level overviews like these to ensure no impacts remain overlooked. Individual companies should conduct company-specific materiality assessments to assess the relevance of these impacts in specific locations across their full value chain.

Leading forest companies take a broad range of actions to prevent these impacts from materializing in their operations and value chains. Section IV of this report offers a comprehensive overview of actions to avoid, reduce or reverse these impacts.

Figure 10: Potential sector-level impacts on nature along the forest products value chain

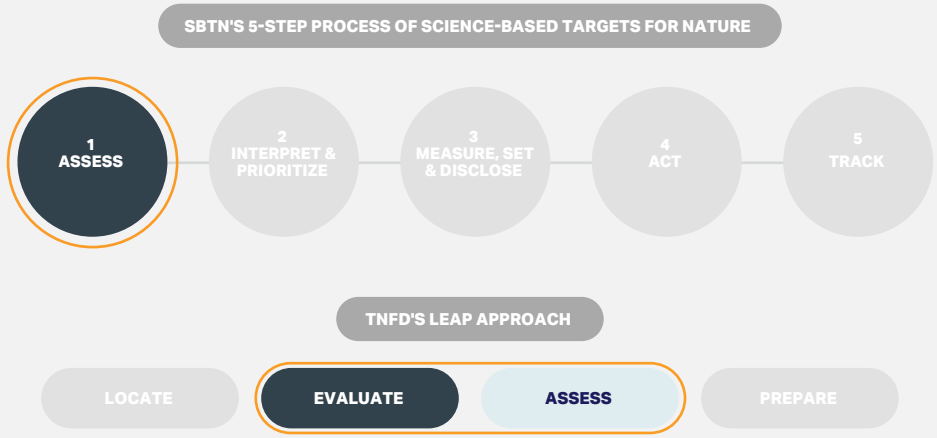


Source: Adapted from SBTN's Sectoral Materiality Tool[30]
Description: *SBTN's Sectoral Materiality Tool provides information on potential sector-level impacts on nature along different value chains. The ratings of the sector-level materiality assessment represent a sectoral average based on data from ENCORE[31] (direct operations and upstream) and EXIOBASE[32] (upstream). The most recent version at the time of writing this report only provides information for direct operations and upstream, so we used data from Forest Products Sector Guide to the Natural Capital Protocol[33] to fill the gap. The significance of impact from pressure categories factors in the frequency, timeframe and severity of impacts, and varies along the different stages of the forest products value chain. The figure shows that all pressure categories, except for freshwater ecosystem use and marine ecosystem use (where data isn't yet available), are relevant for the forest sector in at least one stage of the value chain.*

Box 2: Connections to SBTN and TNFD – Screening for material pressures

Screening for material pressures is part of Step 1: Assess in SBTN's 5-step process. It provides an overview of the issue areas associated with the economic activities of a sector. Companies should then complement the overview with a company-level value chain hotspot assessment to provide an extensive list of potential issue areas and locations where there may be a need to set targets. SBTN's guidance stipulates that companies seeking to set SBTN-aligned targets are required to consider all relevant sector-level pressures in their company materiality assessment and provide a justification for exclusion. The process of assessing pressures also feeds into the Evaluate and Assess phases of TNFD's LEAP approach, supporting companies in the identification of material risks and opportunities.

Figure 11: Connections to SBTN/TNFD - Screening for material pressures



Source: Adapted from SBTN[34] and TNFD[35]

To delve further into the impacts identified in Figure 10, Table 2 provides an overview and description of the impacts on nature, as well as the type of activities that may cause such impacts at different stages of the forest products value chain.

Table 2: Potential impacts on nature along the forest products value chain and examples of processes that may cause them

Nature-related issue	Pressure category	Impacts	Examples of processes that can cause such impacts		
			Forest production	Processing & manufacturing	Downstream
Land-/water-/sea-use change	Terrestrial ecosystem use	• Biodiversity loss • Habitat loss	• Unsustainable forest management • Road construction	• Infrastructure construction • Road construction	• Landfill establishment in sensitive areas
Resource exploitation	Water use	• Depletion of water resources • Habitat loss	• Water-demanding tree species and nursery irrigation in water stressed areas	• Bleaching of wood pulp	• Paper and board recycling
Climate change	GHG emissions	• Increased GHG concentration in the atmosphere	• Forestry machinery • Carbon released at harvest	• Wood and recovered fiber pulping • Burning biomass without carbon capture technology	• Waste decomposition in landfills • Transportation • Paper and board recycling
Pollution	Non-GHG air pollutants	• Biodiversity loss • Habitat loss	• Forestry machinery • Fertilizers and pesticides	• Incineration of process residuals and waste	• Shipping • Waste incineration
	Water pollutants	• Changes in water quality • Eutrophication	• Fertilizers and pesticides	• Chemicals • Wastewater discharge	• Shipping • Waste decomposition in landfills
	Soil pollutants	• Changes in soil quality • Biodiversity loss	• Fertilizers and pesticides	• Chemicals • Wastewater discharge	• Waste decomposition in landfills
	Solid waste	• Increased GHG concentration in the atmosphere	• Solid waste disposal (e.g., unused fertilizers, pesticides and containers)	• Solid waste disposal (e.g., sludge)	• Hazardous and non-hazardous waste disposal in landfills
Invasives and other	Disturbances	• Habitat loss	• Light, noise and vibration pollution from harvesting	• Odor, noise and light pollution from industrial facilities	• Waste decomposition in landfills • Transportation
	Biological alterations/ interference	• Biodiversity loss • Habitat loss	• Introduction of unadapted non-native tree species	• Released water changing local water temperature	• Introduction of invasive species through transportation

Source: Based on pressure categories from SBTN[36]

Dependencies on nature

The flow of ecosystem goods and services from nature underpins core operations in most economic sectors. The forest sector is particularly dependent on thriving ecosystems for its prosperity. It is not surprising that forestry's gross value added out of all industries was estimated to be the most dependent on nature in a recent report from the World Economic Forum, closely followed by other primary sectors such as agriculture, fisheries and aquaculture.[37]

Figure 12 presents an overview of the goods and services provided by nature that forest companies are highly dependent on in the forest production and processing and manufacturing stages of the value chain. The two most important ecosystem services that occur in direct physical inputs are the wood fiber that flows throughout the production process and the water needed for forest operations, pulp and paper mills, and paper recycling operations to function. The forest sector also depends on ecosystem services that enable production processes, mitigate direct impacts and protect from disruption. Soil quality, for example, is essential for the growth of healthy forests. Degraded soils are prone to erosion, nutrient-poor and water-permeable. Other ecosystem services protect forest companies from business disruptions, such as disease and pest control, the absence of which can leave forests vulnerable to parasites, bacteria, fungi or viruses, resulting in widespread losses or reductions in yields. Climate regulation is also critical for the sector as non-adapted forest ecosystems become increasingly unstable in a warming climate, leading to greater incidences of forest fires, droughts and pest outbreaks. Finally, the forest sector also benefits from bio-remediation ecosystem services when biological systems such as microorganisms prevent the contamination of soils and water by transforming toxic pollutants (for example, from fertilizers) into less-hazardous or non-hazardous forms.

The high dependency of the sector on these nature products and services provides a strong incentive to steward the world's working forests to the highest standards of sustainable forest management to protect and enhance invaluable ecosystem services and resources.

Figure 12: Nature dependencies along the forest products value chain

		VALUE CHAIN STAGES		
		Forest production	Processing & manufacturing	Downstream
NATURE DEPENDENCIES	Ecosystem services that are **direct physical inputs**	• Fibers and other materials • Ground/surface water		
	Ecosystem services that **enable production processes**	• Water flow maintenance • Pollination • Soil quality	No significant dependency	Data not yet available
	Ecosystem services that **mitigate direct impacts**	• Bio-remediation		
	Ecosystem services that **protect from disruption**	• Climate regulation • Disease/pest control • Flood and storm protection • Mass stabilization and erosion control		

Source: Adapted from ENCORE[38]
Description: *The figure links the ecosystem services the forest sector depends on to the stages of the value chain based on ENCORE data and classifications. Low dependency was not considered. Downstream data is not yet available from the ENCORE database.*

Nature-related risks facing forest companies

While understanding of the risks related to climate change is relatively advanced, those connected to biodiversity loss have garnered less attention. Yet recent global assessments highlight that nature loss represents a fundamental risk to the functioning of societies and economies. TNFD describes how nature-related risks (and opportunities) result from businesses' dependencies on nature's products and services and their own impacts on nature: "Short-term impacts on nature can result in consequences for the quality and resilience of ecosystems; thereby creating potentially additional risks and opportunities for enterprises given their dependencies.

In short, today's nature impacts can create tomorrow's risks and opportunities." [39]Appendix A builds on TNFD's risk classifications and provides a high-level summary of potential risks that forest companies should consider when designing mitigation strategies. The physical risks are specific to the forest sector, whereas transitional risks are more general risks any organization can face as a result of the transition to nature-positive. The forest sector can turn many of these risks into opportunities as forests and forest products can play a major role in mitigating climate change and the biodiversity crisis.

To implement savvy risk mitigation strategies and factor in the opportunities, forest companies should lead the way in managing and disclosing nature-related impacts, dependencies and the resulting risks. For the first time in 2020, the top five global risks in the *Global Risks Report*[40] came from a single category – the environment – and another report includes biodiversity loss as one of the top risks in the coming 10 years.[41] This means that businesses can expect investors to increasingly require insights on companies' nature-related risks and primary sectors, such as the forest sector, are likely to be at the forefront.[42]

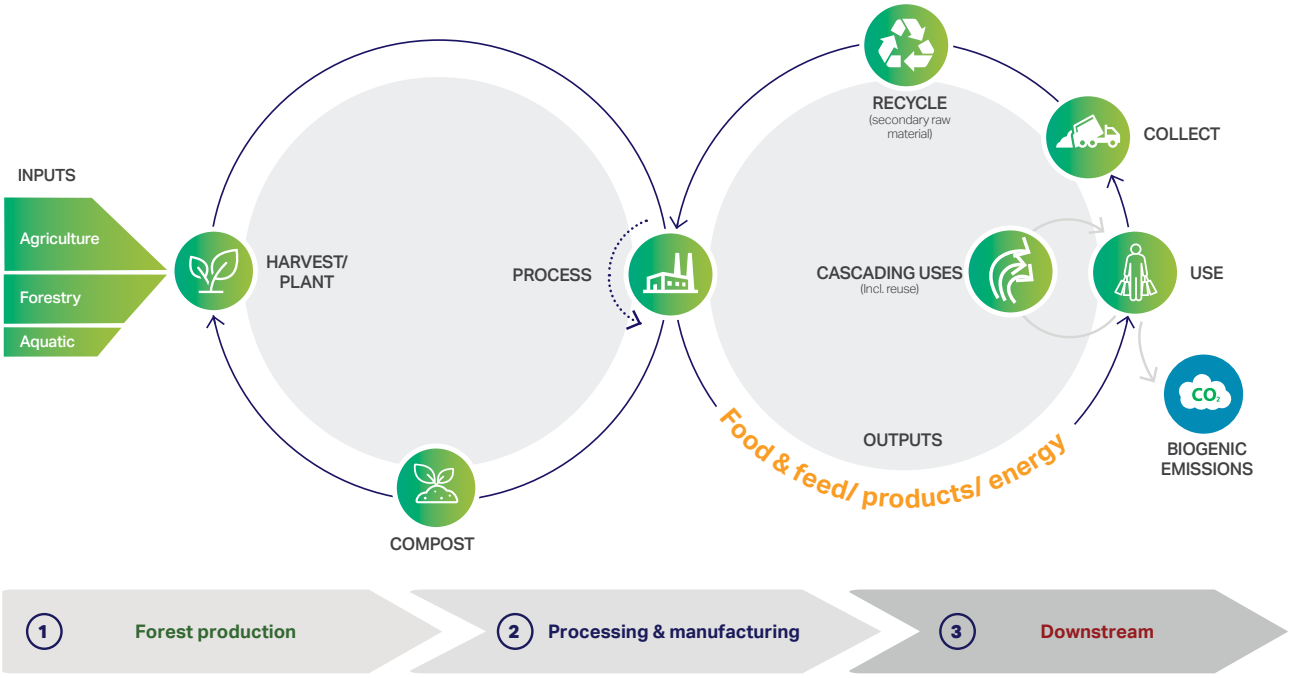
④ Putting nature at the heart of the value chain

Scaling up the circular bioeconomy

Linear value chains that depend on the continuous and increasing extraction of natural resources are the foundations of current economic systems. As the global population grows to reach almost 10 billion by 2050, humans will be living in an increasingly resource-constrained world, using natural resources beyond the regenerative capacity of the planet. Halting nature loss requires transitioning to a more regenerative economic model based on sustainably managed, renewable resources. As wood is a renewable and recyclable raw material, the forest sector is in a position to scale-up the circular bioeconomy (Figure 13) as an alternative model by:

1. Maintaining and enhancing the working forests from which forest products originate;
2. Reducing the impacts of processing, manufacturing and transportation;
3. Maximizing the recovery of materials and products.

Figure 13: Flows within the circular bioeconomy



Source: WBCSD[43]
Description: *In a circular bioeconomy, companies harvest and process agriculture, forestry and aquatic input resources into products, food, feed or energy, then reuse and cascade them over multiple periods to ultimately recycle or compost them to give the nutrients back to the soil. The combustion of biomass can release biogenic emissions during the cycle.*

Box 3: Focus - The circular bioeconomy defined

The bioeconomy is the use of biological resources to produce food and feed, products and energy. In a circular bioeconomy, biological resources are renewable, sustainably managed, recovered and reused as much as possible. This alternative economic model is gaining momentum to decarbonize the economy and sustainably integrate nature into productive systems. The forest sector lies at the heart of this transition to a low-carbon circular bioeconomy due to the renewable and recyclable nature of the materials, as well as the ability of forest products to capture and store carbon. These can effectively substitute for and complement fossil-based materials in sectors such as packaging, construction materials, textiles, energy, pharmaceuticals or even vehicle components. In addition to the societal benefits, the shift to a sustainable, low-carbon, circular bioeconomy represents a business opportunity estimated at USD $7.7 trillion.[44]

Halting & reversing nature loss along the forest products value chain

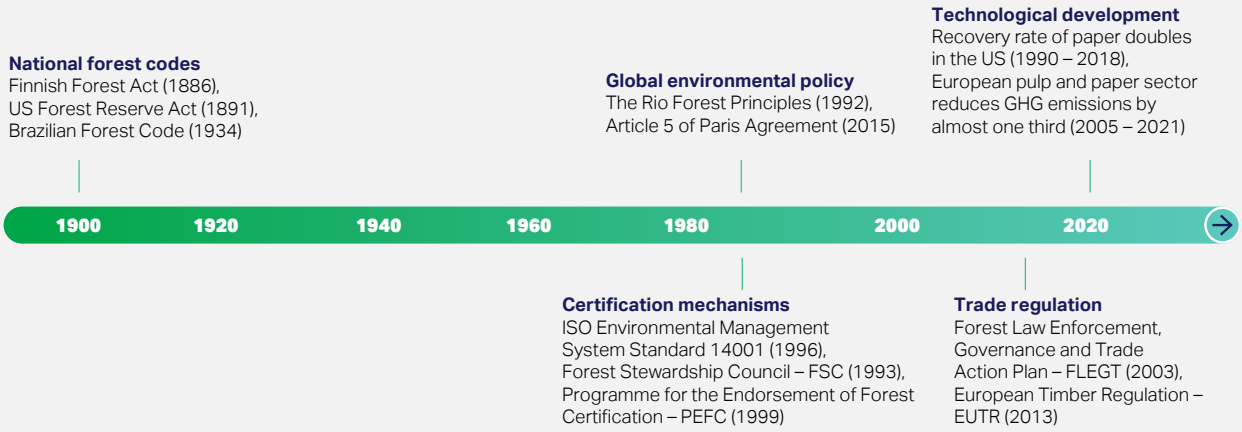
In order to halt and reverse nature loss through the growth of the circular bioeconomy, forest companies should start by considering the full spectrum of science-informed actions they can take and assess their relevance in the context of their specific business and location. To support companies in this process, this section provides a comprehensive overview of actions the forest sector can implement in their operations and value chains to halt and reverse nature loss.

Based on the mitigation hierarchy (Figure 8), we introduce a distinction between actions that contribute to halting nature loss (actions to avoid or reduce loss of nature) and those that contribute to reversing loss (restorative and regenerative actions). While many of these practices are already mainstream in the sector due to some of the nature-related milestones described in Box 4, it is possible to advance further, scale up and replicate others. Companies should implement these individual actions as part of a cohesive corporate-level strategy and, when relevant, through collaboration across value chains, sectors and with multiple stakeholders at the landscape or regional level. Businesses should act on all fronts simultaneously while prioritizing actions where they have the most leverage and that lead to the highest impacts.

Box 4: Focus - Nature-related milestones in the forest sector

Over the last century – and mainly since the 1990s – several key milestones have led to leaps forward in the forest sector's management of its impacts and dependencies on nature. When considering the sector's actions to halt and reverse nature loss, it is essential to put these in the context of the historical baseline.

Figure 14: Significant nature-related milestones in the forest sector



Forest and timber trade legislation:

National forest codes started to emerge toward the end of the 19th century to regulate the management of forests and guarantee the long-term supply of timber. Since the early 2000s, regional regulations complement many national forest codes to cover timber trade as well. By 2020, national forest policies and legislation covered 99% of the global forest area, with additional traceability systems for forest products at the national level covering 84%.[45]

Certification systems:

Over the past 30 years, forest certification has become a reference to verify and demonstrate responsible forest management and sourcing practices. Certification can be an effective, market-based tool for protecting and enhancing critical biodiversity and ecosystems in forests as it is based on internationally defined biodiversity regulatory frameworks. In 2019, about 10% of the global forest area was certified (see Box 5 on certification).[46]

Technological developments:

Since the early 2000s, driven partially by regulatory require ments, the forest sector has invested heavily in improving resource, water and process efficiency. For example, in Europe, the pulp and paper sector achieved GHG emissions reductions of 28% between 2005 and 2021[47] and in the United States the recovery rate of paper has doubled since 1990. Due to progress in closed-loop systems and modern water treatment facilities, most prominent water impacts have also been reduced significantly.

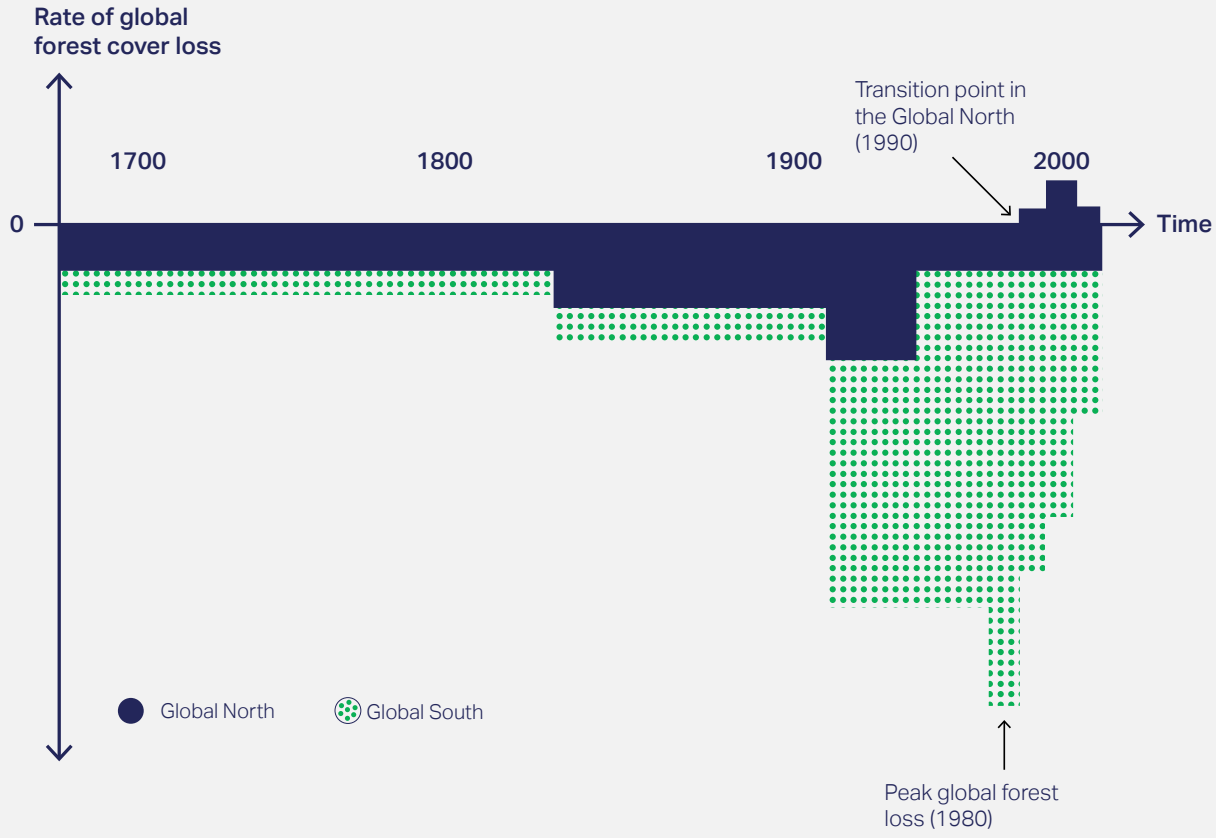
Box 4: Focus - Nature-related milestones in the forest sector (continued)

Forests in multilateral environmental agreements and processes:
At the 1992 Earth Summit, the United Nations (UN) agreed on the Forest Principles, a non-legally binding authoritative statement of principles for a global consensus on the management, conservation and sustainable development of all types of forests. In 2007, the Intergovernmental Panel on Climate Change (IPCC) emphasized the important role forests play in climate change mitigation. In 2015, the United Nations Climate Change Conference released the Paris Agreement, encouraging all parties to conserve and enhance forests, including through sustainable forest management.

Figure 16 below illustrates how, in part due to some of these milestones, the Global North has reached the so-called "transition point" and is experiencing net gains in forest cover and growing stock since the 1990s. While many factors have contributed to this – such as increased temperature and nitrogen availability – improved forest protection, restoration and management by the forest sector played a leading role.[49]

Leading up to that point, net global forest loss peaked in the 1980s, and losses have since then steadily declined due to a decrease in deforestation in the Global South and continued increases in forest cover in the Global North. Although the annual rate of deforestation is declining, the issue remains a major cause of global concern. While data and the main drivers of deforestation vary regionally, global estimates link around 10% of global deforestation to forest products and the remaining share mainly to agriculture, with beef and oil seeds playing a significant role.[50]

Figure 15: Decadal changes in global forest cover (1700 – 2020)



Source: Adapted from Ritchie and Roser[48]

Forest production

Forest companies that own, lease or manage working forests promote sustainable forest management practices for the long-term delivery of a wide range of goods and ecosystem services. Companies that do not own the forests from which they source work with suppliers and landowners to uphold the same standards. In addition to actions prescribed by national and regional regulations, voluntary forest certification systems provide an effective tool to drive actions that contribute to positive outcomes for nature (see Box 5 on certification). The perpetual cycle of harvesting and planting ensures a sustainable and renewable supply of wood to feed the growing circular bioeconomy.

Table 3 offers an overview of levers of the mitigation hierarchy in forest production: avoid, reduce, restore & regenerate.

Table 3: Overview of the levers of the mitigation hierarchy in forest production

RESTORE & REGENERATE	Most high-impact restorative and regenerative actions lie in the forest production stage of the value chain, where the sector interacts most closely with nature. Combined with actions to avoid and reduce nature loss, these high-impact actions present the greatest opportunity for the sector to contribute to bringing back more nature. We identified four key restorative and regenerative actions as priority areas of action, to be scaled up throughout the sector.
REDUCE	Given the high dependency of the sector on thriving ecosystems for its prosperity, there are strong incentives for actions to reduce any unavoidable negative impacts on nature. Forest managers routinely take a range of actions to protect nature and reduce these impacts throughout establishment, management and harvesting.
AVOID	Some practices have such deep and intricate impacts on nature that it is crucial to avoid them altogether. For the forest sector, these are deforestation and the conversion of areas of significant biodiversity and carbon value to intensively managed forests. Forest certification and rigorous traceability systems provide effective tools for forest companies to manage the risks associated with deforestation and forest conversion in their operations and value chains.

Table 4 offers a comprehensive list of actions available to forest companies to halt and reverse nature loss. Although sustainable forest management practices vary based on the type of forests – from managed natural and semi-natural forests to plantation forests – these actions generally apply to all types of forests. The prescription of the vast majority of these actions by forest certification systems contributes to mainstreaming sustainable forest management practices across the sector.

Table 4: List of actions to halt and reverse nature loss in forest production

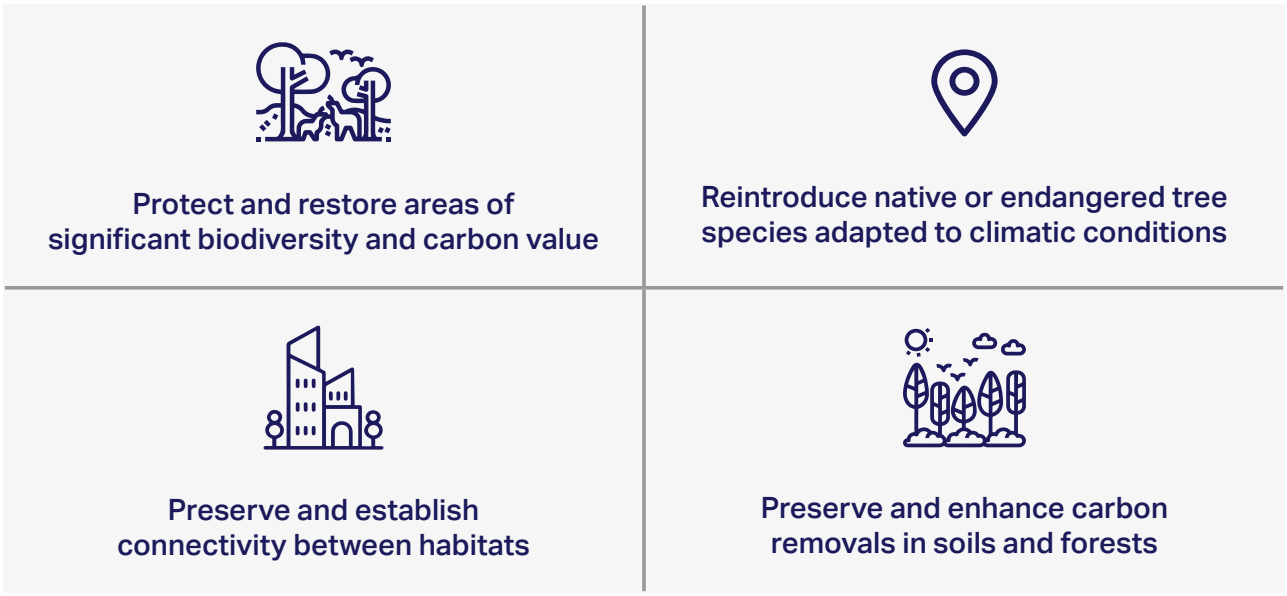
	Establishment	Management	Harvesting
RESTORE & REGENERATE	• **Restore areas of significant biodiversity and carbon value** • **Restore connectivity between habitats** • **Restore native or endangered tree species adapted to climatic conditions**	• **Enhance carbon removals in soils and forests**	
REDUCE	• **Protect water bodies, as well as areas of significant biodiversity and carbon value** • **Promote forest diversity** • Reduce water use and waste in nurseries and forest operations • Prevent contamination of water bodies • Reduce impacts from road networks • Optimize land use	• **Reduce climate change-induced pressures** • **Reduce pressures from invasive species** • Prevent poaching and illegal logging • Protect soil quality	• **Protect biodiversity during harvesting** • **Replant productive forests after harvest** • Reduce GHG emissions from harvesting and transportation
AVOID	• **Avoid deforestation in direct operations and value chain** • **Avoid conversion of areas of significant biodiversity value to intensively managed forests**		

Description: *The actions in bold are considered priority actions with high impact on the issue and high degree of influence from forest companies. Appendix B includes the full list of actions with examples of specific practices.*

High-impact restorative and regenerative actions in forest production

Meeting the Global Goal for Nature requires that nature be measurably on the path to recovery by 2030, with human activity actively contributing to nature regeneration. The forest sector is characterized by access to large areas of land – directly owned, leased or managed by companies, governments and local communities or through wood procurement – which offers a real opportunity to bring back more nature through restorative and regenerative practices. Below we describe four high-impact restorative and regenerative actions that the forest sector has the knowledge and resources to promote simultaneously in its operations, in its value chains and at the landscape level (Figure 16). Implementing these actions on degraded land (estimated at nearly 2 billion hectares globally[51]) will further augment the impact. To reach scale, forest companies will need to adopt landscape-level approaches involving other land users and work closely with governments, investors, communities and civil society organizations in their region of operation to deploy an inclusive and coordinated approach. The following section describes each of these four actions, illustrated with examples from the forest sector.

Figure 16: Four high-impact restorative and regenerative actions in forest production



Protect and restore areas of significant biodiversity and carbon value

Forest companies are increasingly expected to go beyond the protection of areas of significant biodiversity value to actively restore degraded lands within their managed land and beyond. National and regional regulatory frameworks for forests, as well as major forest certification systems, prescribe the designation of an area of land to manage for conservation or restoration, as well as qualitative requirements. Increasingly, ambitious company-level restoration targets are going beyond these requirements.

Restoring areas of significant biodiversity and carbon value within and surrounding forest production sites, such as wetlands, peatlands and riparian buffer zones, both benefits nature and can improve the productivity of forestry stands. Restoring surrounding ecosystems can help protect natural resources and the ecosystem services on which the forest sector depends, such as water quality and availability, soil protection, pest and disease control, and wildfire reduction. Although the availability of funding for such activities can be a critical barrier to overcome, the maturation of markets for carbon, biodiversity and other payments for ecosystem services (PES) are starting to improve the economics.

Manulife Investment Management

ILLUSTRATIVE EXAMPLE

Restoring areas of warm temperate rainforests adjacent to productive forest

In Australia, HVP Plantations, a timberland management entity of Manulife Investment Management, has restored areas of warm temperature rainforest adjacent to its productive forest. Warm temperate rainforests have high levels of flora biodiversity and are home to various endemic species. The area restored by HVP was subject to land clearing for farming and ranching over a century ago. While some patches are regenerating naturally, others need direct restoration support, notably due to the presence of invasive species. In partnership with local partners, HVP removed the widespread invasive blackberry causing the deterioration of natural habitats and planted 11,000 rainforest canopy trees to kick-start the regeneration and recovery process and prevent the invasive species from recolonizing. As part of the regional authorities' restoration target, the plots are monitored to follow the long-term recovery of this ecosystem and to ensure the continued success of the project.

Reintroduce native or endangered tree species adapted to climatic conditions

The planting of native and endangered tree species resilient to existing and future climatic and natural conditions can protect, restore and enhance biodiversity and ecosystem services in productive forests or areas managed for conservation and restoration. Silvicultural interventions can help natural and semi-natural forests, where native and endangered species are already present, thrive. Similarly, in some cases, incorporating different species into plantations can help improve resilience to droughts, pests, diseases and wildfires, thereby creating a business case for plantation owners.[52] Although a few studies point to potential productivity gains from mixed species production models,[53,54] their viability largely depends on the existence of profitable markets for the grown timber. Finally, forest companies can contribute their state-of-the-art tree breeding and nursery infrastructure to reintroduce and grow endangered native species for internal and external restoration projects.

sappi

ILLUSTRATIVE EXAMPLE

Protecting and reintroducing the endangered pepper-bark tree

In South Africa, Sappi is leading efforts to protect and reintroduce the pepper-bark tree (*Warburgia salutaris*), which is endangered due to habitat loss, overharvesting and poaching for its use in traditional medicines. Sappi's initiative focuses on reintroducing it into local communities, working closely with private and public sector partners, academia and local traditional healers. Since 2015, Sappi has grown and donated 65,000 seedlings to communities and engaged with 200 traditional healers and other community members through workshops on planting, tending and sustainable harvesting. Thanks to its success, the initiative has expanded nationally and to neighboring countries Eswatini and Zimbabwe.

Preserve and establish connectivity between habitats

Improving connectivity in fragmented landscapes contributes to preserving the habitat of a wide variety of forest and non-forest species, including animal and plant species at risk of extinction. For example, reconnecting fragmentized parcels of forest can ensure the survival of certain animals through a safe migration route to areas with more suitable climatic and natural conditions.[55] Also, plant species such as mosses and lichens thrive in damp and shady conditions often found deep in forests and can be at risk when more forest edges are exposed to wind and sun. Natural or artificial wildlife corridors and crossings, such as habitat bridges over motorways or broader regions of connectivity at landscape-scale, can improve connectivity and species mobility.[56] To be effective, it is necessary to combine these corridors with hunting restrictions and illegal logging patrols.

INTERNATIONAL PAPER

ILLUSTRATIVE EXAMPLE

Restoring habitat connectivity along rivers in the Atlantic Rainforest

In Brazil, as part of the Atlantic Forest Restoration Pact, International Paper partnered with WWF to restore degraded forests along rivers in the Mogi Guaçu watershed. The conversion of the land to other uses in the area has fragmented these natural corridors where animals migrate and hunt. Because local family famers own much of the land, the success of the project hinges on the buy-in and participation of private landowners, requiring a multi-stakeholder approach centered on private landowner engagement. The restored connectivity between the fragmented forests contributes to regulating soil erosion, filtering out pollutants, maintaining watershed stability, and creating corridors for wildlife.

Preserve and enhance carbon removals in soils and forests

Natural climate solutions (NCS), through conservation, restoration and improved land management, can provide more than a third of the cost-effective CO_2 mitigation needed by 2030.[57] A major share of the mitigation potential lies in protecting existing carbon stocks in soil organic matter and in living biomass within forests and adjacent ecosystems while also increasing the uptake of carbon where feasible. A range of silvicultural management techniques are known to secure above- and below-ground carbon stocks in managed forests, such as extending rotations, retaining coarse woody debris, minimizing soil disturbance or selection cutting.[58]

SUMITOMO FORESTRY

ILLUSTRATIVE EXAMPLE

Preserving and enhancing carbon removals in peatlands

In Indonesia, Sumitomo Forestry developed a new sustainable peatland management model to preserve and enhance the carbon stocks of these high-value wetland ecosystems. Peatlands cover only 3% of the global land area but store twice as much carbon as all the world's forests.[59] Conventional tropical peatland management often consists of drying the land by digging drainage canals, leading to high risk of large-scale fires that release greenhouse gases and impact the aquatic fauna and the health of local communities. Working with the Indonesian Government and neighboring concession owners, Sumitomo Forestry introduced a stock-based water management approach based on peat dams – resembling the irrigation system for rice paddies – designed to achieve high levels of water retention. This leads to healthy and resilient peatland ecosystems, securing and enhancing carbon stocks while providing habitat for wildlife.

Box 5: Focus - The role of forest certification in driving nature-positive outcomes

Over the last 30 years, forest certification has grown to cover over 10% of the global forest area[60] and become a reference to verify and demonstrate responsible forest management and sourcing practices. The three largest independent third-party certification systems – the Forest Stewardship Council (FSC), Programme for the Endorsement of Forest Certification (PEFC) and Sustainable Forestry Initiative (SFI) – prescribe the majority of actions taken by companies to halt and reverse nature loss. These provide a valuable framework to incentivize and reward actions that contribute to nature-positive. They also contribute to mainstreaming essential sustainable forest management practices such as avoiding the conversion of natural forests to plantations, setting aside a portion of land for conservation and restoration or restoring areas of significant biodiversity value. Certification systems also increasingly require forest companies to consider climate resilience and social implications when identifying areas for conservation and restoration. Therefore, certifying a company's forest management or wood procurement under an internationally recognized independent third-party certification is an important first step in a company's nature-positive journey.

To continue to act as catalysts for progress toward nature-positive, forest certification systems ought to keep raising their ambition to stay at the forefront of a fast-evolving agenda and changing expectations and practices. For example, although certification systems require companies to set aside land for conservation or restoration within their landholdings, yet not all have the same prescriptions regarding ecosystem quality. As site-level data collection is a challenge for nature-positive strategies, certification systems have begun to play a valuable a role in data collection on biodiversity metrics in certified areas, advancing tools to measure, value and report on impacts on nature over time.

Processing & manufacturing

Once the harvested wood leaves the forest, processing and manufacturing activities turn it intoz a variety of products for everyday use, such as pulp, paper, packaging, tissue paper, building materials, biomaterials and bioenergy. The impacts on nature resulting from production processes – and their level of environmental regulation – differ greatly based on product categories and regions of operation. The reduction of impacts on nature is generally tied to technological upgrades and process optimization, as well as close collaboration with suppliers of raw materials such as wood, fiber or chemicals. Table 5 offers an overview of the levers of the mitigation hierarchy in processing & manufacturing: avoid, reduce, restore and regenerate.

Table 5: Overview of the levers of the mitigation hierarchy in processing & manufacturing

RESTORE & REGENERATE	Fewer restorative and regenerative actions exist at the processing and manufacturing stage. While this applies to all sectors, the forest sector has the opportunity to tap into knowledge and resources in-house to support the restoration of areas of significant biodiversity value on-site and in areas surrounding industrial facilities. Also, at the end-of-life of the infrastructure, companies should rehabilitate the sites so they can provide the same level of ecosystems services as before.
REDUCE	The forest sector is subject to scrutiny related to production facility water consumption, energy intensity and waste management. Legislation and industrial certification prescribe many mitigation measures, often achieved through best available technologies, exposing companies to risks for non-compliance. Improvements to product design mitigate some impacts related to the end-of-life of forest products, although positive impacts tend to materialize further downstream.
AVOID	While it is possible to mitigate many of the impacts of industrial facilities on nature, companies can eliminate some of the most harmful impacts through proper planning when establishing a new facility. Although industrial planning is highly regulated in many regions worldwide, in the absence of legislation, forest companies decide where to establish a new facility. In this situation, they should give environmental considerations the same weight as supply chain optimization or economics.

Table 6 offers a comprehensive list of actions available to forest companies to halt and reverse nature loss in processing and manufacturing operations. The level of regulation related to the management of the environmental impacts of these facilities varies by country and region. Companies commonly obtain certification to standards such as I*SO 9001: Quality Management System and ISO 14001: Environmental Management System* to show that they manage operations and procurement to the highest environmental standards.

Table 6: List of actions to halt and reverse nature loss in processing & manufacturing

	Establishment	Management	Infrastructure end of life
RESTORE & REGENERATE		• Restore areas of significant biodiversity value on mill site and surrounding areas	• Restore sites of decommissioned mills and other infrastructure
REDUCE	• Conserve areas of significant biodiversity value on mill site and surrounding areas	• **Reduce operational GHG emissions** • **Reduce and reuse operational waste** • Reduce disturbances (e.g., light, noise, vibration) from operations • Reduce water use and waste • Reduce water and soil pollution • Reduce air pollution • Reduce use of harmful chemicals	
AVOID	• **Avoid establishing new operations in/adjacent to areas of significant biodiversity value or in water-stressed regions**		

Description: *The actions in bold are considered priority actions with high impact on the issue and high degree of influence from forest companies. Appendix B includes the full list of actions with examples of practices.*

Downstream

Once forest products leave manufacturing facilities, they go to intermediaries or retailers and then on to customers and consumers. These stakeholders can contribute to nature-positive outcomes by choosing sustainable forest products over less sustainable alternatives and prolonging product life through reuse and recycling. Eventually, many products are incinerated or disposed in landfills at the end of life. While forest companies are generally not in direct control of downstream impacts, they can exert influence and work closely with value chain partners and local governments to drive impact. Table 7 offers an overview of the levers of the mitigation hierarchy downstream: avoid, reduce, restore and regenerate.

Table 7: Overview of the levers of the mitigation hierarchy downstream

RESTORE & REGENERATE	While forest companies are generally not in direct control of the impacts that occur at the end of a product's life, they can exert influence and work closely with value chain partners and local governments to drive impact. As this stage is further removed from direct contact with nature, there were no identifiable restorative and regenerative actions downstream.
REDUCE	To reduce impacts downstream, forest companies must collaborate with transportation and recycling partners, local municipalities and sectors that can re-use forest residuals or by-products as input raw materials. Although actions along the full value chain are needed to scale-up the circular bioeconomy model, engaging with forest product customers and consumers is key to raising awareness of the sustainable attributes of forest products and incentivizing their responsible purchase and use.
AVOID	As in other stages of the value chain, it is possible to prevent many impacts through careful planning when establishing new recycling facilities or landfills, such as avoiding proximity to areas of significant biodiversity value and to water bodies. As these facilities are generally not on the company's premises, close collaboration with value chain partners and government bodies is required.

Table 8 offers a comprehensive list of actions available to forest companies to halt and reverse nature loss in transportation and the use and end-of-life stages of forest products. Environmental footprint assessments across a company's entire value chain show that direct operational impacts are a relatively small part of a company's total nature impacts for many large organizations, with impacts often embedded in supply chains.[61] To address these, forest companies must extend their reach and work closely with value chain partners, governments and other stakeholders.

Table 8: List of actions to halt and reverse nature loss in processing & manufacturing

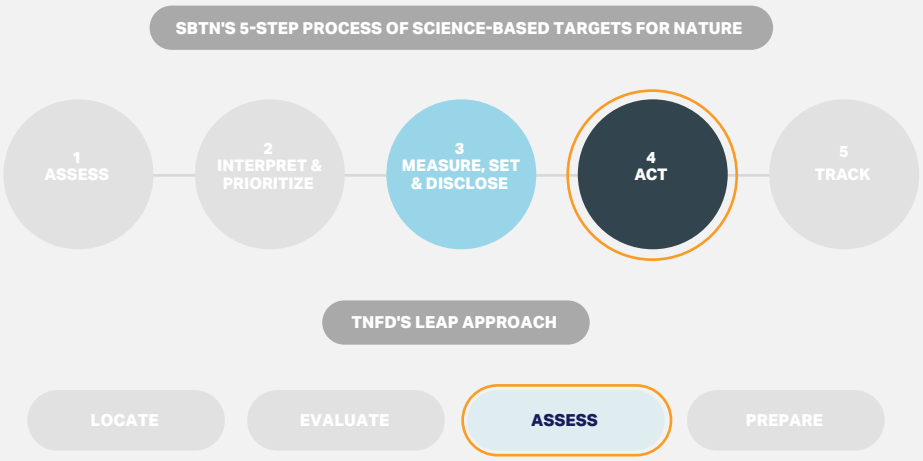
	Transport	Use	Product end of life
RESTORE & REGENERATE			
REDUCE	• Reduce use of transportation • Reduce impacts of transportation • Reduce value chain GHG emissions	• **Reduce use of fossil-based, non-renewable materials by stimulating use of forest products** • Enhance product lifetime	• Reduce pollution from waste disposal • Increase recovery rate of forest products • Increase re-use of residuals and by-products by other industries
AVOID			• Avoid establishing landfills or recycling facilities in/adjacent to areas of significant biodiversity value and water bodies

Description: *The actions in bold are considered priority actions with high impact on the issue and high degree of influence from forest companies. Appendix B includes the full list of actions with examples of practices.*

Box 6: Connections to SBTN and TNFD - Actions

After identifying material impacts and dependencies of their business along the full value chain, companies should prioritize places to take action, prioritizing action in areas important for biodiversity and degraded areas. Even without detailed baselines and target-setting, companies can take "no-regret" measures and set interim targets to prevent these impacts from materializing in their operations and value chains. This section can inform Step 4: Act in SBTN's 5-step process. It provides an overview of actions companies in the forest sector can take to halt and reverse the nature loss based on SBTN's mitigation hierarchy (Figure 8). This will help companies work retroactively on Step 3: Measure, set & disclose by providing visibility on the type of actions for which to set targets and measure progress through indicators (see examples below). The list of actions can also support companies in identifying nature-related opportunities as part of TNFD's LEAP approach (Phase: Assess).

Figure 17: Connections to SBTN/TNFD - Overview



Source: SBTN[62] and TNFD[63]

Table 9: Examples of targets and indicators tied to actions

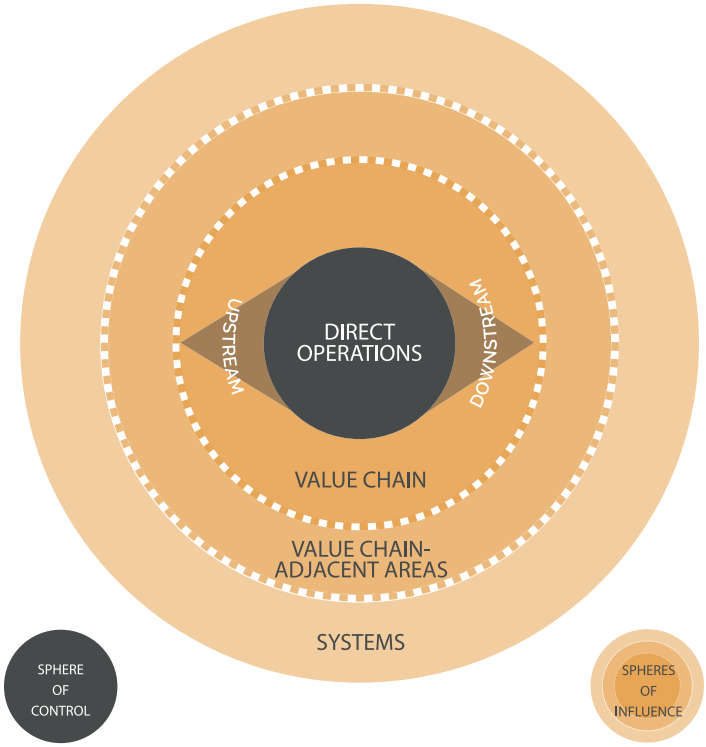
Example of actions	Illustrative target	Indicator
Reduce water use and waste in manufacturing	By 2030, reduce water use across all manufacturing sites by X%	Water withdrawn (m^3)
Reduce process and residual waste generated during manufacturing	By 2030, reduce process and residual waste generated across all manufacturing sites by X%	Share of reused process residuals and waste of total waste generated (%)
Reduce direct and indirect value chain emissions	By 2030, reduce scope 3 emissions by X%	GHG emissions (tons CO_2e)

⑤ Path to a nature-positive world

Stretching beyond business boundaries

In order to avoid irreversible nature loss, disruptive climate change and mounting social inequity, we must rethink and transform the systems that structure the world. Business has the potential to lead systemic improvements, for example, by demanding higher standards from suppliers and partners or advocating for regulatory reforms. The scale of the transformation calls for companies to stretch beyond their direct operations to reach the impacts embedded in supply chains and production systems.[65] This also means exerting influence over less discernable underlying drivers of nature loss, such as the dominant belief and value systems of individuals and organizations. Thoughtful and deliberate partnerships across supply chains and sectors, investment in landscapes and regions of operations, and advocacy for governments to raise policy ambitions for nature and climate can help reach these spheres of influence along and beyond the value chain as well as in value chain-adjacent areas (such as landscapes or regions) (Figure 18).

Figure 18: Spheres of control and spheres of influence



Source: SBTN[64]

Collaborative action will look different depending on the stage of the value chain:

In forest production: Various actors across productive areas and landscapes share risks related to water scarcity, biodiversity loss, ecosystem degradation and climate change. The management of shared resources spans property boundaries and requires context-based landscape management approaches to deliver meaningful outcomes at scale. These long-term initiatives engage multiple land owners, managers and other stakeholders (e.g., policy-makers and communities) within a given landscape. Companies engaging in these initiatives contribute by sharing their know-how and resources through coordinated, multi-stakeholder action at the landscape level.

In processing and manufacturing: To amplify impact beyond their direct operations, companies can engage in collaborative initiatives with local communities and municipalities in their regions of process, for example, by providing wastewater treatment services or district heating services to communities neighboring plants and mills. They can also engage with actors downstream in their value chain or other industries to reuse the waste generated.

Downstream: Collaboration is crucial for successful action downstream in the forest products value chain. Forest products customers and consumers hold the key to the growth of the circular bioeconomy through the choice of products and materials they make, as well as how they handle the end of life of products. Forest companies must work with customers to tackle barriers to the adoption of renewable forest products over less sustainable alternatives in different industries and increase product lifespan and material efficiency through smart product design and recycling capacity.

mondi

ILLUSTRATIVE EXAMPLE IN FOREST PRODUCTION

Landscape-level water stewardship

To manage operational risks related to water scarcity in South Africa, Mondi has built on its long-standing wetland management partnership with WWF to promote landscape-level water stewardship approaches in prioritized river catchments. The aim is to strengthen effective water resource management practices and governance while maintaining healthy freshwater ecosystems. This is done by engaging with the main land users (e.g., agricultural users, forestry companies, national and local government regulators, and manufacturing industries) across entire water catchments and by sharing best practices and lessons learned at national, regional and global levels. In order to expand the reach of the initiative, Mondi contributes to the development and implementation of water stewardship tools and standards with WWF and global certification systems.

cmpc

ILLUSTRATIVE EXAMPLE IN PROCESSING AND MANUFACTURING

Valorization of manufacturing waste

To minimize and add value to waste from its manufacturing operations in Brazil, CMPC has partnered with local waste treatment and recycling specialists VIDA to convert over 99% of the industrial residues from its pulping process into 15 new products, such as organic fertilizers, egg cartons and shoe insoles. The initiative diverts and reuses 600,000 tons of waste annually, thereby maximizing resource efficiency in the pulp production process. It is part of broader efforts by CMPC to drive system-level transformation by advocating for the growth of a sustainable circular bioeconomy through strategic partnerships at national, regional and global levels.

LLUSTRATIVE EXAMPLE DOWNSTREAM

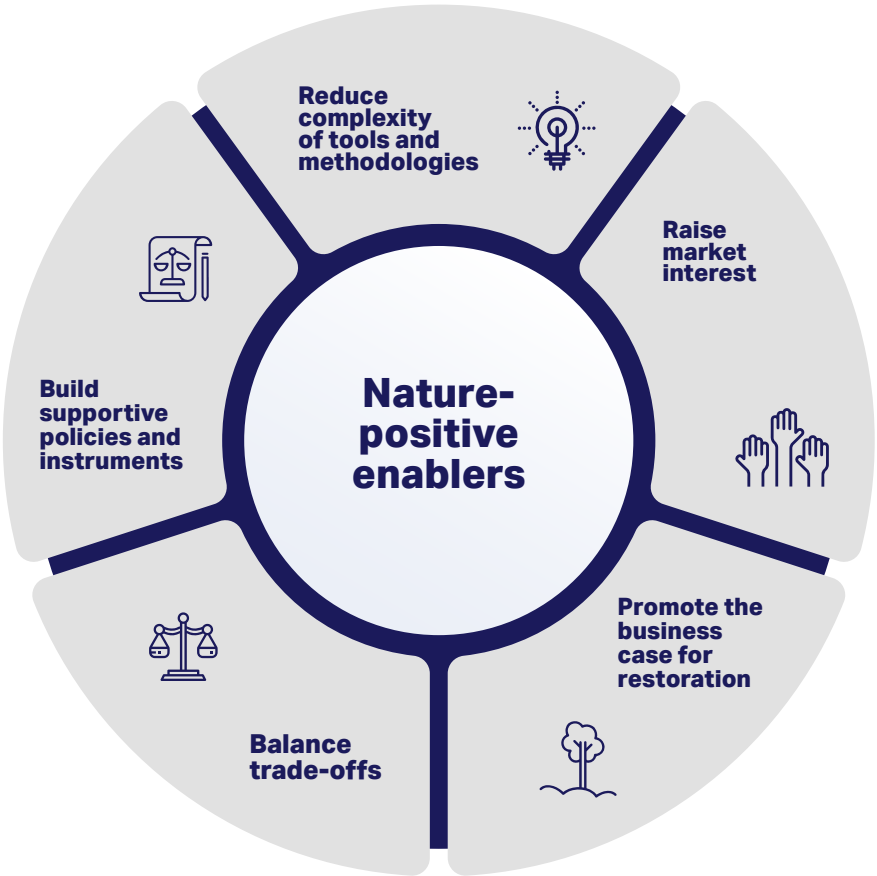
Tripling recycling capacity in Poland

To increase the recycling rate of forest-based products in Europe, Stora Enso has partnered with its client Tetra Pak to triple the annual recycling capacity of used beverage cartons in Poland. Together they have invested in building the recovery and recycling infrastructure that will allow for the recycling of the entire volume of used beverage cartons sold in Poland and neighboring countries. This joint investment in a complete recycling solution is set to significantly improve recycling throughout Central and Eastern Europe. The initiative bolsters Stora Enso's contribution to Europe's beverage carton recycling targets. It also contributes to Stora Enso's broader efforts to increase the global recycling rate of forest products.

Collectively catalyzing 5 key enablers

The road to a radically different economic model prospering in harmony with nature can seem daunting, but a number of recent developments point to a transition already in motion. To stay at the forefront, committed companies should continue striving for meaningful progress within their organizations and value chains while working collectively to overcome some of the biggest hurdles that will cross their path. Collective actions to catalyze the five enablers described in this section will contribute to leveling the playing field and to accelerating the scale and pace of the transition (Figure 19):

Figure 19: Nature-positive enablers



Reduce complexity of tools and methodologies

Companies aiming to deliver cohesive and impactful nature-positive strategies face considerable complexity related to the actions themselves, as well as the tools and methodologies to measure and disclose impacts. For example, delivering a multi-stakeholder landscape-level program to restore wildlife corridors can take years to operationalize, even without the additional challenge of measuring and disclosing progress on the ground. To address this, global tools and methodologies – such as the SBTN and TNFD frameworks – should strive for simplicity, alignment and usability. Until a common language and broadly accepted science-based tools, methods and metrics are available to business, the frontrunners will need to embrace the complexity and proactively invest in supporting the development of global frameworks and tools to ensure they are fit for purpose.

Raise market interest

Until the economic system (especially investors and customers) fully integrates nature-related risks and opportunities in decision-making, the benefits of investing in nature-positive initiatives will be undervalued and companies will struggle to reflect the added value in their products. Like all industries, the forest sector is under pressure to produce forest products at the lowest cost, competing within the sector and with alternative materials. Business actions contributing to nature-positive can require significant investments while not necessarily providing any short-term economic benefits. For these investments to drive a price premium, forest companies must invest in raising broader understanding of nature-related risks, as well as nature-positive practices among partners in their value chain, investors and governments. For example, the forest sector is working with the construction sector, scientists and architects to show the benefits of timber products in climate change mitigation and to overcome potential barriers to widespread adoption.

Promote the business case for restoration

It is necessary to further strengthen and communicate the financial rationale for pursuing regenerative and restorative actions. Following the rapid growth in carbon markets in the last decade, the United Nations Environment Programme (UNEP) estimates that nature-based assets could increase by 300 million hectares by 2050 compared to 2020, which will require a fourfold increase in investments in nature-based solutions compared to 2020.[66] Given this large financing gap and the urgency to meet climate and nature targets, leading banks and international NGOs are increasingly working together to explore and promote the business case for these investments. Deeper research into the business case for investing in regenerative and restorative practices will also be instrumental in catalyzing wider action by forest companies. For example, although there is a plethora of data demonstrating the ecological benefits of planting native tree species, research on the commercial returns is so far limited and mostly case-based.[67]

Balance trade-offs

In a world of finite resources, actions focused on nature-positive outcomes are bound to conflict with other environmental, social or economic priorities. Forest companies face the dual expectation of protecting and sustainably managing soils, carbon, water and biodiversity while also optimizing production to feed the growing bioeconomy. Common trade-offs are found in land-use prioritization (such as food vs. fiber) or different forest management methods (such as intensification vs extensification). Trade-offs are often tied to specific regions and require management with holistic, long-term outcomes in mind to strike the optimum balance for all priorities. For example, at the stand level, forest plantations are often associated with higher yields but less favorable biodiversity outcomes than managed semi-natural and natural forests. Yet applying a holistic, landscape-level view may reveal improved biodiversity outcomes at the landscape level due to areas set aside for conservation and restoration, or climate benefits when considering the fossil-based materials the renewable forest products will displace.

Build supportive policies and instruments

To support the transition to nature-positive, governments should mirror or exceed the level of ambition for climate in a set of nature-related global, regional and national policy goals and targets. The post-2020 Global Biodiversity Framework (GBF) of the Convention on Biological Diversity (CBD) aims to commit the global community to such goals. Public authorities can provide collaborative platforms, regulatory requirements and incentives to translate these goals into action on the ground. Local authorities can conduct integrated landscape planning, considering different land uses and environmental, social and economic challenges. Combined with the landscape-level target-setting, this gives a clear framework for forest companies to contribute effectively to restoration.[68] Regulation can also mandate compensation for and the offsetting of nature impacts of industrial and urban development activities to minimize negative impacts and provide funding for restoration activities. Incentives such as payments for ecosystem services (PES), subsidies and tax reductions for companies that conduct nature restoration work can also be effective in stimulating measures to recover nature when coupled with clear baselines and monitoring methodologies.

6 Commitment to action

As leading businesses in the forest sector, members of WBCSD's Forest Solutions Group recognize the need to rally behind a shared definition of nature-positive, and commit to work toward the following actions to accelerate the transformation of the forest sector:

Assess & prioritize: Based on the sector-level analysis provided in Figure 10, identify, assess and prioritize our individual company's impacts and dependencies on nature, first in our direct operations and over time in collaboration with supply chain partners.

Commit: Define baselines and reference conditions supported by evidence in priority locations and commit to time-bound, science-informed goals and targets to halt and reverse the loss of nature.

Preliminary guidance on baseline setting in the forest sector can be found in the *Forest Products Sector Guide to the Nature Capital Protocol*.[69]

Act: Building on the list of actions described in section IV of this report, define a clear set of actions to carry out, ideally accompanied by an analysis of how these actions will add up to net gains for nature.
Our companies should provide a cost for, sequence and prioritize them based on their impact and our leverage to drive change.

Measure & value: Measure and report on the outcomes of priority actions against a fixed baseline through a set of indicators and metrics aligned with nature targets. Further guidance on this step will come in the next phase of this roadmap.

Transform: Continue to build internal buy-in for integrated and inclusive net-zero and nature-positive strategies and disclosures. Build effective external partnerships to extend our companies' reach and work on catalyzing some of the key enablers for a nature-positive transition described in Figure 19.

In order to catalyze the system-level transformation needed to accelerate this urgent and far-reaching transition, we call on value chain partners, investors and policy-makers to join forces in building conducive enabling conditions:

Value chain partners

When sourced responsibly, forest products can contribute to climate change mitigation and nature regeneration. To drive progress to meet your own nature and climate goals, work with forest companies in your value chain to scale up action to grow the circular bioeconomy, and measure and disclose nature-related impacts through meaningful metrics.

Investors

Accelerate your portfolio's transition to nature-positive with forest sector investments that offer many co-benefits in addition to competitive financial returns. Do not wait for markets to value the ecosystem services and products they provide more accurately. Show leadership in incorporating nature-related risks in investment decision-making and recognizing the inherent value of sustainable working forests.

Policy-makers

Sustainable business leaders are acting for nature, but political leadership is needed to accelerate and scale up these actions to reverse nature loss this decade. Provide incentives for companies to assess and disclose their impacts and dependencies on nature and reform subsidies and incentive mechanisms that contribute to nature loss. Adopt national legislation, global targets and indicators informed by science that provide the right direction and financial incentives for business action.

Appendix A

Potential nature-related risks for the forest sector

Risk category	Nature-related risk
PHYSICAL RISK	**ACUTE** • Ecosystem degradation and biodiversity loss may diminish yields, reduce natural disease and pest control, and lead to soil and water contamination. • Increased occurrence of diseases and pests affecting tree species may result in widespread destruction or reduction in yield. • Degradation of nature and subsequent loss of natural protection exacerbates severity of damages from extreme weather such as cyclones, droughts, flooding, and storms.
	CHRONIC • Increased scarcity of key natural inputs, such as water and fiber, due to climate change and invasive species proliferation. • Changing climatic conditions and severe weather events may affect resilience, growth and survival of tree species and intactness of company operations in general.
TRANSITION RISK	**POLICY & LEGAL** • Changes to existing regulations or new regulations aimed at achieving nature-positive outcomes and targets in jurisdictions, requiring adaptations to production and operation methods. • Tighter legislation (e.g., trade restrictions, taxes) on activities, products or services that impact nature (e.g., tighter water consumption legislation for processing facilities) and rights, permits and allocations for natural resources to alleviate pressures on nature. • Enhanced reporting obligations for nature-related impacts and risks, increasing monitoring and reporting costs.
	MARKET • Shifting customer values or preferences to products with perceived lower impacts on nature may decline demand for certain forest products (e.g., away from single-use forest products) while increasing demand for others (e.g., increased demand for timber in construction). • Volatility or increased costs of materials due to increased competition or scarcity (e.g., increased price of timber can result in additional revenue, or increased costs depending on where the company is in the value chain).
	REPUTATION • Shift of consumer sentiment away from organizations/brands/products with a poorly perceived nature management leading to reduced demand for products, reduced supplier or off-take loyalty, or reduced employee retention.
	TECHNOLOGY • Transition to more efficient and cleaner technologies with lower nature impacts.
	• Lack of access to (high quality) data that hampers nature-related assessments. Regulators demanding the usage of new monitoring technologies that are costly to implement.

Description: *Table builds on the identified nature-related impacts and dependencies at the sector level and The Corporate Ecosystem Services Review*[70] *and provides an overview of the resulting nature-related risks for the forest sector. Risks are categorized using TNFD's risk classification system and identified risks build on TNFD's suggested risks and financial impacts.*

Appendix B

Actions and practices to halt & reverse nature loss

Methodology

- The list of business actions was developed based on FSG members' practices, a literature review and consultations with FSG members and key stakeholders.
- The actions constitute forest companies' response to relevant impacts on nature described in Table 2 in section III of this report. As nature-related impacts are often interlinked, actions don't generally contribute to addressing a single impact on nature but multiple ones.
- Although actions were categorized along three distinct stages of the value chain (i.e., forest production, processing and manufacturing, and downstream), some actions cut across multiple stages. For example, reusing processing residues from manufacturing will have impacts further downstream by reducing the amount of waste sent to landfills.
- Each stage of the value chain was further broken down by management stages. For example, forest production consists of the following steps: (pre)-establishment, forest management and harvesting. However, many actions aren't strictly tied to a singular management stage.
- In consultation with FSG members and external stakeholders, each action was mapped against the mitigation hierarchy, its relative expected impact on nature (high, medium or low) and the forest sector's relative influence over the implementation of the response (high, medium or low). Actions assessed as high on both expected impact and forest sector leverage are indicated in bold in the lists of actions.

a) In forest production

The vast majority of actions listed below are prescribed by the three largest independent third-party certification systems.

Mitigation hierarchy	Management step	Business action	Examples of practices
RESTORE & REGENERATE	ESTABLISHMENT	**Restore areas of significant biodiversity and carbon value**	• Returning trees to former forest land and improving the condition of degraded forests • Restore habitat features such as nesting cavities • Reintroduce keystone species
		Restore connectivity between habitats	• Create new and expand existing wildlife corridors and crossings • Reconnect fragmented parcels of forest in a landscape
		Restore native or endangered tree species adapted to climatic conditions	• Grow, plant and distribute native or endangered tree species • Restore growing conditions for native or endangered tree species, such as open forests
	MANAGEMENT	**Enhance carbon removals in soils and forests**	• Introduce sustainable water management and re-vegetation on degraded peatlands • Extend rotations, retain residues and increase productivity
REDUCE	ESTABLISHMENT	**Protect areas of significant biodiversity and carbon value**	• Create buffers zones along these areas (e.g., watercourses) • Optimize road network to avoid these areas
		Preserve forest diversity when replanting after harvest	• Preserve diversity in structure, age and species
		Reduce water use and waste in nurseries and forests	• Switch to drip irrigation in nurseries • Harvest rainwater for irrigation • Reduce the use and impact of water-demanding species in water stressed areas
		Prevent contamination of water bodies	• Protect, restore and establish riparian buffers • Reduce fertilizer and pesticide runoff in nurseries (e.g., install filter strips)
		Reduce impacts from road networks	• Optimize road networks • Establish wildlife crossings • Establish buffers to areas of significant biodiversity value
		Optimize use of land	• Introduce mixed production models (e.g., agroforestry) • Promote sustainable intensification

Note: *The actions in bold are considered priority actions with high impact on the issue and high degree of influence from forest companies.*

a) In forest production (continued)

Mitigation hierarchy	Management step	Business action	Examples of practices
REDUCE	MANAGEMENT	**Reduce climate change induced pressures**	• Plant tree species that are resilient to climate change • Reduce the spread of pests and diseases (e.g., monitoring, raising public awareness, sanitary felling) • Manage wildfire risk (e.g., monitoring, prescribed burning)
		Reduce pressures from invasive species	• Reduce the spread of invasive species (e.g., monitoring, raising public awareness, sanitary felling)
		Prevent poaching and illegal logging	• Introduce monitoring, patrols and check points in high risk areas • Apply due diligence and traceability systems
		Protect soil quality	• Consider seasonal variations when planning logging sites • Increase organic matter inputs through residue retention • Minimize use of chemical pesticides and fertilizers
	HARVESTING	**Protect biodiversity during harvesting**	• Promote sustainable forest management practices (e.g., through certification) • Maintain habitat features such as decaying wood, high-stumps and retention trees
		Replant productive forests after harvest	• Plant seedlings and support natural regeneration • Protect seedlings from weather and pests • Monitor growth of seedlings and replant if required
		Reduce GHG emissions from harvesting and transportation	• Upgrade machinery to increase energy efficiency • Switch to cleaner fuels • Optimize transport modes • Protect soils during harvesting
AVOID	ESTABLISHMENT	**Avoid deforestation in direct operations and value chain**	• Engage supply chain to improve traceability • Apply due diligence and traceability systems • Survey sites diligently during planning process
		Avoid conversion of areas of significant biodiversity value to intensively managed forests	

b) In processing & manufacturing

Mitigation hierarchy	Management step	Business action	Examples of practices
RESTORE & REGENERATE	ESTABLISHMENT	Restore areas of significant biodiversity value on mill site and surrounding areas	• Restore native vegetation and habitat features • Support pollination by introducing beehives
	INFRASTRUCTURE END OF LIFE	Restore sites of decommissioned mills and other infrastructure	• Clear decommissioned infrastructure • Restore ecosystems with special focus on areas prone to erosion or weed infestation
	ESTABLISHMENT	Protect areas of significant biodiversity value on mill site and surrounding areas	• Survey mill site and surrounding areas • Designate and protect areas of significant biodiversity value
REDUCE	MANAGEMENT	**Reduce operational GHG emissions**	• Increase energy efficiency (e.g., automation, combined heat and power systems, improved insulation) • Increase use of renewable energy (e.g., solar, biomass) • Introduce carbon capture technology
		Reduce and reuse operational waste	• Improve resource efficiency (e.g., technological upgrades) • Maximize recycling of waste and processing residues • Improve product design to maximize lifetime and recovery potential (e.g., minimize use of non-recyclable components and treatments)
		Reduce disturbances (e.g., light, noise, vibration) from operations	• Install silencers and dampers • Limit range of light pollution through smart light design • Switch to electric timber trucks
		Reduce water use and waste	• Reduce amount of water withdrawn (e.g., reuse treated wastewater) • Increase share of water returned (e.g., water recycling)
		Reduce water and soil pollution	• Improve wastewater treatment (e.g., through membrane technologies) • Practice chemical recovery
		Reduce air pollution	• Install filters and scrubbers • Use clean energy sources • Recover chemicals from waste streams
		Reduce use of harmful chemicals	• Substitute with bio-based chemicals, adhesives and coatings
AVOID	ESTABLISHMENT	**Avoid establishing new operations in/adjacent to areas of significant biodiversity value or in water-stressed regions**	• Survey sites diligently during planning process • Optimize access roads to avoid these areas

Note: *Actions in bold are high impact action = high impact on the issue and high degree of influence for forest companies*

c) Downstream

Mitigation hierarchy	Management step	Business action	Examples of practices
REDUCE	TRANSPORT	Reduce use of transportation	• Localize supply chains • Optimize transportation routes • Maximize shipping efficiency (e.g., standardize packaging)
		Reduce impacts of transportation	• Improve onboard waste treatment systems on ships • Upgrade vehicles
		Reduce value chain GHG emissions	• Switch to vehicles with higher fuel efficiency • Switch to electric vehicles • Optimize transportation modes
	USE	**Reduce use of fossil-based and non-renewable materials by stimulating use of forest products**	• Raise consumer and customers awareness of the sustainable attributes of forest products • Invest in innovation for better and new applications of fiber-based materials
		Enhance products lifetime	• Engage with customers to encourage reuse of forest product (e.g., take-back programs, modular furniture) • Create multipurpose products (product design)
	PRODUCT END OF LIFE	Reduce pollution from waste disposal	• Ensure safe disposal of hazardous waste • Reuse by-products
		Increase recovery rate of forest products	• Educate consumers about recyclability of forest products • Invest in local recycling infrastructure
		Increase reuse of residuals and by-products by other industries	• Reuse by-products • Engage with other industries to use residual-based alternatives (e.g., paper sludge for bioenergy and fertilizer producers, paper fibers and fillers for the brick industry)
AVOID	PRODUCT END OF LIFE	Avoid establishing new landfills or recycling facilities in/adjacent to areas of significant biodiversity value and water bodies	• Survey site diligently during planning process • Optimize access roads

Note: *The actions in bold are considered priority actions with high impact on the issue and high degree of influence from forest companies.*

Appendix C

Glossary

Term	Definition
Business actions/ responses	Individuals or groups can respond "to prevent, compensate, ameliorate or adapt to changes in the state of the environment." (European Environment Agency EEA) Responses can have a positive or negative effect on the drivers, pressures, states and impacts they seek to address. Examples of responses include the use changing production practices and technologies, changing management practices. (SBTN)
Circular bioeconomy	The bioeconomy is the use of biological resources to produce food and feed, products and energy. In a circular bioeconomy, biological resources are renewable, sustainably managed, recovered and reused as much as possible. (WBCSD)
Dependencies	Aspects of ecosystem services that an organization or other actor relies on to function. Dependencies include ecosystems' ability to regulate water flow, water quality and hazards like fires and floods, provide a suitable habitat for pollinators (who in turn provide a service directly to economies) and sequester carbon (in terrestrial, freshwater and marine realms). (SBTN/TNFD)
Direct operations	All activities, sites (e.g., buildings, farms, mines, retail stores) and vehicles over which the enterprise has operational or financial control. This includes majority owned subsidiaries. In SBTN terminology, direct operations may also be referred to as the sphere of control. (SBTN)
Downstream	All activities that are linked to the sale of products and services produced by the company setting targets. This includes the use and reuse of the product and its end of life to include recovery, recycling and final disposal. (SBTN) In the frame of this report, we consider transportation under downstream.
Global Goal for Nature	Policy ask for a global goal that identifies the level of ambition needed to achieve a nature-positive world with three measurable temporal objectives: zero net loss of nature from 2020, net positive by 2030, and full recovery by 2050. (WBCSD)
Greenhouse gases (GHGs)	Those gaseous constituents of the atmosphere, both natural and anthropogenic (human-caused), that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, by the atmosphere itself and by clouds. This property causes the greenhouse effect, whereby heat is trapped in the Earth's atmosphere. Water vapor (H2O), carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), and ozone (O3) are the primary GHGs in the Earth's atmosphere. (CDR primer)
(Nature) impacts	Changes in the state of nature, which may result in changes to the capacity of nature to provide social and economic functions. Impacts can be positive or negative. They can be the result of an organization's or another party's actions and can be direct, indirect or cumulative. (SBTN/TNFD)
Mitigation (of climate change)	A human intervention to reduce emissions or enhance greenhouse gas sinks. (IPCC)
Mitigation hierarchy	The widely regarded as a best practice approach to managing biodiversity risk. According to the mitigation hierarchy, efforts should be made to prevent or avoid impacts to biodiversity, then minimize and reduce, and then repair or restore adverse effects. (UNEP FI) There are different versions of the mitigation hierarchy, some including biodiversity offsets and compensation. In the context of this report, we use SBTN's AR3T Framework built on the conservation mitigation hierarchy. The mitigation hierarchy has four levers: avoid, reduce, restore & regenerate, transform (defined in section II of this report).
Nature	Nature refers to the natural world, with an emphasis on biodiversity. Within the context of science, it includes categories such as biodiversity, ecosystems, ecosystem functioning, evolution, the biosphere, humankind's shared evolutionary heritage and biocultural diversity. Nature contributes to societies through the provision of contributions to people. (IPBES)
Nature-positive	A high-level goal and concept describing a future state of nature (e.g., biodiversity, nature's contributions to people) that is greater than the current state. (SBTN/TNFD)
Nature-based solutions (NBS)	Actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges (e.g., climate change, food and water security or natural disasters) effectively and adaptively, simultaneously providing human well-being and biodiversity benefits. (WBCSD)

Natural climate solutions (NCS)	Actions to conserve, restore or improve the management of land and coastal ecosystems (e.g., forests, wetlands, grasslands, agricultural land) that increase carbon storage and/or avoid greenhouse gas emissions and therefore neutralize residual emissions. Forest pathways, such as reforestation, avoided forest conversion, natural forest management, improved plantations, avoided wood fuel harvest and fire management, cover two-thirds of the cost-effective NCS mitigation potential needed between now and 2030 to stabilize warming to below 2°C. (Griscom et al.)
Natural forest	Natural forest refers to natural forests that are being managed for forest products but no planting is undertaken for regeneration purposes. (WBCSD)
Net-zero emissions	Emissions achieved when anthropogenic removals balance anthropogenic emissions of greenhouse gases to the atmosphere over a specified period. The reduction of emissions should follow science-based pathways that limit warming to 1.5°C, with no or limited overshoot. Permanent removals either within the value chain or through the purchase of valid offsets must fully neutralize any remaining attributable GHG emissions. This definition clarifies that purchasing offsets cannot be a substitute for emissions reductions but rather a tool to complete the neutralization process. (IPCC)
Plantation forest	Forests where companies (exclusively) undertake establishment or regeneration by planting of native or non-native tree species. (WBCSD)
Physical risks	Risks related to the physical impacts of climate change. Physical risks resulting from climate change can be event-driven (acute) or longer-term shifts (chronic) in climate patterns. Physical risks may have financial implications for organizations, such as direct damage to assets and indirect impacts from supply chain disruption from fires, flooding, drought, pests, wind, etc. See transition risks. (TCFD)
Pressures	Developments in release of substances (emissions), physical and biological agents, the use of resources and the use of land. The pressures society exerts are transported and transformed in a variety of natural processes to manifest themselves in changes in environmental conditions. (EEA)
Removal of carbon/ GHGs	Biogenic or technological absorption or sequestration of carbon dioxide and other GHGs from the atmosphere. (WRI/WBCSD)
Residual emissions	The emissions remaining after implementing all technically and economically feasible opportunities to reduce emissions in all covered scopes and sectors. (C40)
Semi-natural forest	Forests where some establishment or regeneration is natural and some happens when companies plant native or non-native tree species. (WBCSD)
Substitution	The ability to substitute non-renewable, fossil-based materials with renewable, bio-based products, such as forest products. (WBCSD)
Transition risks	Risks related to the transition to a lower carbon economy. Transitioning to a lower carbon economy may entail extensive policy, legal, technology and market changes to address mitigation and adaptation requirements related to climate change. Depending on the nature, speed and focus of these changes, transition risks may pose varying levels of financial and reputational risk to organizations. See physical risks. (TCFD)
Upstream	All activities associated with suppliers, e.g., production or cultivation, sourcing of commodities of goods, as well as transportation of commodities to manufacturing facilities. (SBTN)
Working forest	Forests actively managed to generate revenue from multiple sources, including physical goods for sale (such as sustainably produced timber) while maintaining ecosystem services and social values; thus, they are not converted to other land uses. (WRI)
Taskforce on Nature-related Financial Disclosures (TNFD)	A global, market-led initiative with the mission to develop and deliver a risk management and disclosure framework for organizations to report and act on evolving nature related risks, with the ultimate aim to support a shift in global financial flows away from nature negative outcomes and toward nature-positive outcomes. (TNFD)
Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)	Intergovernmental body that assesses the state of biodiversity and of the ecosystem services it provides to society in response to request from decision-makers. (IPBES)
Natural Capital Protocol	A decision-making framework that enables organizations to identify, measure and value their direct and indirect impacts and dependencies on natural capital. (Capitals Coalition)

Appendix D

List of interviewees

The Forest Solutions Group secretariat, supported by Terranomics, conducted seven interviews with forest stakeholders to validate the approach and capture insights and perspectives on the topic of nature-positive in the forest sector. The interviews took place in April and May 2022.

Name	Organization	Title
Daniel O'Brien	Taskforce on Nature-related Financial Disclosures (TNFD)	Taskforce member
	PricewaterhouseCoopers (PwC)	Partner, Sustainability & ESG, PwC Canada
Eva Zabey	Business for Nature (BfN)	Executive Director
Ilkka Norjamäki	Finnfund	Senior Investment Manager – Head of Agribusiness and Forestry
Kathy Abusow	Sustainable Forestry Initiative (SFI)	President and CEO
Kim Carstensen	Forest Stewardship Council (FSC)	Director General
Margot Wood	Science Based Targets Network (SBTN)	Member of the Technical Advisory Committee
	Conservation International	Director, Nature-Positive Science
Thorsten Arndt	Programme for the Endorsement of Forest Certification (PEFC)	Head of Communications

Endnotes

[1] Locke et al. (2021). A Nature-Positive World: The Global Goal for Nature. Retrieved from: https://www.nature.org/content/dam/tnc/nature/en/documents/NaturePositive_GlobalGoalCEO.pdf.

[2] WBCSD (2018). Forest Products Sector Guide to the Natural Capital Protocol. Retrieved from: https://www.wbcsd.org/Sector-Projects/Forest-Solutions-Group/Resources/Forest-Products-Sector-Guide-to-the-Natural-Capital-Protocol.

[3] Science Based Targets Network (SBTN) (2020). Why set SBTs?. Retrieved from: https://sciencebasedtargets-network.org/how-it-works/why-set-sbts-for-nature/.

[4] Taskforce on Nature-related Financial Disclosures (TNFD) (2022). Website. Retrieved from: https://tnfd.global/.

[5] WBCSD (2021). What does nature-positive mean for business? Retrieved from: https://www.wbcsd.org/contentwbc/download/13439/196253/1.

[6] Business for Nature (2022). High level actions for nature. Retrieved from: https://www.businessfornature.org/high-level-business-actions-on-nature.

[7] WBCSD (2021). What does nature-positive mean for business? Retrieved from: https://www.wbcsd.org/contentwbc/download/13439/196253/1.

[8] WBCSD (2018). Forest Sector Guide to the Natural Capital Protocol. Retrieved from: https://www.wbcsd.org/Sector-Projects/Forest-Solutions-Group/Resources/Forest-Products-Sector-Guide-to-the-Natural-Capital-Protocol.

[9] Science Based Targets Network (SBTN) (2020). Science-Based Targets for Nature. Initial Guidance for Business. Retrieved from: https://sciencebasedtargets-network.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf.

[10] Taskforce on Nature-related Financial Disclosures (TNFD) (2022). Nature-Related Risk & Opportunity Management and Disclosure Framework. Beta v.03. Retrieved from: https://framework.tnfd. global/.

[11] WBCSD (2021). Vision 2050: Time to transform. Retrieved from: https://www.wbcsd.org/Overview/About-us/Vision-2050-Time-to-Transform/Resources/Time-to-Transform.

[12] Taskforce on Nature-related Financial Disclosures (TNFD) (2022). Nature-Related Risk & Opportunity Management and Disclosure Framework. Beta v.03. Retrieved from: https://framework.tnfd.global/.

[13] Taskforce on Nature-related Financial Disclosures (TNFD) (2022). Nature-Related Risk & Opportunity Management and Disclosure Framework. Beta v.03. Retrieved from: https://framework.tnfd. global/.

[14] Potsdam Institute for Climate Impact Research (2022). Planetary boundaries update: freshwater boundary exceeds safe limits. Retrieved from: https://www.pik-potsdam.de/en/news/latest-news/planetary-boundaries-update-freshwater-boundary-exceeds-safe-limits.

[15] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (2019). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Retrieved from: https://ipbes.net/global-assessment.

[16] Science Based Targets Network (SBTN) (2020). Initial Guidance for Business. Retrieved from: https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf.

[17] Science Based Targets Network (SBTN) (2020). Initial Guidance for Business. Retrieved from: https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf.

[18] Nature Positive (n.a.). A Global Goal for Nature. Nature Positive by 2030. Retrieved from: https://www.naturepositive.org/.

[19] Locke et al. (2021). A Nature Positive World: The Global Goal for Nature. Retrieved from: https://www.wbcsd.org/Programs/Food-and-Nature/Nature/News/Embracing-a-Global-Goal-for-Nature.

[20] Science Based Targets Network (SBTN) (2020). Initial Guidance for Business. Retrieved from: https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf.

[21] Science Based Targets Network (SBTN) (2020). Initial Guidance for Business. Retrieved from: https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf.

[22] Science Based Targets Network (SBTN) (2020). Initial Guidance for Business. Retrieved from: https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf.

[23] WBCSD (2021). Forest Sector Net Zero Roadmap. Retrieved from: https://www.wbcsd.org/Sector-Projects/Forest-Solutions-Group/Resources/Forest-Sector-Net-Zero-Roadmap

[24] Science Based Targets Network (SBTN) (2020). Initial Guidance for Business. Retrieved from: https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf

[25] Food and Agriculture Organization of the United Nations (FAO) (2020). Global Forest Resources Assessment 2020. Retrieved from: https://www.fao.org/3/ca9825en/ca9825en.pdf.

[26] Food and Agriculture Organization of the United Nations (FAO) (2020). Global Forest Resources Assessment 2020. Retrieved from: https://www.fao.org/3/ca9825en/ca9825en.pdf.

[27] Griscom et al. (2017). Natural climate solutions. Retrieved from: https://www.researchgate.net/publication/320536154_Natural_climate_solutions.

[28] Food and Agriculture Organization of the United Nations (FAO) (2022). The state of the world's forests. Retrieved from: https://www.fao.org/3/cb9360en/cb9360en.pdf. Food and Agriculture Organization of the United Nations (FAO) (2020). Global Forest Resources Assessment 2020. Retrieved from: http://www.fao.org/3/ca9825en/ca9825en.pdf.

[29] United Nations (n.d.). SDG 15 Life on Land. Retrieved from: https://www.un.org/sustainabledevelopment/biodiversity/.

[30] Science Based Targets Network (SBTN) (2022). Sectoral Materiality Tool (February 2022). Retrieved from: https://science-basedtargetsnetwork.org/take-action-now/take-action-as-a-company/join-the-sbtn-corporate-engagement-program/corporate-engagement-members-only/target-setting-tools-and-guidance/.

[31] ENCORE (n.d.). Exploring Natural Capital Opportunities, Risks and Exposure. Retrieved from: https://encore.naturalcapital.finance/en.

[32] EXIOBASE (n.d.). Webpage. Retrieved from: https://www.exiobase.eu/.

[33] WBCSD (2018). Forest Products Sector Guide to the Natural Capital Protocol. Retrieved from: https://www.wbcsd.org/Sector-Projects/Forest-Solutions-Group/Resources/Forest-Products-Sector-Guide-to-the-Natural-Capital-Protocol.

[34] Science Based Targets Network (SBTN) (2022). Technical Guidance for Step 1: Assess and Step 2: Prioritize. Retrieved from: https://sciencebasedtargetsnetwork.org/wp-content/uploads/2022/09/Technical-Guidance-for-Step-1-Assess-and-Step-2-Prioritize.pdf.

[35] Taskforce on Nature-related Financial Disclosures (TNFD) (2022). Nature-Related Risk & Opportunity Management and Disclosure Framework. Beta v.03. Retrieved from: https://framework.tnfd.global/.

[36] Science Based Targets Network (SBTN) (2020). Initial Guidance for Business. Retrieved from: https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf.

[37] World Economic Forum and PwC. (2020). Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy. Retrieved from: https://www.weforum.org/reports/nature-risk-rising-why-the-crisis-engulfing-nature-matters-for-business-and-the-economy.

[38] ENCORE (2022). ENCORE (Exploring Natural Capital Opportunities, Risks and Exposure). Retrieved from: https://encore.naturalcapital.finance/en/explore.

[39] Taskforce on Nature-related Financial Disclosures (TNFD) (2022). Nature-Related Risk & Opportunity Management and Disclosure Framework. Beta v.03. Retrieved from: https://framework.tnfd.global/.

[40] World Economic Forum (2020). The Global Risks Report 2020. Retrieved from: https://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf.

[41] World Economic Forum and PwC (2020). Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy. Retrieved from: https://www.weforum.org/reports/nature-risk-rising-why-the-crisis-engulfing-nature-matters-for-business-and-the-economy.

[42] United Nations Environment Programme Finance Initiative (UNEP FI) (2021). Taskforce on Nature-related Financial Disclosures (TNFD) Launched. Retrieved from: https://www.unepfi.org/news/themes/ecosystems/tnfd-launch/.

[43] WBCSD (2020). Circular bioeconomy: The business opportunity contributing to a sustainable world. Retrieved from: https://www.wbcsd.org/Archive/Factor-10/Resources/The-circular-bioeconomy-A-business-opportunity-contributing-to-a-sustainable-world

[44] WBCSD (2020). The circular bioeconomy. A business opportunity contributing to a sustainable world. Retrieved from: https://www.wbcsd.org/Archive/Factor-10/Resources/The-circular-bioeconomy-A-business-opportunity-contributing-to-a-sustainable-world

[45] Food and Agriculture Organization of the United Nations (FAO) (2020). Global Forest Resources Assessment 2020. Retrieved from: http://www.fao.org/3/ca9825en/ca9825en.pdf.

[46] Food and Agriculture Organization (FAO) of the United Nations (2020). Global Forest Resources Assessment 2020. Retrieved from: http://www.fao.org/3/ca9825en/ca9825en.pdf.

[47] Confederation of European Paper Industries (CEPI) (2021). Cepi Energy Solutions Forum. Retrieved from: https://www.cepi.org/wp-content/uploads/2021/03/Energy-Solutions-Forum-in-brief.pdf

[48] Ritchie and Roser (2021). Forests and Deforestation. Retrieved from: https://ourworldindata.org/forests-and-deforestation.

[49] Kahle et al. (2008). Causes and Consequences of Forest Growth Trends in Europe - Results of the Recognition Project. EFI. Retrieved from: https://efi.int/publications-bank/causes-and-consequences-forest-growth-trends-europe-results-recognition-project.

[50] Union of Concerned Scientists (2016). Wood Products. Retrieved from: https://www.ucsusa.org/resources/wood-products.

[51] International Union for Conservation of Nature (2021). Forests and Climate Change. Retrieved from: https://www.iucn.org/resources/issues-briefs/forests-and-climate-change.

[52] Liu et al. (2018). Mixed-species versus monocultures in plantation forestry: Development, benefits, ecosystem services and perspectives for the future. Retrieved from: https://www.sciencedirect.com/science/article/pii/S235198941830088X.

[53] Davis et al. (2012). Challenging a paradigm: toward integrating indigenous species into tropical plantation forestry. Retrieved from: https://www.fs.usda.gov/treesearch/pubs/44261.

[54] Piotto, D. (2008). A meta-analysis comparing tree growth in monocultures and mixed plantations. Retrieved from: https://www.sciencedirect.com/science/article/abs/pii/S0378112707007360.

[55] Haber and Peter (2015). Planning for Connectivity. Retrieved from: https://defenders.org/sites/default/files/publications/planning-for-connectivity.pdf.

[56] Trees for Life (n.a.). Habitat Fragmentation. Retrieved from: https://treesforlife.org.uk/into-the-forest/habitats-and-ecology/human-impacts/habitat-fragmentation/.

[57] Griscom et al. (2017). Natural climate solutions. Retrieved from: https://www.researchgate.net/publication/320536154_Natural_climate_solutions.

[58] Kaarakka et al. (2021). Improved forest management as a natural climate solution. Retrieved from: https://besjournals.onlinelibrary.wiley.com/doi/full/10.1002/2688-8319.12090.

[59] United Nations Environment Programme (UNEP) (2019). Peatlands store twice as much carbon as all the world's forests. Retrieved from: https://www.unep.org/sw/node/24283

[60] Food and Agriculture Organization (FAO) of the United Nations (2020). Global Forest Resources Assessment 2020. Retrieved from: http://www.fao.org/3/ca9825en/ca9825en.pdf

[61] Ermgassen et al. (2022). Are corporate biodiversity commitments consistent with delivering 'nature-positive' outcomes? A review of 'nature-positive' definitions, company progress and challenges. Retrieved from: https://osf.io/preprints/socarxiv/rq6z2/.

[62] Taskforce on Nature-related Financial Disclosures (TNFD) (2022). Nature-Related Risk & Opportunity Management and Disclosure Framework. Beta v.03. Retrieved from: https://framework.tnfd. global/.

[63] Taskforce on Nature-related Financial Disclosures (TNFD) (2022). Nature-Related Risk & Opportunity Management and Disclosure Framework, Version v.02 Beta Release. Retrieved from: https://framework.tnfd.global/.

[64] Science Based Targets Network (SBTN) (2020). Initial Guidance for Business. Retrieved from: https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf.

[65] Ermgassen et al. (2022). Are corporate biodiversity commitments consistent with delivering 'nature-positive' outcomes? A review of 'nature-positive' definitions, company progress and challenges. Retrieved from: https://osf.io/preprints/socarxiv/rq6z2/.

[66] United Nations Environment Programme (UNEP) (2021). State of Finance for Nature. Retrieved from: https://www.unep.org/resources/state-finance-nature.

[67] Davis et al. (2012). Challenging a paradigm: toward integrating indigenous species into tropical plantation forestry. Retrieved from: https://www.fs.usda.gov/treesearch/pubs/44261.

[68] Slobodian et al. (2020). Policies that support forest landscape restoration: What they look like and how they work. Retrieved from: https://portals.iucn.org/library/node/49261.

[69] WBCSD (2018). Forest Products Sector Guide to the Natural Capital Protocol. Retrieved from: https://www.wbcsd.org/Sector-Projects/Forest-Solutions-Group/Resources/Forest-Products-Sector-Guide-to-the-Natural-Capital-Protocol.

[70] World Resources Institute (WRI) (2012). The Corporate Ecosystem Services Review. Retrieved from: https://www.wbcsd.org/Archive/Assess-and-Manage-Performance/Resources/Guidelines-for-identifying-business-risks-and-opportunities-arising-from-ecosystem-change.

DISCLAIMER

WBCSD is an active member of the SBTN Corporate Engagement Programme, and both an Implementation and Knowledge partner of TNFD. Although the Roadmap is not formally endorsed by TNFD or SBTN, representatives from both organizations were consulted as part of the process.

This publication has been developed in the name of WBCSD. Like other WBCSD publications, it is the result of a collaborative effort by members of the secretariat and senior executives from member companies. A wide range of member companies reviewed drafts, thereby ensuring that the document broadly represents the perspective of WBCSD membership. Input and feedback from stakeholders listed above was incorporated in a balanced way. This does not mean, however, that every member company or stakeholder agrees with every word.

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ABOUT THE FOREST SOLUTIONS GROUP

WBCSD's Forest Solutions Group (FSG) is the global platform where leading business in the forest products sector build and share sustainable development solutions. FSG's mission is to grow an inclusive circular bioeconomy that is rooted in thriving working forests.

Our member companies span all forested continents and a broad range of forest products such as pulp, paper, packaging, timber, biomaterials, bioenergy and forest asset management. They represent a combined revenue of more than USD $165 billion and 260'000 employees. Together they own, lease or manage more than 20 million hectares of land, of which 98% is third party certified and 24% is set aside for conservation or restoration.

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ABOUT WBCSD

WBCSD is the premier global, CEO-led community of over 200 of the world's leading sustainable businesses working collectively to accelerate the system transformations needed for a net zero, nature positive, and more equitable future.

We do this by engaging executives and sustainability leaders from business and elsewhere to share practical insights on the obstacles and opportunities we currently face in tackling the integrated climate, nature and inequality sustainability challenge; by co-developing "how-to" CEO-guides from these insights; by providing science-based target guidance including standards and protocols; and by developing tools and platforms to help leading businesses in sustainability drive integrated actions to tackle climate, nature and inequality challenges across sectors and geographical regions.

Our member companies come from all business sectors and all major economies, representing a combined revenue of more than USD $8.5 trillion and 19 million employees. Our global network of almost 70 national business councils gives our members unparalleled reach across the globe. Since 1995, WBCSD has been uniquely positioned to work with member companies along and across value chains to deliver impactful business solutions to the most challenging sustainability issues.

Together, we are the leading voice of business for sustainability, united by our vision of a world in which 9+ billion people are living well, within planetary boundaries, by mid-century.

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