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STUDY GUIDE

United Nations Forum on Forests

Reverse the loss of forest cover worldwide through sustainable forest management and increase efforts to prevent forest degradation and contribute to the global effort of addressing climate change

Introduction

What is the purpose of this report?

This report answers the question:"Is the world on track to reach its collective goals to protect and restore forests by 2030?" We refer to the collective goals of globally eliminating deforestation and forest degradation and restoring 30 percent of degraded forests by 2030, as established by international commitments such as the New York Declaration on Forests (2014), the Glasgow Leaders' Declaration (2021), and the Kunming-Montreal Global Biodiversity Framework (KM-GBF) (2022), and reaffirmed in the First Global Stocktake (2023).

How does this report track progress on forest goals?

This report provides an assessment of progress as of2023to protect, conserve, and restore forests. We indicate whether the world, regions, and individual countries are "on track" or "off track" towards 2030 forest goals using the most up-to-date annual data.

To do this, we report on a range of quantitative forest indicators (e.g., gross deforestation, forest degradation, primary forest loss, emissions from deforestation) and compare those values to an Assessment-identified baseline and target for the same year.

The world, a region, or an individual country is considered "on track" for an indicator when their 2023 Assessment-identified target is met. The world, a region, or an individual country is considered "off track" for an indicator when it falls short of its 2023 target for that indicator. We express the degree to which a given geography is "off track" on its target through a percentage, which indicates how much that geography deviated from its 2023 target.

For details on this baseline period and other methodological notes, please see the section: "How does this report track progress?", and the Annex B for more details.
Global spatial data on forest change (Hansen et al. 2013, updated through 2023) and primary forests (Turubanova et al. 2018) differ in their definitions and methods from official national forest statistics. Moreover, the deforestation statistics used in this Assessment are derived from a map of drivers of tree cover loss (Curtis et al. 2018, updated through 2023) that attributes all tree cover loss to the same driver over the entire assessment period, even if changes in drivers do occur over time in regions or countries.

When countries fail to meet their annual targets on the pathway to 2030, greater efforts will be needed in the following years to make up lost ground. To create the annual targets against which we measure progress for deforestation and degradation, this report uses the baseline period 2018-20 as a starting point on the pathway to 2030 and assumes a 10 percent reduction in the deforestation or forest degradation rate each year from 2021-30.

As such, the only intermediate targets before 2030 are linear decreasesfrom the baseline. The baseline periodb was selected in connection with theendorsement of the Glasgow Leaders' Declaration on Forests and Land Useby world leaders in November 2021; previous progress assessments based onother commitments, like the New York Declaration on Forests, used anearlier baseline.

In addition to figures that illustrate progress on indicators, tables of "key metrics" present an overview of the trends for every indicator at the global and regional scale. Key metrics include baseline values, 2023 targets, observed values, and deviation between observed values and 2023 targets for any given indicator.

This report also features case studies to highlight how existing and emerging policies and economic factors affect forests in major forest countries, highlighting key regional and country-level trends.

What indicators does this report consider?

Wepresent core indicators– such as estimates ofdeforestation, forest degradation, and area under restoration – that have corresponding 2030 targets under global frameworks (see **Annex A and B** for details on definitions and methodologies, respectively).

We also include forest-related metrics – such as tree cover loss due to fires and total conversion of temperate and boreal forestsd – which do not correspond to specific 2030 targets but provide key context on the state of forests, as well as causes and consequences of deforestation and

In places where commodity-driven deforestation has declined significantly in recent years, current deforestation rates may be overestimated due to the large amounts of commodity-driven deforestation earlier in the period. Primary forest loss statistics may likewise be different from official national statistics.

[d] Conversion here refers to all tree clearing, not just the "permanent" tree clearing that deforestation usually refers to. This indicator includes even temporary causes of tree cover clearing such as timber harvest, which do not lead to harmful forest outcomes in all cases.

degradation. Even though these supplementary indicators do not directly track progress toward a 2030 target, it is difficult to understand the state of progress toward forest goals without them.

We narrow in on primary forest loss within the deforestation chapter (**Chapter 1**). While primary forest loss is considered a component of deforestation in this report, we also report progress on halting its loss separately. This is because of the incredible and irreplaceable value of primary forests. Once cleared, primary forests' value – in terms of carbon storage, biodiversity, ecosystem services, and more – cannot be fully replaced on timescales relevant for meeting the 2030 forest goals or for mitigating the worst impacts of climate change and biodiversity loss.e,11

In addition, reporting on tree cover loss from fire is increasingly relevant due to worsening fire seasons that threaten to accelerate forest degradation12 and make it harder to achieve the goal of eliminating forest degradation by 2030. However, eliminating fires globally by 2030 is neither a goal nor a desirable outcome, given their importance in many natural ecosystems. Additional information on indicators and metrics is available in **Annex B**.

Clearer assessments of progress will emerge as more annual data becomes available. Thus, the trends presented in this report will continue to be honed and validated in the years ahead. For more detailed information and additional methodological notes, please see **Annex B**.

Does this report consider non-forest ecosystems?

This report tracks progress towards protecting and restoring forests, stemming from the Assessment's original mandate to track progress on the New York Declaration on Forests – a mandate that has since expanded to tracking other global goals, such as progress toward the Bonn Challenge, the

[e] Naturally regenerating secondary forests would be considered degraded compared to the primary forests they replaced - hence, the loss of primary forests can also be considered degradation. In this report, however, we count primary forest loss within deforestation.

Glasgow Leaders' Declaration, and the Kunming-Montreal Global Biodiversity Framework.

With such a focus, this report does not imply that non-forest ecosystems are less impacted by conversion (e.g., the Cerrado's savannahs and the U.S. and Canadian Great Plains' old-growth grasslands are the largest conversion fronts outside of the Amazon13), nor that the protection and restoration of other ecosystems are less crucial to reducing the impacts of climate change and safeguarding biodiversity. Efforts to reduce deforestation sometimes lead to the conversion of non-forest ecosystems (e.g., eliminating deforestation in one biome may shift its drivers elsewhere, also known as 'leakage'), highlighting the importance of protecting forest and non-forest ecosystems together. When we discuss ending deforestation and forest degradation and restoring forests in this report, it is important to recognize that similar efforts are needed to halt and reverse the conversion and degradation of other ecosystems. and Canadian Great Plains' old-growth grasslands are the largest conversion fronts outside of the Amazon14), nor that the protection and restoration of other ecosystems are less crucial to reducing the impacts of climate change and safeguarding biodiversity. Efforts to reduce deforestation sometimes lead to the conversion of non-forest ecosystems (e.g., eliminating deforestation in one biome may shift its drivers elsewhere, also known as 'leakage'), highlighting the importance of protecting forest and non-forest ecosystems together. When we discuss ending deforestation and forest degradation and restoring forests in this report, it is important to recognize that similar efforts are needed to halt and reverse the conversion and degradation of other ecosystems.

CHAPTER 1

Is the world on track to eliminate deforestation by 2030?

Forests are deeply interconnected with climate change, biodiversity, sustainable development, and the global economy. Eliminating deforestation by 2030 is crucial for ensuring a just and sustainable future for people and the planet. This chapter evaluates global and regional progress towards halting deforestation, including primary forest loss, and associated emissions.

Subsequent chapters track progress on other core indicators: halting degradation (**Chapter 2**), restoring forests (**Chapter 4**), and protecting biodiversity in forests (**Chapter 5**).

[f] Primary forests are defined as natural forests of native tree species that have not been completely cleared and regrown in recent history. See Annex A for details.

METHODOLOGY: ASSESSING PROGRESS TOWARDS ELIMINATING DEFORESTATION

This chapter assesses global and regional progress toward achieving zero gross deforestation by 2030. In this report, “zero gross deforestation” refers to a state of permanent land use change from forests to non-forest and clearing of primary forests,f irrespective of any forest gains. All references to “deforestation” refer to gross deforestation, not net deforestation. See **Annex A** for more details.

There are many different definitions of deforestation, which are appropriate in their own contexts. This report defines deforestation as a loss of tree cover that is expected to be permanent or result in permanent impacts. This includes the conversion of primary and non-primary forests due to urbanization and commodity production, and the conversion of primary forests due to shifting agriculture.15

Primary forests are mature natural forests that have not been completely cleared and regrown in recent history.16 They are usually characterized by richer biodiversity and larger carbon stocks than non-primary forests.17 We consider tree cover loss within primary forests to be permanent deforestation because the biodiversity resources of primary forests are irreplaceable,18 and the loss of the carbon stored in these forests is irreversible on timescales relevant for avoiding catastrophic effects associated to anthropogenic climate change.19 It can take tens or even hundreds of years to re-establish the structures and the ecological functions that characterize a primary forest.20

We report deforestation at the global and regional scale, as well as humid tropical primary forest loss21 and the respective emissions of carbon dioxide equivalents.22 Since the large majority of deforestation occurs in the tropics, results for tropical deforestation are disaggregated at the regional level. Deforestation in temperate and boreal forests is first cumulated, then disaggregated by region. See the **Annex A and B** for a full list of definitions and methodology.

In addition to tracking the overarching goal of eliminating deforestation, we also progress on halting the loss of primary forest and the emissions from deforestation, as they are implied within the 2030 forest protection target.

CHAPTER 1 – DEFORESTATION

1.1 Global deforestation

The world is off track to eliminate deforestation by 2030. In 2023, 6.37 million hectares of deforestation occurred worldwide. That level of deforestation is significantly higher than it should be for the world to be on the pathway to zero deforestation by 2030.

In2023,the world should have had no morethan 4.38 million hectaresof global deforestation to be on track to eliminate deforestation by 2030. However, that target was exceeded by 45 percent – 6.37 million hectares of forests were lost in 2023 (Figure 1). Regrettably, deforestation in 2023 was even higher than the 2018-20 baseline.

Deforestation continues to be a major contributor of greenhouse gases. Not accounting for removals, 3.8 billion metric tons of carbon dioxide-equivalent were emitted from deforestation last year (**Figure 2**). This is a four percent increase from the 2018-20 baseline. If deforestation was its own country, it would have been the fourth-highest emitter in 2023 after China, the U.S., and India.

The world is increasingly off track to meet the 2030 goals; all actors and sectors must work to make up that lost ground, and more, in the coming years. With less than six years remaining until 2030, immediate action to protect forests is essential.

Over the past two decades, 57 percent of global deforestation has been caused by the production of agricultural commodities,23 while other drivers such as mining add increasing pressure on forests.24

Commodity productionremains the predominant driverofdeforestation worldwide. This broad category of deforestation encompasses large-scale agriculture and pastures, as well as the mining of commodities like coal, metals, and minerals.25

Agricultural production, including pastures for beef production, contributes the greatest share of commodity-driven deforestation26 (**Figure 3**). Over half of tropical deforestation in the past two decades was caused by agricultural commodity production, with about 20 to 25 percent of this production being exported. 27 Agricultural production continues has continued to expand in recent years. From

[9] As reported by the World Emissions Clock by the World Data Lab, China's 2023 emissions amount to 15.6 GtCO2e and the United States amount to 5.8 GtCO2e, and India listed at 4.1 GtCO2e. The next highest emitter is Brazil, with 2.7 GtCO2e in 2023.

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2 **Did You Know That**

Forest loss at this scale emits more CO_2 annually than all passenger vehicles in the U.S.? Forest clearing contributes roughly 10% of global emissions, making forest policy as critical as energy policy.

3 **Did You Know That**

While deforestation ranks 4th in emissions globally, it receives a fraction of the funding allocated to mitigation compared to sectors like transportation and energy. Nature-based solutions receive just ~3% of global climate finance.

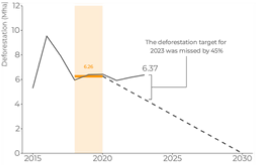
7 **Definition**

Commodity-driven deforestation, unlike subsistence farming, refers to clearing forests for goods intended for global markets.

12 **Did You Know That**

Over 60% of tropical deforestation is linked to just four products: palm oil, soy, beef, and timber.

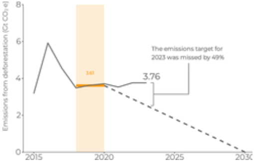
Figure 1. Global deforestation from 2015-2023, in million hectares (Mha)



Key metrics on global deforestation in million hectares (Mha)

Region	Baseline deforestation (Mha)	Deforestation target for 2023 (Mha)	Deforestation in 2023 (Mha)	Change from Baseline (%)	Deviation from 2023 target (%)
Global	6.26	4.38	6.37	+2%	+45%

Figure 2. Emissions from global deforestation from 2015-2023, in billion metric tons of carbon dioxide equivalent (GtCO2e)



Key metrics on emissions from global deforestation in billion metric tons of carbon dioxide equivalent (GtCO2e)

Region	Baseline emissions from deforestation (GtCO2e)	Emissions from deforestation target for 2023 (GtCO2e)	Emissions from deforestation in 2023 (GtCO2e)	Change from Baseline (%)	Deviation from 2023 target (%)
Global	3.6	2.5	3.8	+4%	+49%

2000 to 2021, the production of primary crops grew by 54 percent and meat production by 53 percent.28

Producer and consumer countries share the responsibility for addressing commodity-driven deforestation. From 2020-22, the EU and China – the top importing markets for forest-risk commodities – were responsible for approximately 40 percent of all deforestation embodied in the direct trade of agricultural commodities.29

After commodity production, shifting agriculture in primary forests is the second largest driver of deforestation, responsible for the loss of 15.9 million hectares of primary forests from 2015-23.

Shifting agriculture is a common practice among small-scale farmers that can be practiced sustainably as part of traditional, rotational land management systems. However, when primary forests or other largely intact ecosystems are affected, the damage can be considered permanent.,30

Mining is also a key driver of deforestation, and the sector's impact on forests is projected to rise.31

While mining underpins the economic growth model of industrialized, mineral-dependent nations as well as the renewable energy transition, it remains one of the most environmentally and socially harmful human activities.32 The extraction of metals and minerals has surged in recent years: from 2000-19, mining volumes from tropical moist forest ecosystems doubled.33 Industrialized countries – like China, the EU, and the U.S. – drive nearly half of the global demand for metals and minerals,34 and an increase in demand for mined materials could have immense consequences for forests (**Box 1**). As demand for mined materials is predicted to rise so are mining's adverse impacts on forests and other natural ecosystems.35 Mining presents a particular threat to biodiversity. In 2019, 79 percent of global metal ore extraction originated from five of the six most species-rich biomes.36 Forests in countries like Indonesia are at particular risk (**Box 3**).

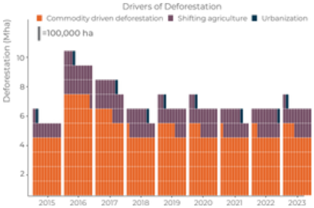
1 Did You Know That

If global meat consumption followed U.S. dietary patterns, an estimated 4.6 billion hectares of land—more than Earth's current arable land—would be required. Our food choices are intimately tied to deforestation risks.

6 Something to Think About

Should governments establish "no-go" forest zones for mining—similar to marine protected areas—to safeguard high-carbon or high-biodiversity landscapes?

Figure 3. Drivers of deforestation from 2015-2023 in million hectares (Mha)



BOX 1. NAVIGATING FOREST IMPACTS AND HUMAN RIGHTS CONSIDERATIONS AMID THE RENEWABLE ENERGY TRANSITION

Achieving the renewable energy transition and forest goals are not mutually exclusive. However, the increasing demand for minerals essential to clean energy technologies causes real environmental and community impacts – all of which can and must be mitigated. Most mining-related deforestation is still caused by coal and gold demand,37 which shows no signs of slowing, even as the threat to forests from mined critical minerals for the green transition grows.

Surging demand for mined materials

The surge in demand for metals and rare earth elements is driven, in part, by the push for renewable energy and the increasing adoption of electric vehicles (EVs).38 A 2023 IEA report found that the market for minerals used in EVs, wind turbines, solar panels, and other clean energy technologies doubled in the previous four years.39

Some argue that mining-related deforestation could be justified if it leads to significant reductions in fossil fuel use as part of the renewable energy transition (which would also lead to a reduction in coal-related deforestation, for example). However, the increase in renewable energy production—which hit a record high of 30 percent of global energy demand in 2022, projected to reach 50 percent by 2030, does not necessarily translate to decreased pressure on forests.

In fact, fossil fuel use reached historic highs in 2023.40 Ongoing reliance on fossil fuels means that, despite the growth in renewables, energy's associated impacts – including deforestation – just continue to rise.41 Fossil fuels' share of global energy supply is projected to decrease from 80 percent to only 73 percent by 2030, underscoring that the "transition" away from fossil fuels is proceeding at a glacial pace.42 In fact, investments in both renewables and fossil fuels are set to continue rising, despite calls for divestment from the latter.43

The intensifying extraction of critical minerals like lithium, cobalt, nickel, and rare earth elements necessary for renewable energy technologies and EVs exacerbates habitat destruction, water pollution, and biodiversity loss. For instance, the global shift to EVs, now numbering over 13 million worldwide,44 necessitates vast mineral extraction for batteries, straining forests and natural ecosystems. Moreover, the electricity needed to power these EVs must come from clean sources, which itself requires more mining, potentially leading to further deforestation and ecosystem degradation.

While the renewable energy transition is clearly essential in our fight against climate change, it has not yet mitigated harmful impacts on forests and other natural ecosystems due to our continued reliance on fossil fuels, our continued overconsumption of natural materials, and the growing impacts associated with their extraction.

Mining's human rights violations

The mining sector also poses severe – and often deadly – impacts on human rights defenders, as highlighted by recent findings from Global Witness. In 2023, mining was again the largest industry driver of fatal attacks on environmental defenders, associated with 25 killings. This violence is predominantly concentrated in Latin America, which accounted for 23 of these deaths, while over 40 percent of mining-related killings from 2012-23 occurred in Asia. Both regions are crucial for critical minerals essential to clean energy technologies.45

Policies to address mining's impacts often fall short

Current policies are insufficient to mitigate mining's impact on ecosystems.46 Even mining-specific regulations – such as the EU Critical Raw Materials Act, which aims to ensure a secure and sustainable supply of critical raw materials to EU countries – lack safeguards to balance sustainability considerations with supply security. 47 China, a leader on renewable energy manufacturing, is revising its Mineral Resources Law to include requirements for ecological restoration of mining areas.48 However, it remains unclear if these revisions will effectively mandate measures to prevent ecosystem damage. Moreover, China's growing overseas mining operations, which saw a 158 percent increase in investment in 2023, 49 raise concerns about the environmental practices in resource-rich, biodiversity-sensitive regions in tropical Africa and Asia.50 The revised law does not regulate companies operating abroad, leaving significant gaps in environmental protection.5 1

A new way forward

The advancement of EVs and renewable energy need not be pitted against forest conservation goals. The harmful impacts of mining itself can be significantly reduced with the right approaches – from avoiding high-conservation value areas, to reducing the footprint of mining operations and restoring affected areas, to respecting the rights and territories of the Indigenous peoples and local communities within whose lands most of these critical mineral deposits lie. 52 There is also a pressing need for policies that promote greater circularity in the use of materials. Once mined, critical minerals can be re-used for a dozen years or more,53 as long as systems are in place for their recovery and recycling. 54 The absence of incentives or mandates for circular economies exacerbates the environmental impact of mining by failing to address the full lifecycle of materials, from extraction to disposal. This gap contributes to the ongoing trade-offs between renewable energy initiatives and forest conservation.

1.2 Regional and country-level deforestation

1.2.1 Tropical deforestation

Progress oneliminating deforestation by 2030 was off track in tropical regions, which is where the vast majority of global deforestation occurred.

Reducing deforestation in the tropics is essential for meeting globalforest goals – nearly 96 percent of all deforestation in 2023 took place in tropical regions. Yet, deforestation levels were off track in nearly all tropical regions in 2023: Africa, Asia, and Latin America and the Caribbean (LAC) (**Figure 4**). Tropical Oceania was the only tropical region to meet its annual target last year.

Tropical deforestation resulted in the emissions of nearly 3.7 billion metric tons of carbon dioxide-equivalent in 2023, with tropical Latin America alone producing 2.0 billion metric tons of carbon dioxide equivalent (**Figure 5**). As with deforestation itself, none of the tropical regions, except for tropical Oceania, met their Assessment-defined target for 2023 deforestation-related emissions.

A particularly concerning trend was observed in tropical Asia. While the region was nearly on track until 2022, when deforestation was just 1 percent above its Assessment-defined target, 2023 saw a sudden deforestation spike. This reversal is substantial. In 2022, tropical Asia had reduced deforestation 16 percent *below* baseline levels, but in 2023, deforestation rose to 13 percent *above* baseline levels. This setback illustrates how progress must be sustained year after year.

Though tropical LAC remains off track to eliminate deforestation by 2030, the region made an important step in the right direction in 2023. Tropical LAC decreased its deforestation by 19 percent in 2023 compared to the year prior. If these successful efforts are maintained and accelerated, the region could set an example for the world.

2 Interesting Facts

Agricultural expansion in the Amazon, for example, contributes significantly to this phenomenon. Interestingly, countries like Colombia are now experimenting with payments for ecosystem services to reverse this trend.

In addition, while tropical regions account for most deforestation, they receive less than half of total international climate finance directed toward forest protection—despite their disproportionate importance in global carbon storage.

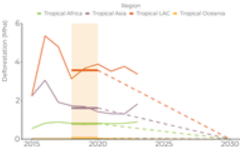
3 Interesting Facts

That amount of emissions is equivalent to the annual carbon production of the entire European Union. Forest conservation could be one of the most cost-effective ways to slow climate change.

4 Something to Think About

Should multilateral institutions create early-warning mechanisms or financial consequences for countries that reverse progress after nearing their targets, as happened in tropical Asia?

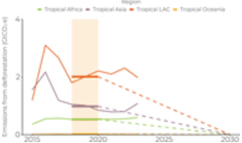
Figure 4. Tropical regional deforestation from 2015-2023, in million hectares (Mha)



Key metrics on tropical regional deforestation in million hectares (Mha)

Region	Baseline deforestation (Mha)	Deforestation target for 2023 (Mha)	Deforestation in 2023 (Mha)	Change from 2023 target (%)	Deviation from Baseline (%)
Tropical Africa	0.80	0.56	0.89	+60%	12%
Tropical Asia	1.61	1.13	1.82	+62%	13%
Tropical LAC	3.57	2.50	3.37	+35%	-5%
Tropical Oceania	0.05	0.03	0.01	-74%	-62%

Figure 5. Tropical regional emissions from deforestation from 2015-2023, in billions of metric tons of carbon dioxide equivalent (GtCO2e)



Key metrics on emissions from tropical regional deforestation in billion metric tons of carbon dioxide equivalent (GtCO2e)

Region	Baseline emissions deforestation (GtCO2e)	Emissions target for 2023 (GtCO2e)	Emissions from deforestation in 2023 (GtCO2e)	Change from Baseline (%)	Deviation from 2023 target (%)
Tropical Africa	0.53	0.37	0.59	+13%	+62%
Tropical Asia	0.98	0.68	1.08	+11%	+58%
Tropical LAC	2.01	1.40	1.98	-1%	+41%
Tropical Oceania	0.02	0.02	0.01	-68%	-55%

3 **Interesting Facts**

That amount of emissions is equivalent to the annual carbon production of the entire European Union. Forest conservation could be one of the most cost-effective ways to slow climate change.

1.2.2 Countries with the greatest absolute areas of deforestation

In 2023, nine of the ten countrieswith the greatest absoluteareas of deforestation were off track toward eliminating deforestation by 2030. Only one country, Paraguay, met its country-level Assessment-defined deforestation target for 2023.

Nearly every one of the top ten countries that hadthe greatest absoluteareas of deforestation in 2023 failed to meet their deforestation target last year (**Table 1**). Bolivia – the country with the third greatest absolute areas of deforestation, after Brazil and Indonesia – provides an important example of the dire consequences for forests of economic policies being mis-aligned with forest goals (**Box 2**). Deforestation in Indonesia accounted for 65 percent of total deforestation in tropical Asia in 2023.55 The country's nickel mining presents an important example of emerging drivers of deforestation (see **Box 3**). Though mining poses a growing threat alongside oil palm and wood pulp plantations there, it's important to recognize Indonesia's success at curbing deforestation in previous years. For instance, Indonesia experienced the steepest drop in deforestation of any tropical country between the periods 2015-2017 and 2020-2022.56

1 **Something to Think About**

Why have countries with the most deforestation found it hard to make their national policies match global forest protection promises like the Glasgow Declaration, even though they agreed to them?

Table 1. 10 countries with the greatest absolute areas of deforestation in 2023 in million hectares (Mha)

Country	Baseline deforestation (Mha)	Deforestation target for 2023 (Mha)	Deforestation in 2023 (Mha)	Change from Baseline (%)	Deviation from 2023 target (%)
Brazil	2.14	1.5	1.94	-9%	+29%
Indonesia	0.92	0.65	1.18	+28%	+82%
Bolivia	0.48	0.34	0.66	+38%	+98%
Democratic Republic of the Congo	0.48	0.34	0.53	+10%	+56%
Malaysia	0.28	0.19	0.24	-16%	+21%
Peru	0.17	0.12	0.16	-6%	+34%
Paraguay	0.23	0.16	0.16	-32%	-2%
Laos	0.1	0.07	0.14	+44%	+105%
Argentina	0.1	0.07	0.14	+34%	+92%
Cameroon	0.07	0.05	0.1	+43%	+105%

Note: Additional country data is available in Annex B. Global spatial data on forest change (Hansen et al. 2013, updated through 2022) and primary forests (Turubanova et al. 2018) differ in their definitions and methods from official national forest statistics. Moreover, the deforestation statistics used in this Assessment are derived from a map of drivers of tree cover loss (Curtis et al. 2018, updated through 2022) that attributes all tree cover loss to the same driver over the entire assessment period, even if changes in drivers do occur over time in regions or countries. In places where commodity-driven deforestation has declined significantly in recent years, current deforestation rates may be overestimated due to the large amounts of commodity-driven deforestation earlier in the period. Primary forest loss statistics may likewise be different from official national statistics.

BOX 2. AGRICULTURAL AND LAND USE POLICIES ACCELERATE DEFORESTATION IN BOLIVIA

Soaring deforestation

Bolivia has experienced an alarming rise in deforestation. From 2015-23, deforestation increased by 351 percent,[57] a trend that shows no sign of abating. From 2022-23, deforestation increased by 21 percent. Since the mid-1990s, most deforestation in Bolivia has been illegal.[58]

Economic crisis, agricultural reform, and a political crisis

Bolivia faces an economic crisis and may soon be forced into an abrupt currency devaluation in the face of dwindling reserves.[59] In response, Bolivia's government has enacted regulatory reforms to bolster the agribusiness sector, upon which the country's economy increasingly relies.[60] These reforms have important consequences for Bolivia's forests. The regulatory reforms encourage the expansion of the agricultural frontier, are supported by agribusiness interests,[61] and are designed in part to meet growing international demand for agricultural commodities. The government's approach to addressing the economic crisis is further hampered by a political one: the upcoming presidential elections in 2025 have set up an internal conflict between factions of Bolivia's ruling party that, along with external pressures, leaves open few feasible policy options.[62]

Crucially, drivers of deforestation are complex and interconnected, and while agribusiness plays a key role in Bolivia, it is only one part of a broader picture, including smallholder expansion, pressure from new infrastructure developments, and beyond. Understanding these reforms within the broader context of their expected impacts and exacerbating factors is essential.

Limited commitment to reduce deforestation

Bolivia's land-use policies tend to incentivize and legitimize land clearing for agriculture, while less emphasis is placed on curbing deforestation. For example, the government has redesignated forests for agricultural production[63] and retroactively approved unauthorized land clearings.[64] Additionally, a 2021 law eliminated the Value Added Tax on the import of heavy agricultural machinery,[65] accelerating the expansion of the agricultural frontier through mechanized clearing.[66]

While the government has taken some steps to improve land governance – such as banning fires for land clearance in Santa Cruz and Beni[67] – weak enforcement undermines these measures. For example, in 2021, the federal Forest and Land Authority reported that 98 percent of the 4.2 million hectares of burned forest land was not authorized.[68] Moreover, fines for illegal deforestation are substantially lower than those in neighboring countries.[69] Political instability, recent protests, and unprecedented rifts within the highest levels of government also add to the complexity.[70]

Among several commodities, soy production fuels deforestation

Agricultural commodity production – particularly of soy but also beef and sugar –is a major driver of Bolivia's high deforestation rate.[71] Large landholders are taking advantage of easy credit provided by Bolivian banks to clear forests, which increases the economic value of land.[72] Since the early 2000s, nearly one million hectares have been deforested for soy. [73] Almost one quarter (23%) of this soy-driven deforestation can be attributed to Mennonite colonies.[74] These colonies are expanding and increasing their deforestation footprint.[75] Over the past five years, they have caused 33 percent of soy deforestation in the Bolivian Amazon.[76]

Bolivia's lower agricultural productivity (2.0-2.3 metric tons of soy per hectare) compared to neighboring countries (2.7-3.5 metric tons per hectare) exacerbates this issue.[77] Instead of investing in productivity improvements or regeneration of existing agricultural landscapes, agribusinesses clear new land to increase output.78 As a result, soy production in Bolivia caused 31.8 hectares of deforestation per thousand metric ton of soy produced in 2021, a much higher rate than Brazil (4.6 hectares per thousand metric ton produced in 2020) and Argentina (0.9 hectares per thousand metric ton produced in 2019).79

Despite the government betting heavily on agribusiness to address the currency crisis, some agribusiness multinationals are opting to exit Bolivia due to economic uncertainty.80 Companies like Alicorp, Bolivia's largest soy exporter,81 have scaled back operations and transferred control to domestic companies. Notably, Cargill has excluded Bolivia from its deforestation- and conversion-free commitments in South America.82

Path forward

Currently, Bolivia finds itself in a form of "deforestation lock-in," where a strong economic dependence on large-scale agriculture drives deforestation and primary forest loss at a massive scale.83 But alternative economic models exist, and they can reverse the country's deforestation trend.

While some initiatives exist in Bolivia to support more sustainable agricultural production, these are largely driven by private and civil society groups and have yet to yield significant outcomes. Meanwhile, the government and large agricultural companies have not made meaningful commitments to curb harmful 'gray' finance that contributes to deforestation. One major step would be to divest pension funds from agri-extractive sectors. Other possible measures include suspending new land allocations in critical areas, increasing penalties for illegal deforestation, and implementing due diligence requirements for financial institutions.84

Signs of progress exist. A law currently under debate in the Senate would significantly increase fines for illegal burning.85 However, even if passed, the effectiveness of this law – and others like it – will depend on the willingness and ability of the Forest and Land Authority and any other relevant agencies to enforce it.

Other measures to slow land conversion include investing in more productive and climate-resilient agriculture, including integrated approaches to water-resource management.86 The Bolivian government has already begun to prioritize these investments, and the World Bank has pledged further financing to support these initiatives.87 Alongside the government, private sector, financial, and multilateral actors must play a role in safeguarding Bolivia's forests and reversing this alarming trend.

As Bolivia heads towards a contentious presidential election in 2025, its political and economic instability is likely to continue, further complicating efforts to address deforestation. The debate over appropriate responses to the economic crisis underscores the broader challenges that many countries face in balancing environmental protection with economic survival.

BOX 3. SURGING DEMAND FOR SUSTAINABLE ALTERNATIVES NONETHELESS LINKED TO INDONESIA'S RISING DEFORESTATION

Increasing deforestation

After years of progress, deforestation in tropical Asia is once again on the rise, increasing by 39 percent from 2022 to 2023.**88** Indonesia's 1.18 Mha of deforestation in 2023 was 65 percent of the region's total and marked a 57 percent increase for the country's from 2022, which means it missed its Assessment-identified target for 2023 by 82 percent.

Deforestation in Indonesia has multiple drivers. From 2000-16, large-scale oil palm and timber plantations, conversion of forests to grassland, and small-scale agriculture converged to cause widespread forest loss.**89** While these drivers are still a factor, increasing pressure from new drivers is compounding the threat to the country's forests.

Surging demand for renewable energy and commodities marketed as eco-friendly is exacerbating deforestation in Indonesia. Even "sustainable" products can still harm forests when safeguard are not in place, and governments and companies must act to mitigate these harms. Renewable energy and sustainable alternatives are essential, but their environmental impacts need scrutiny.

'Eco-friendly' textile and paper products

Demand for viscose –a biodegradable, wood pulp-based alternative to cotton and polyester – and the resulting expansion of Indonesia's wood pulp sector,90 is one increasing deforestation driver.91 A common material in household products from t-shirts to disinfectant wipes, viscose (and particularly versions of it like lyocell) have been marketed as eco-friendly.92 The material's popularity has made it a multi-billion dollar industry.93 Global production of man-made cellulosic fibers increased to an all-time high of 113 million metric tons in 2021.94

Indonesia's wood pulp sector grew by 46 percent in the last eight years, and further growth is on the horizon.95 The fast pace of conversion from natural forest to pulpwood plantations is worrying. Peatland deforestation from 2015-19 was linked to the pulp exports of the Royal Golden Eagle group.96 The company supplies some of the biggest viscose manufacturers and, in 2019 alone, it was linked to more than 2,000 hectares of peatland deforestation.97 And from 2015-22, just one wood pulp concession, PT Mayawana Persada in the province of West Kalimantan, was responsible for 21,000 hectares of conversion of natural forests to plantations.98

Rather than vilifying materials like viscose – which can be produced sustainably under the right conditions – we must instead scrutinize the claims made about them. Companies must ensure that the materials they source are produced with responsible environmental and social practices.

Nickel mining

Increasing deforestation in Indonesia is also caused by a surge in nickel mining. Nickel laterite deposits are typically located near the Earth's surface and are most easily accessible through open-pit mining, a practice that involves the removal of topsoil and directly contributes to deforestation.99 From 2001-22, at least 75,000 hectares of forest loss occurred within Indonesia's nickel concessions.100

Nickel, as a key component of electric vehicle batteries, is considered a critical mineral for the renewable energy transition. By 2040, global nickel demand is projected to rise by 60 percent

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1.2.3 Countries that most drastically decreased deforestation compared to baseline

In2023, thecountries with themost significantreductions in deforestation from baseline levels were Australia, Colombia, Vietnam, Venezuela, and Paraguay.

These countries had the largest reductions in deforestation indicator in 2023 compared to the baseline 2018-20 (**Table 2**). Half of them were on track to eliminate deforestation by 2030.

Brazil and Malaysia – two countries that failed to meet their 2023 Assessment-identified deforestation target and are among the top ten most deforested countries in the world – are listed in **Table 1** and **Table 2**. In other words, both countries had high deforestation and were off track, while also being among the countries that have reduced deforestation the most from their baseline. These countries have reduced deforestation 9 percent and 16 percent below baseline levels, respectively. These reductions signal a positive trend, but they aren't happening fast enough to halt deforestation by 2030.

Brazil has made strides in reducing deforestation in recent years, though more progress is needed. Thanks to the strong political resolve of the Brazilian government under the Lula administration, forest conservation is now a top priority after having been deprioritized by the previous administration – further underscoring that progress is not linear and depends strongly on political will. Even with this progress, deforestation and conversion are escalating in the Brazilian Cerrado (**Box 3**). The Brazilian government has signaled that it is aware of these rising conversion rates in the Cerrado and is beginning to act, but it remains a challenge.

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11 **Interesting Facts**

This list includes both tropical and non-tropical countries, suggesting that effective deforestation strategies are adaptable across different climates and development levels.

2 **Something to Think About**

Does being "on track" in 2023 not guarantee success in 2030? A sudden change in political leadership, funding, or economic priorities could quickly reverse progress, as seen in several tropical countries.

4 **Something to Think About**

Should global forest agreements require countries to keep their commitments even after elections, to make sure progress continues in the long term?

4 **Did You Know That**

The Cerrado stores roughly 13.7 billion tons of carbon and is home to 5% of global biodiversity—yet receives far less attention and protection than the Amazon.

Table 2. 10 countries that most drastically decreased deforestation in 2023 compared to baseline, in million hectares (Mha)

Country	Baseline 2018-20 (Mha)	Target in 2023 (Mha)	Deforestation in 2023 (Mha)	Change from baseline (%)	Deviation from target (%)
Australia	0.04	0.03	0.01	**-82%**	**-75%**
Colombia	0.17	0.12	0.08	**-55%**	**-35%**
Vietnam	0.07	0.05	0.04	**-51%**	**-30%**
Venezuela	0.07	0.05	0.04	**-45%**	**-21%**
Paraguay	0.23	0.16	0.16	**-32%**	**-2%**
Papua New	0.05	0.04	0.04	**-21%**	**+13%**
Guinea	0.1	0.07	0.08	**-16%**	**+19%**
United States of	0.28	0.19	0.24	**-16%**	**+21%**
America	0.04	0.02	0.03	**-15%**	**+21%**
Malaysia	2.14	1.94	1.5	**-9%**	**+29%**
Guatemala					
Brazil					

Note: Additional country data is available in Annex B. Global spatial data on forest change (Hansen et al. 2013, updated through 2022) and primary forests (Turubanova et al. 2018) differ in their definitions and methods from official national forest statistics. Moreover, the deforestation statistics used in this Assessment are derived from a map of drivers of tree cover loss (Curtis et al. 2018, updated through 2022) that attributes all tree cover loss to the same driver over the entire assessment period, even if changes in drivers do occur over time in regions or countries. In places where commodity-driven deforestation has declined significantly in recent years, current deforestation rates may be overestimated due to the large amounts of commodity-driven deforestation earlier in the period. Primary forest loss statistics may likewise be different from official national statistics

15 Definition

"Baseline 2018–20" means the average amount of deforestation that happened between 2018 and 2020. All later results are compared to this average to see if countries are moving toward their 2030 goals.

BOX 4. DEFORESTATION IN THE BRAZILIAN AMAZON VS. THE BRAZILIAN CERRADO

Remarkable recent success in the Brazilian Amazon

The largest forest biome in tropical Lation America and the Caribbean (and the world) has seen a remarkable reduction in deforestation. In 2023, the Brazilian Amazon – over half of the Amazon's total area – saw a 62.2 percent decrease in deforestation compared to 2022, falling to 454,000 hectares.120 Brazil has taken major steps to curb deforestation within this irreplaceable forest.

In 2023, the Brazilian government mobilized donor finance by reinstating the Amazon Fund,121 announcing new incentives for municipalities making progress on curbing deforestation,122 and ramping up law enforcement – issuing twice as many infraction notices and sanctions in the Legal Amazon in 2023 compared to the previous four-year average.123 Underpinning each of these actions is strong political will. In the face of competing priorities and tempting short-term economic gains, prioritizing forest protection and conservation demands significant political resolve and long-term vision.

Importantly, the success in the Amazon does not imply that leaders can now be complacent. Curbing deforestation is an ongoing effort, not a one-time achievement. There is significant progress that must be made to halt deforestation in the Amazon by 2030, and new laws or shifts in administration could threaten this progress.124 Still, these reductions in deforestation show progress in protecting forests is possible when leaders choose to act.

The Cerrado: Brazil's neglected biome

But not all biomes in the region have seen the same success. In stark contrast, the Cerrado – a sprawling tropical savannah home to five percent of the world's biodiversity across its grasslands, shrublands, and large swaths of forests – has experienced an alarming rise in ecosystem conversion in recent years. 2023 marked the first time that deforestation in the Cerrado was higher than that in the Amazon, with a 67.7 percent increase in deforestation in Cerrado compared to 2022.125 That translates to a staggering 1.11 million hectares of deforestation.126 The main causes of Cerrado's conversion are beef and soy production expansion and closely related to land speculation. 127 Cerrado is responsible for most of Brazil´s soy production and related environmental and social impacts.128 Cattle ranches there are four times more likely to contain deforested land than those in the Amazon.

Why has deforestation declined in the Amazon but risen in the Cerrado? For one, there is much weaker public protection for natural vegetation in the Cerrado compared to the Amazon. Most deforestation in the Cerrado is permissible under law,129 and as of 2016, only 7.5 percent of the Cerrado fell in public protected areas.130 Brazil's Forest Code – one of the laws often cited as behind the Amazon's deforestation declines – requires private landowners in the Cerrado to maintain between 20 and 35 percent of their property under native vegetation, in contrast to an 80 percent requirement for forests in the legal Amazon.131 And the Cerrado has simply not received the same attention as its Amazonian neighbor on the international stage, as evidenced by successful sectoral agreements to curb deforestation in the Amazon that overlook the impacts (and potential leakage) to the Cerrado.132

New efforts underway

Within Brazil, there are ongoing efforts and potential opportunities to reverse course for the Cerrado. In November 2023, the Brazilian government announced the fourth phase of the Action Plan for Prevention and Control of Deforestation in the Cerrado Biome (PPCerrado), which establishes the goal of zero deforestation by 2030 (defined as eliminating illegal deforestation and offsetting legal suppressions of vegetation and greenhouse gas emissions).[133] The Brazilian government could also promote conservation in the Cerrado by incentivizing agricultural expansion on already converted areas, and broadening the scope of initiatives like the Amazon Soy Moratorium to encompass the Cerrado.[134]

Action to protect the Cerrado must also be taken outside of Brazil. For instance, there is an opportunity to broaden the scope of corporate voluntary commitments, due diligence regulations, as well as international financing and cooperation to include the Cerrado, as well as other widely threatened non-forest ecosystems, such as the Pampas,[135] and the North American Great Plains.[136]

The current definitions with the EUDR exclude much of the Cerrado from its scope; by mid-2025, a review of the EUDR is expected to assess the inclusion of other natural ecosystems within the regulation.[137]

1.2.4 Temperate and boreal deforestation

Progress to eliminate deforestation in the world'stemperate and boreal regions varied in 2023 – but nearly all regions were off track. Though only 4 percent of global deforestation occurs outside the tropics, deforestation in temperate and boreal forests is still a critical issue.

In2023, almosteverytemperate and boreal region(whicharereported together in this deforestation analysis) was off track to eliminate deforestation by 2030, with the only exception being temperate Asia, which met its Assessment-identified 2023 target. (Degradation, which is much more common in temperate and boreal forests than deforestation, is covered in **Chapter 2**). The degree to which these regions missed their deforestation targets differs significantly (**Figure 6**). Temperate Latin America and temperate and boreal North America showed the greatest absolute levels of deforestation and missed their Assessment-identified deforestation targets by 92 percent and 20 percent, respectively. Temperate Africa experienced over 16,000 hectares of deforestation in 2023, which is nearly nine times the level needed to be on track to eliminate deforestation. It's also a nearly six-fold increase in deforestation from baseline levels. The sharp increase is primarily driven by forest clearance in Algeria and Tunisia, which together accounted for 85 percent of deforestation in the region. These countries have low forest cover, but deforestation increased by nearly ten times from 2022-23. The drivers of this increase remain unclear.

While most emissions from temperate and boreal forests come from degradation, emissions from deforestation in these regions remain significant (**Figure 7**). Deforestation in North America, for instance, caused the release of nearly 45 million metric tons of carbon dioxide equivalent. This is in the same range of magnitude as the transport sector of a country like South Africa.138 Temperate Latin America is the region with the second-largest emissions from deforestation, totaling nearly 27 million metric tons. Although temperate Africa's emissions are low in absolute terms, the region has experienced an increase of 582 percent compared to the baseline of carbon dioxide equivalent.

Despite accounting for only 4 percent of global deforestation, eliminating deforestation in temperate and boreal regions remains essential (in addition to addressing forest degradation in these regions, which is discussed in **Chapter 2**). The act of removing forest canopy and replacing it with roads, parking lots, homes, or cultivated areas has an immediate impact on the land's ability to absorb water and mitigate the destructive effects of floods,139 which are occurring at increasing frequency and intensity also in temperate regions.140 Forests in temperate and boreal regions also play a crucial role in regulating temperatures both on a global and local scale.141

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1 Did You Know That

Even though temperate and boreal forests account for only 4% of deforestation, they store nearly one-third of the world's terrestrial carbon—meaning their loss disproportionately affects global climate stability.

2 Interesting Facts

In North America, this deforestation is often linked to logging and land conversion in Canada's boreal forest, which provides habitat for over 500 species and absorbs more carbon per hectare than the Amazon.

2 Interesting Facts

This dramatic spike in Algeria and Tunisia could be linked to rising agricultural land pressures and climate adaptation struggles, but current national data is lacking—highlighting a major gap in forest monitoring.

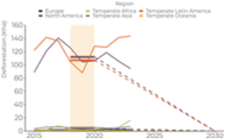
3 Definition

Carbon dioxide equivalent (CO_2e) is a way to measure how much all greenhouse gases warm the planet by comparing them to the amount of CO_2 that would cause the same effect.

4 Something to Think About

Could global carbon markets be expanded to include boreal forest preservation incentives, given their importance in long-term climate stabilization?

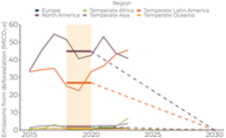
Figure 6. Temperate regional deforestation from 2015-2023, in thousand hectares (Kha)



Key metrics on deforestation in temperate and boreal regions, in thousands of hectares (Kha)

Region	Baseline deforestation (Kha)	Deforestation target for 2023 (Kha)	Deforestation in 2023 (Kha)	Change from Baseline (%)	Deviation from 2023 target (%)
Temperate Africa					
Temperate Asia	2.4	1.7	16.4	+590%	+886%
Temperate and boreal Europe	5.1 2.2 107.0 112.0	3.6 1.5 74.9 78.4	6.8 2.4 143.7 91.4	+34% +10% +34% -16%	+92% +58% +92% +20%
Temperate Latin America	1.3	0.9	1.2	-7%	+33%
Temperate and boreal North America					
Temperate Oceania					

Figure 7. Temperate regional emissions from 2015-2023, in millions of metric tons of carbon dioxide equivalent (MtCO2e)



Key metrics on cumulative emissions from deforestation in temperate and boreal regions, in million metric tons of carbon dioxide equivalent (MtCO2e)

Region Temperate Africa Temperate Asia	Baseline emissions (MtCO2e)	Emissions target for 2023 (MtCO2e)	Emissions in 2023 (MtCO2e)	Change from Baseline (%)	Deviation from 2023 target (%)
Temperate and	0.99 2.06	0.69	6.75	+582%	+874%
boreal Europe	0.94	1.44	3.78	+83%	+161%
Temperate Latin	26.89	0.66	1.12	+19%	+70%
America	44.85	18.83	45.60		+142%
Temperate and	0.89	31.39	40.77	+70%	+30%
boreal North America		0.62	0.97	-9%	+56%
Temperate Oceania					
				+9%	

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1.3 Pantropical primary forest loss

In2023, 3.7 million hectares of tropical primaryforestwere lost – leaving the world 38percent offtrack toeliminateprimary forest loss by 2030.

Inthe absence ofdata onglobal primary forest loss, thisreport looks at pantropic data on humid tropical primary forests.142 This is not a perfect proxy for all primary forest loss because it omits dry primary forests in the tropics and primary forests outside the tropics, in temperate and boreal regions. However, it does allow us to track some progress on this important indicator.

Levels of tropical primary forest loss remain almost the same as at the beginning of the decade (**Figure 8**). Additionally, in 2023, total emissions from pantropic primary forest loss totaled 2.41 billion metric tons of carbon dioxide equivalent – 37 percent higher than the Assessment-identified target to be on track to eliminate emissions from primary forest loss by 2030 (**Figure 9**).

2 **Definition**

Pantropic data are datasets that show forest loss across all tropical regions of the world, focusing mainly on humid tropical primary forests — the areas that are the most natural and least disturbed.

2 **Interesting Facts**

Dry tropical forests, though less visible in deforestation data, are home to unique species and are among the most threatened ecosystems due to agricultural pressure and weak legal protection.

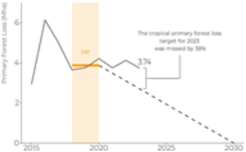
3 **Something to Think About**

With little progress since 2020, should countries be required to report primary forest loss separately from general forest loss in their national climate plans?

3 **Did You Know That**

This level of emissions exceeds the annual footprint of India—the world's third-largest emitter—and highlights how forest loss alone can cancel out many national climate gains.

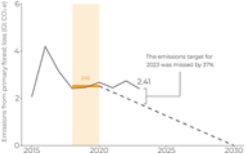
Figure 8. Global (pantropic) primary forest loss from 2015-2023, in millions of hectares (Mha) and additional key metrics



Key metrics on humid tropical primary forest loss (PFL) in million hectares (Mha)

Region	Baseline PFL (Mha)	PFL target for 2023 (Mha)	PFL in 2023 (Mha)	Change from Baseline (%)	Deviation from 2023 target (%)
Pantropic	3.87	2.71	3.74	**-3%**	**+38%**

Figure 9. Emissions from primary forest loss from 2015-2023, in billions of metric tons of carbon dioxide equivalent (GtCO2e) and additional key metrics



Key metrics on emissions from humid tropical primary forest loss (PFL) in billion metric tons of carbon dioxide equivalent (GtCO2e)

Region	Baseline PFL emissions (GtCO2e)	PFL emissions target for 2023 (GtCO2e)	PFL emissions in 2023 (GtCO2e)	Change from Baseline (%)	Deviation from 2023 target (%)
Pantropic	2.52	1.76	2.41	**-4%**	**+37%**

1.4 Regional and country-level primary forest loss

1.4.1 Tropical primary forest loss

Alltropical regions wereoff trackin2023 to eliminate primary forest loss by 2030 (Figure 10).

Whileboth Tropical AsiaandTropicalLAC reduced their primary forest loss below baseline levels (-2 percent and -9 percent, respectively), those reductions were not sufficient to meet the Assessment-identified 2023 target. Tropical Africa was also off track (by +60 percent). Millions of metric tons of emissions were released due to primary forest loss in every tropical region (**Figure 11**).

1 Interesting Facts

Even though more than 100 countries promised at COP26 to stop forest loss by 2030, tropical regions are still falling behind, showing a big gap between what was promised and what is actually being done.

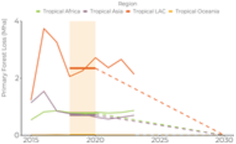
2 Something to Think About

Given that most deforestation in Africa is subsistence-driven, are traditional approaches like carbon credit programs sufficient—or should solutions be more community-centered and development-oriented?

2 Interesting Facts

These emissions not only shrink the world's ability to absorb carbon but also change rainfall patterns across continents — for example, causing less rain in farming areas of the U.S. and South Asia because of forest loss in the Amazon.

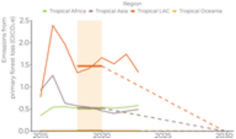
Figure 10. Regional tropical primary forest loss from 2015-2023, in millions of hectares (Mha)



Key metrics on regional humid tropical primary forest loss (PFL)

Region	Baseline PFL (ha)	PFL target for 2023 (ha)	Baseline PFL (ha)	Change from Baseline (%)	Deviation from 2023 target (%)
Tropical Africa	0.78	0.55	0.87	+12%	+60%
Tropical Asia	0.71	0.50	0.70	-2%	+41%
Tropical LAC	2.35	1.64	2.14	-9%	+30%
Tropical Oceania	0.01	0.01	0.01	-45%	-21%

Figure 11. Emissions from primary forest loss in tropical regions from 2015-2023, in billions of metric tons of carbon dioxide equivalent (GtCO2e)



Key metrics on emissions from regional humid tropical primary forest loss (PFL)

Region	Baseline PFL emissions (GtCO2e)	PFL emissions target for 2023 (GtCO2e)	PFL emissions in 2023 (GtCO2e)	Change from Baseline (%)	Deviation from 2023 target (%)
Tropical Africa	0.51	0.58	0.36	+13%	+61%
Tropical Asia	0.52	0.49	0.37	-5%	+35%
Tropical LAC	1.47	1.33	1.03	-10%	+29%
Tropical Oceania	0.01	0.01	0.01	-45%	-21%

1.4.2 Countries with the greatest absolute areas of tropical primary forest loss

In2023, the countrieswith the greatestabsoluteareasof tropical primary forest loss were Brazil, the Democratic Republic of Congo, and Bolivia (Table 3).

None of thesecountries were on track in 2023to haltprimary forest lossby 2030. Bolivia – for the second year in a row – experienced nearly triple the primary forest loss than needed to be on track. Four of the ten countries with the largest absolute areas of tropical primary forest loss in 2023 have above-baseline levels of primary forest loss.

Globally, Brazil had the largest absolute area of tropical primary tropical forest loss in 2023 (1.14 million hectares) – an area equal to 60 percent of all primary forest losses in the other nine countries combined (1.9 million hectares).

1.4.3 Countries with the most substantial decreases in primary forest loss

In2023, thecountries with themostsignificant decreases in tropical primary forest loss from baseline levels were Côte d'Ivoire, Colombia, and Vietnam (Table 4).

Among the top ten countries achieved the most substantial decreasesintropical primary forest loss in 2023 compared to baseline 2018-20, Colombia stands out because it is among the top ten countries with the greatest area of primary forest loss and was able to meet its Assessment-identified 2023 target. Colombia reduced its primary forest loss by 57 percent compared to baseline levels. Brazil's success was also notable. Though it was 10 percent off track in 2023, it still achieved the largest absolute reduction in primary forest loss compared to baseline levels (-0.33 Mha).

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2 Interesting Facts

Bolivia's continued forest loss is largely driven by land-use expansion for soy and cattle, often supported by state subsidies—highlighting how forest policies may be undermined by broader economic agendas.

4 Something to Think About

Colombia's success may be linked to peacebuilding efforts and community forest management—could post-conflict governance be a hidden opportunity for forest recovery in other regions?

Table 3. The 10 countries that recorded the largest areas of humid tropical primary forest loss (PFL) in million hectares (Mha)

Country	Baseline PFL (Mha)	PFL target for 2023 (Mha)	PFL in 2023 (Mha)	Change from baseline (%)	Deviation from target (%)
Brazil	1.47	1.03	1.14	-23%	+10%
Democratic Republic of the Congo	0.48	0.34	0.53	+9%	+56%
	0.24	0.17	0.49	+104%	+191%
Bolivia	0.31	0.22	0.29		+34%
Indonesia	0.16	0.11	0.15	-6%	+31%
Peru	0.15	0.11	0.07	-8%	-38%
Colombia	0.11	0.08	0.08	-57%	+1%
Malaysia	0.07	0.05	0.14	-30%	
Laos	0.07	0.05	0.1	+96%	+180%
Cameroon	0.06	0.04	0.05	+45%	+107%
Papua New Guinea				-20%	+14%

Note: Additional country data is available in Annex B. Global spatial data on forest change (Hansen et al. 2013, updated through 2022) and primary forests (Turubanova et al. 2018) differ in their definitions and methods from official national forest statistics. Moreover, the deforestation statistics used in this Assessment are derived from a map of drivers of tree cover loss (Curtis et al. 2018, updated through 2022) that attributes all tree cover loss to the same driver over the entire assessment period, even if changes in drivers do occur over time in regions or countries. In places where commodity-driven deforestation has declined significantly in recent years, current deforestation rates may be overestimated due to the large amounts of commodity-driven deforestation earlier in the period. Primary forest loss statistics may likewise be different from official national statistics.

Table 4. The 10 countries that achieved the most drastic decreases in primary forest loss (PFL) in 2023 compared to baseline in million hectares (Mha)

Country	Baseline PFL (Mha)	PFL target for 2023 (Mha)	PFL in 2023 (Mha)	Change from baseline (%)	Deviation from target (%)
Côte d'Ivoire	0.02	0.01	0.01	-59%	-41%
Colombia	0.15	0.11	0.07	-57%	-38%
Vietnam	0.03	0.02	0.02	-49%	-27%
Paraguay	0.04	0.03	0.03	-44%	-20%
Venezuela	0.05	0.03	0.03	-42%	-17%
Malaysia	0.11	0.08	0.08	-30%	+1%
Guatemala	0.03	0.02	0.02	-28%	+2%
Brazil	1.47	1.03	1.14	-23%	+10%
Papua New Guinea	0.06	0.04	0.05	-20%	+14%
Mexico	0.06	0.04	0.05	-18%	+17%

Note: Additional country data is available in Annex B. Global spatial data on forest change (Hansen et al. 2013, updated through 2022) and primary forests (Turubanova et al. 2018) differ in their definitions and methods from official national forest statistics. Moreover, the deforestation statistics used in this Assessment are derived from a map of drivers of tree cover loss (Curtis et al. 2018, updated through 2022) that attributes all tree cover loss to the same driver over the entire assessment period, even if changes in drivers do occur over time in regions or countries. In places where commodity-driven deforestation has declined significantly in recent years, current deforestation rates may be overestimated due to the large amounts of commodity-driven deforestation earlier in the period. Primary forest loss statistics may likewise be different from official national statistics.

CHAPTER 2

Is the world on track to eliminate forest degradation by 2030?

Forest degradation, like deforestation, poses threats to biodiversity, forest resilience, and ecosystem services.147 It can release emissions that equal or exceed those caused by deforestation, as observed in forests including the North American boreal and the Amazon.148 Particularly in tropical forests, human-caused forest degradation often precedes deforestation – meaning these two processes are intricately intertwined.149

Tracking forest degradation is hindered in part by disagreements over its definition. While the meaning of deforestation is relatively solidified in policy,150 there is still variance in and disagreement around how degradation is understood and defined.151 There is widespread agreement that forest degradation involves changes of forest structure, with indicators including species composition and abundance, and of ecological functions upon which the existence and resilience of a forest is based.152 Yet, there is a lack of consensus regarding the exact attributes and the magnitude of change necessary to qualify forest disturbances as degradation. Some governments and stakeholders also consider economic indicators alongside ecological ones.153

Unsustainable forestry is a major driver of forest degradation worldwide154 including impacts to primary or old-growth forests, and other biodiversity-rich forests.155 In 2023, forestry led to the loss of eight million hectares of tree cover.156 This loss may be temporary, as part of sustainable forest management practices, such as fire prevention cuts and sustainable timber extraction. However, it can also lead to degradation, where harvesting impacts the forest's structure to the extent that

2

Definition

Forest degradation lacks a universally agreed definition in policy and science. Some define it by structural and ecological shifts; others include economic production like wood volume or commercial viability.

h

[illegible] consistency in the classification of points between the original and revised datasets. The revised ranges are used here. They will be validated in a peer-reviewed paper and until then should be considered provisional.

METHODOLOGY: ASSESSING PROGRESS TOWARD ELIMINATING FOREST DEGRADATION

The Assessment relies on multiple datasets to evaluate forest degradation across regions.

In the tropics, the Tropical Moist Forests (TMF) dataset assesses temporal dynamics of forest disturbances to differentiate degradation from deforestation.143 All forest disturbances events whose impacts were observed over a period of less than 2.5 years (900 days) are considered degradation processes, and impacts exceeding that period are instead classified as deforestation.144 For estimating emissions from degradation in the tropics, the Assessment leverages data adopting the same definitions defined by the TMF.145 Accordingly, the respective emissions from degradation of tropical moist forests are presented alongside the area of degraded tropical humid forests.

Additionally, the Assessment framework includes one forest integrity indicator to track the loss of forest integrity as a proxy for forest degradation. To this end, we leverage the forest integrity classes as defined by the Forest Landscape Integrity Index (FLII).146 The value of the FLII ranges between 0 and 10. Three forest integrity classes (high, medium and low) are defined in the original paper describing the FLII, based on differences in physical condition and defined by FLII value ranges.h Our indicator tracks the percent of forests that transition from a higher to a lower integrity class. For further details on the methodologies, please see **Annex B**.

See additional methodology box on the following page for more on the difference between TMF-based and FLII-based indicators.

species composition, ecological functions, productivity, or overall ecosystem conditions decline. In temperate and boreal forest countries where forestry is a major economic activity, like Canada, the U.S., Sweden, and Russia, forest degradation is generally a more relevant concern than deforestation since timber harvests do not typically change the land use but can have long-term impacts on forest quality.

The predominant drivers of degradation in the tropics vary by region. In the Amazon, fire, edge effects, timber extraction, and extreme drought are primary causes, with around 38 percent of the Amazon under some form of degradation from 2001-18.161 These disturbances are driven by both local factors (such as weak governance and small-scale agriculture) and global pressures (like agricultural expansion driven by international commodity markets and climate change).162 In the Congo Basin, small-scale agriculture, the expansion of human settlements, fuelwood collection, charcoal production, and roads are the main contributors to forest degradation. Industrial activities like mining and forestry, while less common, still have significant impacts.163,164 While research is unevenly distributed within the region, Southeast Asia is thought to experience forest degradation primarily due to the establishment of commercial plantations, shifting cultivation, logging, fire, and drought.165

1 Something to Think About

Countries with large military space programs often worry about hostile attacks on satellites, anti-satellite weapons, or interference with command systems. They see the potential for conflict as the biggest risk. In contrast, countries that mainly use space for civilian

2 Interesting Facts

That's nearly two-fifths of the world's largest rainforest—meaning much of the Amazon remains forested by definition, but is already weakened ecologically and more vulnerable to collapse.

METHODOLOGY: WHAT DO THE TMF-BASED AND FLII-BASED INDICATORS REVEAL ABOUT FOREST DEGRADATION, AND HOW DO THEY DIFFER?

It is important to note that while both the TMF dataset and the FLII rely primarily on remote-sensing data to estimate structural changes in forests and assess the extent of degraded forest areas, the two indicators have distinctive features that make them unique and complementary:

- Spatial-temporal coverage, and resolution: The TMF focuses exclusively on moist forests occurring in the tropics and has a resolution of 30 meters,[157] and the time series is updated to 2023. The FLII has global coverage, including all forest types, with a spatial resolution of 300 meters and the time series is currently only updated to 2022.[158] Type of Disturbances: The
- TMF and FLII methodologies account for different types of disturbances. The TMF estimates the area of degraded forests based on anthropogenic disturbances such as logging, as well as natural events like fires, windbreaks, and extreme dryness.[159] In contrast, the FLII considers three main components: observed anthropogenic pressures (infrastructure, agriculture, tree cover loss), inferred anthropogenic pressure (modeled based on proximity to observed pressures), and changes in forest connectivity.[160] Notably, the FLII does not account for climate-related stressors, such as droughts and fires, as drivers of forest degradation. Leading
- and Lagging Indicators: A fundamental distinction between the two is that the TMF-based indicator is a "lagging indicator," displaying degradation that has occurred in tropical moist forests up to 2023. On the other hand, the FLII is a "leading indicator." This means that the FLII score responds to both variations in forest area and the presence of anthropogenic factors known to drive forest degradation—or loss of forest integrity, according to FLII methodology. For example, when forests in a given region
- are impacted by logging, both the TMF and FLII detect logging operations as a driver of forest degradation, and both indicators respond accordingly: the TMF shows an increase in the area of degraded forests, while the FLII score decreases, signaling a loss of forest integrity. However, if logging activity ceases in a forest area, the two indicators react differently. The TMF dataset only reflects forest regrowth that has already occurred (as presented in the Forest Restoration and Regrowth chapter). In contrast, the FLII algorithm interprets the cessation of farming as a precursor to forest recovery, increasing the FLII score even if forest recovery has not yet taken place. Thus, the TMF-based indicator of forest degradation is useful for tracking progress by recording past degradation in tropical moist forests both by anthropogenic and natural disturbances, while the FLII-based indicator complements this by providing insights into inferred anthropogenic pressures and anticipates how forest integrity might change in response to those pressures.

2.1 Degradation in tropical moist forests

2.1.1 Pantropical degradation

In2023, 3.72 millionhectares of forests were degraded in tropical regions, which means the world is 20 percent off track to eliminate forest degradation of tropical moist forests (TMF) by 2030 (Figure 12). Emissions resulting from this degradation totaled over 295 million metrics tons of carbon dioxide equivalent (Figure 13).

Degraded forests, particularly those that have lost over 50 percent oftheircanopy structure, face a significantly higher risk of deforestation. In other words, degradation can predict future deforestation, with the likelihood of total deforestation and land use change increasing as degradation worsens. Data from Latin America, Africa, and Asia indicate that degraded forests that experienced deforestation after 2020 previously had significantly lower canopy heights and above-ground biomass compared to those that were not deforested. On average, degraded forests in Latin America exhibited a higher risk of deforestation than those in Africa or Asia.166

Figure 12. Degradation of tropical moist forests from 2015-2023, in millions of hectares (Mha)

Key metrics on the degradation of tropical moist forests in million hectares (Mha)

Region	Baseline degradation (Mha)	Degradation target for 2023 (Mha)	Degradation in 2023 (Mha)	Change from Baseline (%)	Deviation from 2023 target (%)
Pantropic	4.44	3.11	3.72	-16%	+20%

Figure 13. Emissions from the degradation of tropical moist forests from 2015-2023, in million metric tons of carbon dioxide equivalent (MtCO2e)

Key metrics on emissions from the degradation of tropical moist forests in million metrics tons of carbon dioxide equivalent (MtCO2e)

Region	Baseline emissions from degradation (MtCO2e)	Emissions from degradation target for 2023 (MtCO2e)	Emissions from degradation in 2023 (MtCO2e)	Change from Baseline (%)	Deviation from 2023 target (%)
Pantropic	356.58	249.6	294.73	-17%	+18%

2.1.2 Regional tropical degradation

The two largest tropical forestregions - tropical Asia and tropical LAC – were not on track in 2023 to halt forest degradation, whereas tropical Africa and tropical Oceania met their Assessment-identified 2023 targets (Figure 14). Emissions from forest degradation in tropical LAC are in the scale of the total national emissions of countries like Angola, Kenya or Tanzania (Figure 15).

Alarmingly, so-called edgeeffects – changes in forest structure and function that occur at the edges of forests due to habitat fragmentation167 – affect 18 percent of the remaining tropical moist forests – more than double the area previously estimated.168

Species that thrive in interior forest environments may struggle to survive at the edges due to increased exposure to light, wind, and temperature fluctuations, which can alter microclimates and disrupt ecological interactions.169 Edge effects also can have detrimental effects on forests' carbon storage and sequestration.170 In Latin America, Africa, and Asia, canopy height in tropical moist forests is noticeably reduced by edge effects deep into the forest interior – up to 1.7 kilometers in Africa and Asia, and up to 7.0 kilometers in Latin America.171 The most extensive edge effects are found along active and consolidated deforestation fronts in the Amazon, the highly fragmented coasts of Borneo and Sumatra, and the borders of the Congo Basin.172 Fragmentation also facilitates access to forest interiors, leading to more hunting and resource extraction, such as selective logging.173

Edge effects can also activate a vicious cycle with fires. Intact rainforests exhibit strong resistance to fires due to their dense canopies and high humidity, which create conditions that are less conducive to fire ignition and spread.174 In contrast, the increased sunlight, wind, and dryness at forest edges increase susceptibility to fire.175 Once burned, vegetation density and the soil's nutrient content may be compromised, hindering natural recovery and in turn increasing the risk of future fires.

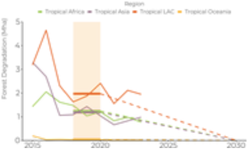
2 **Did You Know That**

Edge effects don't just impact trees—they reduce bird, insect, and mammal biodiversity by as much as 75% within affected zones, even deep inside forests.

4 **Interesting Facts**

Recovery delays can lock forests into long-term degraded states, increasing vulnerability to future fires.

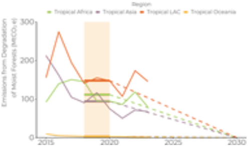
Figure 14. Degradation of tropical moist forests from 2015-2023, in millions of hectares (Mha)



Key metrics on degradation of tropical moist forests at the regional scale in million hectares (Mha)

Region	Baseline degradation (Mha)	Degradation target for 2023 (Mha)	Degradation in 2023 (Mha)	Change from Baseline (%)	Deviation from 2023 target (%)
Tropical Africa	1.24	0.87	0.77	**-38%**	**-11%**
Tropical Asia	1.19	0.83	0.98	**-17%**	**+18%**
Tropical LAC	1.97	1.38	1.95	**-1%**	**+41%**
Tropical Oceania	0.04	0.03	0.02	**-61%**	**-44%**

Figure 15. Emissions from the degradation of tropical moist forests at the regional level from 2015-2023, in million metric tons of carbon dioxide equivalent (MtCO2e)



Key metrics on emissions from the degradation of tropical moist forests in million metrics tons of carbon dioxide equivalent (MtCO2e)

Region	Baseline emissions from degradation (MtCO2e)	Emissions from degradation target for 2023 (MtCO2e)	Degradation emissions in 2023 (MtCO2e)	Change from Baseline (%)	Deviation from 2023 target (%)
Tropical Africa	111.44	78.01	80.01	**-28%**	**+3%**
Tropical Asia	94.08	65.85	67.54	**-28%**	**+3%**
Tropical LAC	147.83	103.48	145.86	**-1%**	**+41%**
Tropical Oceania	3.23	2.26	1.32	**-59%**	**-42%**

Billions of people rely on forests and other natural ecosystems for their livelihoods.191 Forest loss due to smallholder farmers and local communities (e.g., shifting cultivation or fuelwood collection) is usually temporary but can lead to degradation or permanent deforestation when it affects primary and high integrity forests.

Thiscanbe observed in the Congo Basin and specificallytheDemocraticRepublic of the Congo (**Box 5**), where demand for agricultural commodities, restrictions in forest areas or access, population growth and other socio-economic factors drive unsustainable and expanded shifting cultivation. In the Congo Basin, scientists observed an expansion of the area under shifting cultivation from 2000-14, correlating with human population growth.192

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BOX 5. URGENT NEED FOR FOREST AND DEVELOPMENT FINANCE IN THE DEMOCRATIC REPUBLIC OF THE CONGO AND BROADER CONGO BASIN

The Congo Basin contains the world's second-largest tropical forest, the largest high-integrity forests, and vast peatlands.176 Protecting these forests is critical for meeting global climate, biodiversity, and forest goals.177 Historically, the region has contributed little to global deforestation (<7% of the 2010-20 total), but both deforestation and degradation are on the rise.178 Small-scale farm clearing is the region's largest forest loss driver, followed by selective logging, fire, artisanal and small-scale mining, and infrastructure development.179 While large-scale agriculture and mining have historically posed smaller risks, growing commodity demand from wealthy countries is escalating the threat.

Congo Basin countries have committed to forest conservation but face obstacles such as weak governance, low economic development, public debt, and a growing population. Legacies of colonialism and neocolonialism have lasting impacts on current politics, security, and economies.180 Most countries depend on natural resources for economic development.181 The Democratic Republic of the Congo, home to 60 percent of the basin's forests, is crucial for conservation.182 Yet, it faces mounting challenges. More than half of its population live in remote areas and rely on forests for food, fuel, and income.183 Among the five poorest countries in the world, the country's security situation is also deteriorating. Further, its significant population of Indigenous Peoples struggle with displacement and lack access to basic services like healthcare and education.184

Addressing these challenges requires large-scale, innovative, and urgent action.185 Alternative development pathways must be forged, ones that do not rely on forest destruction and address the immense challenges of extreme poverty and armed conflicts. Well-targeted forest finance can play a vital role in stimulating sustainable development and conservation, but current support is far from sufficient.186

International public finance provides the kind of long-term, affordable financing needed to address structural challenges and will remain a crucial funding source for the Congo Basin. But it remains largely inaccessible due to foreign debt and limited fiscal space.187 Several strategies can increase public finance flows: (i) reforming multilateral development banks by, for example, reviewing the use of Special Drawing Rights to favor developing countries that implement conservation efforts; (ii) revising financial and debt management frameworks, such as how countries' financial stability is assessed; and (iii) relieving or restructuring debt, in line with the G20's Common Framework for Debt Treatments.188

There is also a desperate need to enable forest-friendly private investment in the region, given its potential to scale far beyond what public financing can provide. Blended finance, where public or philanthropic finance is paired with private investment to reduce investor risk, could also play a key role in attracting new money from the private sector. Public policies should support the development of these mechanisms to encourage investments in sustainable development pathways.189

Market-based mechanisms that assign value to standing forests can also pull in private funds. However, these approaches must be carefully designed to ensure respect for the rights of Indigenous Peoples and local communities, fair benefit-sharing, and the effective delivery of environmental benefits. Market-based flows can complement the larger, more structural financial flows generated by international public and blended finance.190

2.2 Loss of forest integrity

2.2.1 Global forest integrity

In2022,according to theForest Landscape Integrity Index (FLII) 62.6 million hectares of forest were degraded to lower integrity categories,i which is roughly ten times the area deforested worldwide in the same year. Many additional areas of forest also showed reduced integrity scores but remained within the same broad integrity category.

TheFLII, whichassigns ecological integrityscores, is highlysensitivetothe presence or removal of many of the key anthropogenic pressures known to drive forest degradation, which means it could be useful as a leading indicator of future forest degradation or recovery of ecological integrity. However, it does not account for the growing global role of fire as a driver of degradation (see **Chapter 3**), counting fires as largely not human-induced.j Therefore, the FLII's results must be viewed within the broader context of degradation trends and the anthropogenic and non-anthropogenic pressures driving them.

Based on the value of this FLII-based indicator, there has been a steady decrease in the annual rate of degradation to lower integrity categories compared to the baseline period. The degradation rate for 2022 was below the Assessment-defined target for that year, putting the world on track to halt forest degradation by 2030 by this measure. Given the level of variation between years, a longer time series is required before we can be confident that this represents a sustained downward trend; and the increasing frequency and intensity of forest fires is not reflected in these results. Analysis is underway to determine which factors are driving this decline in observed rates of degradation to lower integrity categories.

[i] This includes areas that moved from a higher to a lower integrity category, net of any areas with increased FLII score. Such increases may result from the removal of observed and/or inferred anthropogenic pressure, anticipating the regeneration of forests that may occur in the future. Moreover, this estimate excludes areas that were permanently deforested, for which see earlier sections.

[j] The FLII is conservative in that it does not treat most fires as causes of degradation, because many fires are a natural, necessary part of the ecology in boreal, dry tropical, and some other forest types. While it is acknowledged that degradation can result from long-term trends in fire regimes in these ecosystems, this cannot be detected using the FLII. The FLII is also not currently very sensitive to the degrading impact of fires in humid forest types where fire is not a natural part of the ecology.

1 Interesting Facts

That's about ten times the global deforested area in 2022, showing degradation—not deforestation—is currently the dominant form of forest decline worldwide.

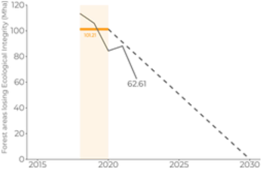
3 Something to Think About

Should integrity scores be changed to reflect the time it takes ecosystems to recover, so early signs of regrowth don't give a false impression of full health?

3 Something to Think About

Should forest integrity indexes be updated to include human-caused fires, since fire is now one of the main drivers of forest damage around the world?

Figure 16. Net area of forests that transitioned to a lower integrity class from 2018-2022, in million hectares (Mha)



Key metrics on areas of forest that lost ecological integrity globally, in million hectares (Mha)

Region	Baseline (Mha)	Integrity Loss Target 2022 (Mha)	Integrity Loss 2022 (Mha)	Change from Baseline (%)	Deviation from 2022 Target (%)
Global	101.2	80.97	62.61	**-38%**	**-23%**

CHAPTER 2 – DEGRADATION

2.2.2 Regional forest integrity

Amongall regions, theFLIIfound that tropical regions recorded the highest annual degradation rates for 2022. In Tropical LAC, just above 15 million hectares of forests transitioned to a lower ecological integrity class, followed by tropical Africa with 14.3 million hectares. Despite this, all four tropical regions were on track to achieve zero degradation by 2030 by this measure.

Thoughthese results do not account forforest fires, theyare remarkable, signaling that efforts to protect tropical forests may have successfully reduced anthropogenic pressures on these ecosystems and providing grounds for cautious optimism about their future preservation.

Based on the FLII-based indicator, since 2020, there has been a steep decline in the degradation rate across all tropical regions. This could be explained with the abandonment of agricultural land, which could be detected within the FLII as a reduction of observed and inferred human pressures on forests. This, based on the FLII methodology, would result in an increase of the forest integrity score even though forest recovery may be still in its early stages (see methodology box and **Annex B** for details on the features of the FLII).

In 2022, four of the six temperate regions were on track to halt forest degradation by 2030. Unfortunately, temperate Asia and temperate Europe were both far off track.

With 7.2million hectares offoreststransitioning to a lower integrity class, temperate Asia had the highest degradation rate among temperate regions in 2022, exceeding its Assessment-identified regional integrity loss target by 33 percent. Temperate Europe's degradation rate was nearly double what was needed to be on track to halt degradation by 2030, with over 5 million hectares of forests transitioning to a lower ecological integrity class.

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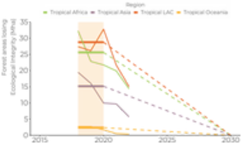
3 **Definition**

A forest's "integrity score" measures how healthy and undisturbed it is by human activity. This score may rise when human pressure decreases, but that doesn't always mean real recovery. True regrowth takes decades and needs close tracking of species and biomass returning.

5 **Interesting Facts**

Forest degradation is not limited to the tropics—temperate Europe's worsening rate reflects rising logging pressures, infrastructure expansion, and increasing vulnerability to storms and pests.

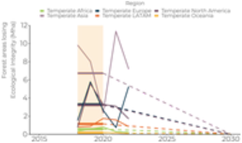
Figure 17. Net area of forests that transitioned to a lower integrity class in tropical regions from 2018-2022, in million hectares (Mha)



Key metrics on areas of forest that lost ecological integrity in tropical regions, in million hectares (Mha)

Region	Baseline (Mha)	Integrity Loss Target 2022 (Mha)	Integrity Loss 2022 (Mha)	Change from Baseline (%)	Deviation from 2022 Target (%)
Tropical Africa	25.62	20.5	14.38	-44%	-30%
Tropical Asia	15.17	12.14	5.72	-62%	-53%
Tropical LAC	28.77	23.02	15.08	-48%	-34%
Tropical Oceania	2.39	1.91	0.38	-84%	-80%

Figure 18. Net area of forests that transitioned to a lower integrity class in temperate regions from 2018-2022, in million hectares (Mha)



Key metrics on areas of forest that lost ecological integrity in temperate regions, in million hectares (Mha)

Region	Baseline (Mha)	Integrity Loss Target 2022 (Mha)	Integrity Loss 2022 (Mha)	Change from Baseline (%)	Deviation from 2022 Target (%)
Temperate Africa	0.57	0.46	0.22	-62%	-52%
Temperate Asia	6.73	5.39	7.18	+7%	+33%
Temperate Europe	3.32	2.66	5.27	+59%	+98%
Temperate LATAM	1.15	0.92	0.85	-26%	-8%
Temperate North America	3.22	2.57	1.71	-47%	-34%
Temperate Oceania	0.18	0.14	0.08	-55%	-43%

Boreal regions recorded the second highest annual degradation rates after tropical regions.

In borealEurope, 10.6millionhectarestransitionedto a lower integrity class, which is 25 percent above the region's Assessment-identified target to be on track with 2030 forest goals. Boreal North America was on track with about 1 million hectares transitioning to a lower integrity class from 2021 to 2022.

Figure 19. Net area of forests that transitioned to a lower integrity class in boreal regions from 2018-2022, in million hectares (Mha)

Key metrics on areas of forest that lost ecological integrity in boreal regions, in million hectares (Mha)

Region	Baseline (Mha)	Integrity Loss Target 2022 (Mha)	Integrity Loss 2022 (Mha)	Change from Baseline (%)	Deviation from 2022 Target (%)
Boreal Europe	10.67	8.53	10.65	0%	+25%
Boreal North America	3.41	2.73	1.09	-68%	-60%

2.3 Conversion of temperate and boreal forests

The vast majority of temperate forests and much of the boreal forest have been heavily altered by human activities, especially timber harvesting. Only 14 percent of the forests in temperate regions and 60 percent of forests in boreal regions are considered to have high ecological integrity.194

Many forests in temperate and boreal regions are harvested using short rotation clearcut methods.195 Even though they are left to regenerate naturally, this can disrupt the forest's natural development, leading to a different, less diverse ecosystem that may not return to its original state.196 Timber harvesting is the dominant disturbance in these areas.197

While affected by anthropogenic pressures over the centuries, temperate and boreal are home to a diverse array of species, including many endemic and threatened species, making their conservation vital for maintaining global biodiversity.198 Old-growth forests, in particular, are characterized by exceptional naturalness, integrity, complexity, resilience, as well as structural and functional diversity.199 Yet, these are often undervalued ecosystems which need to be closely monitored and both for their conservation value and their climate mitigation potential preserved.200

In the absence of a dataset directly tracking the degradation of temperate and boreal forests, in this section we instead present trends in the conversion of temperate and boreal forests. Not all conversion necessarily leads to ecosystem degradation. In fact, conversion also includes timber production and other forestry activities, some portion of which is sustainable, and natural tree mortality. While this supplemental indicator cannot inform us directly about the state of temperate and boreal forest degradation, it can give an indication of the cumulative impact of both sustainable and unsustainable pressures on these forest ecosystems.

METHODOLOGY: ASSESSING TEMPERATE AND BOREAL FOREST CONVERSION

For temperate and boreal forests, a dataset tracking the extent of degraded forest – i.e. an equivalent to the TMF dataset in the tropics – does not exist. Thus, we evaluate the conversion of forest lands to highlight the cumulated impact of anthropogenic and natural stressors on forests outside the tropics. To this end, the Land Use Change Alert (LUCA) dataset is presented. The LUCA detects land-use changes in all forest types, anywhere in the world,193 but only the changes detected in temperate and boreal forests are presented here.

The conversion of temperate and boreal forests does not necessarily lead to ecosystem degradation. In fact, forest conversion also includes sustainable timber harvesting and other forestry activities that may not result in degradation. However, data on the percentage of truly sustainable forestry activities within forest conversion are lacking, making it difficult to extrapolate degradation estimates from forest conversion data. With this in mind, we do not set a zero-forest-conversion target by 2030, as this would imply halting natural tree mortality, all forestry activities, and forest fires.

The conversion of temperate and boreal forests reflects the cumulative impact of multiple stressors on these ecosystems. To avoid double-counting forest conversion across indicators, we subtract the extent of deforestation in temperate and boreal regions (i.e., permanent forest conversion, as presented in the Forest Loss chapter) from the overall forest conversion area. While this approach may not yield highly accurate estimates of non-permanent forest conversion, nor fully represent the extent of degraded forests, we anticipate the development of more robust methodologies to distinguish degradation drivers and provide better estimates of forest degradation outside the tropics.

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In 2023, 2.21 million hectares of temperate and boreal forests were converted for other land uses worldwide.

While not corresponding to the extent of degradedforestsin temperate and boreal regions, the trend of this indicator reveals large annual fluctuations in nearly all temperate regions as well as the two boreal regions considered in this report (**Figure 20**).

The substantial and regular annual fluctuations in the conversion of temperate and boreal forests suggest that multiple stressors are at play, which may hinder the ability of these forests to regenerate at the same pace as disturbances occur.

Inmany boreal and temperate forestmanagement systems, timber harvesting and regeneration occur at regular intervals, known as rotation periods. This rotation interval is determined by factors such as the growth rate of the trees, the desired size of the harvested timber, and the overall management objectives for the forest.201 Overall, rotational systems result in rather stable rate of extraction with relatively small annual fluctuations. Natural drivers, on the other hand, can cause occasional but substantial year-to-year fluctuations in forest conversion due to large-scale disruptive events like extreme weather, and wildfires.202 The occurrence of extreme natural phenomena is increasing due to climate change, putting additional pressure on forests (see **Chapter 3**).

Studies reveal that in Europe, human activities have significantly shortened the time between major forest disturbances, reducing it by half compared to natural cycles. 203

This hasled to forests thatare much younger, particularly in northern Europe and similarly in southeastern North America.204 As a result, the time it takes for vegetation to recycle carbon – known as carbon turnover time – has decreased by 32 percent in temperate forests and by 7 percent in boreal forests.205 In European forests, more than 50 percent of carbon stock is stored in large, old-growth trees, even though these trees make up a relatively small portion of the total tree population.206 Both young and old forests can have high levels of deadwood, which also plays a central role in the carbon turnover time.207 However, both the carbon stocked in standing trees and the amount of deadwood available depends on the rate of anthropogenic and natural disturbances.

[k] Sanitation and salvage logging are two forestry practices aimed at managing tree populations, particularly in response to disturbances or threats to forest health. Sanitation logging involves the removal of trees that

2 Something to Think About

Should policymakers distinguish between human-made and natural causes behind these fluctuations when designing forest management policies? Failing to do so may lead to overgeneralized or ineffective conservation strategies.

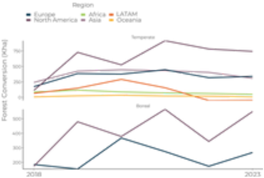
5 Interesting Facts

Shorter disturbance cycles caused by human management reduce forest maturity and biodiversity, which can diminish resilience to future environmental shocks like pests, storms, or heatwaves.

6 Definition

Carbon turnover time is how long it takes for forests to release stored carbon back into the air or into new plant growth. A shorter turnover time means carbon moves faster through the system, which can lower the forest's ability to store carbon over time.

F igure 20. Conversion of temperate and boreal forests from 2018-2023, in thousands of hectares (Kha)



The demand for wood products, combined with efforts to increase productivity, has significantly changed the species composition in large forest areas, making forests more vulnerable and prone to degradation.

Asa result, many forests are now containing non-native speciesand an unnaturally high number of monocultures.208 In some regions, these changes have been compounded by the legacy of past land use, with large areas of young forest growing on former agricultural land.209 These shifts in age structure and species composition also influence the type, severity, and frequency of natural disturbances, such as windthrow, wildfires, insect outbreaks, or diseases.210 These disturbances, in turn, further impact forest composition and age structure, affecting how forests are managed, and giving room to practices like salvage and sanitation logging,k which were in some case seen as a pretext for timber harvesting.211

The commercial implications of these dynamics, combined with the complexity of forest degradation processes across different regions and timeframes, make it nearly impossible to obtain a global picture of forest degradation and respond to it in a timely manner. However, these challenges must not be allowed to impede the conservation and sustainable management of temperate and boreal forests, where key attributes related to forest degradation – such as biodiversity richness and carbon stocks – have already been declining for decades in several regions.212

are infected with pests or diseases. Salvage logging is the practice of harvesting trees from areas that have been damaged by natural disturbances such as wildfires, floods, windstorms, or pest outbreaks.

CHAPTER 3

What is the state of tree cover loss due to fires?

Assessing recent trends in forest fires is crucial for accurately tracking progress toward ending deforestation and forest degradation. While fires are a natural part of many ecosystems, the growing frequency and intensity of forest fires—often exacerbated by human activity—pose a significant threat to achieving the 2030 forest goals. These worsening fires create a vicious cycle: more intense fires lead to greater degradation, reducing forest resilience and increasing vulnerability to future fires. This dynamic makes it even harder to halt deforestation and degradation by 2030.

This section on tree cover loss due to fires aims to highlight the growing significance of fires on tropical, temperate and boreal forests, underscoring the worsening impacts of fires within the broader context of forest goals. In this section, we do not track progress against baselines and 2030 targets, as with other indicators, because eliminating forest fires is not desirable from an ecological standpoint. To evaluate progress, we must instead address the emerging reality of worsening forest fires as we consider the full scope of challenges in eliminating deforestation and forest degradation.

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METHODOLOGY: ASSESSING TREE COVER LOSS DUE TO FIRES

Estimated impacts of fires on forests are expressed as tree cover loss due to fires.213 The dataset expands on the existing annual tree cover loss data214 by identifying where fires are the primary cause of loss.

Each pixel in the annual tree cover loss data is analyzed to determine if the loss resulted from stand-replacing fires, which burn most or all living trees. This tree cover loss due to fires is distinct from losses caused by agriculture, forestry, and other factors. The underlying methodology provides a globally consistent definition enabling detailed analysis of tree cover loss due to fires from 2001 onwards.215

Tree cover loss due to fires includes natural or human-ignited fires that directly lead to tree canopy cover loss, such as wildfires and intentionally set fires, including escaped fires related to agriculture, hunting, recreation, or arson. It excludes instances where trees are mechanically removed before burning and low-intensity or understory fires that do not cause significant canopy loss at the 30-meter pixel scale.216

3.1 Tree cover loss due to fires

Inthe past decade, thefrequency and extent of fires have deviated from the historical average, with disastrous effects on ecosystems and economies.217 Today's unprecedented global surge in forest fires is driven by a vicious cycle of anthropogenic climate change, land use conversion, and degradation.

When considered individually,each instanceof extremefireyearsmay appear to be an anomaly or a rare occurrence. However, the overall picture reveals a concerning trend: the frequency and intensity of these peak fire years are escalating across all regions and forest types.218 This increase is not merely a statistical blip; it signifies a profound shift in fire dynamics driven largely by climate change, which is exacerbating conditions conducive to frequent, extended, intensive fires.219

The risk of a spiraling fire-climate feedback loop is particularly high in boreal and tropical forests, where large and frequent fires can turn important terrestrial carbon reservoirs into major sources of greenhouse gas emissions and exacerbate climate change.220

From 2001-23, more than 138 million hectares of tree cover were lost globally due to fires (Figure 21). Nearly one third of the area lost to fires since 2001 was burned from 2019-23.

Inthose four years, nearly13 billion metric tons of carbon dioxide equivalent was released into the atmosphere due to forest fires (**Figure 22**).l For perspective, that's nearly double the emissions of the Indian energy sector over the same period.m

Across all regions, what may have previously been considered an "outlier" year for fires has become all too common. In 2023, a historically unprecedented drought – primarily attributed to climate change – created favorable conditions for the spread of human-ignited fires into the Amazon rainforest.221 In Oceania, tree cover loss due to fires surged dramatically in 2019 and 2020 during the so-called Australian Black Summer, when over 24 million hectares of forest, shrubland, and grassland

[l] Emissions from tree cover loss due to fire include biomass combustion and fires in organic soils (drained and undrained) where they coincide with tree cover loss. It does not include combustion of soil organic carbon in mineral soils (Harris et al. 2021).

[m] As reported by the World Emissions Clock by the World Data Lab, cumulated emissions by the Indian energy sector from 2019-23 amount to 7.2 GtCO2e.

Figure 21. Tree cover loss due to fires from 2001-2023 in million hectares (Mha)

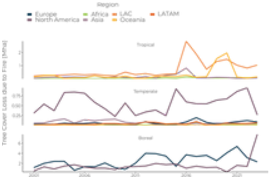
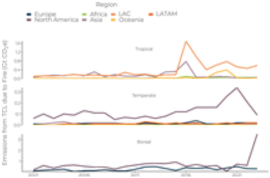


Figure 22. Emissions from tree cover loss due to fires from 2001-2023, in billion metric tons of carbon dioxide equivalent (GtCO2e)



Improvements in the detection of tree cover loss due to the incorporation of new satellite data and methodology changes between 2011 and 2015 may result in higher estimates of loss in recent years compared to earlier years. For this reason, comparisons of data before and after 2015 should be viewed with caution (Weisse & Potapov, 2021).

burned.222 From 2016-22, in temperate North America, tree cover loss due to fires consistently exceeded half a million hectares each year. In 2023, tree cover loss due to fire saw a massive 451 percent increase in boreal North America, where Canada experienced a record-breaking extreme wildfire season. Fires burned roughly 7.8 million hectares of forest – around six times more than the country's average for the 21st century.

Tree cover loss due to fire and its corresponding emissions follow similar patterns, but the magnitude of fluctuations varies across regions. This is because the density of aboveground biomass in tropical forests (200 to 500 metric tons per hectare) is far greater than that in boreal forests (50 to 150 metric tons per hectare), with temperate forests falling in between (100 to 250 metric tons per hectare).223

As a result, patterns and impacts of fire vary significantly by region224 but all contribute to a concerning new fire reality that we must contend with:

- **In tropical forests that have not co-evolved with fires, most fires are caused by humans rather than being ignited naturally.225** Fires in tropical forests often occur due to "escaped fires," which are when fires intentionally set to clear previously deforested land for agriculture or livestock production accidentally spread into surrounding forests. This is now occurring also in primary tropical humid forests, like the Amazon. These biomes have not co-evolved with fire and are burning at unprecedented rates (**Box 6**). The occurrence of fires in primary tropical humid forests is particularly alarming and will likely lead to severe impacts to these ecosystems.

- **The increasing frequency and intensity of fires are now challenging even tropical ecosystems that have co-evolved with fires.** In Brazil's Pantanal and Cerrado biomes, which co-evolved with fire, the first half of 2024 saw unprecedented fire activity, surpassing records set since 1998.226 The Cerrado is identified as one of the global biodiversity hotspots,227 and it is estimated to store about 1.69 billion tons of carbon, with over 89 percent of it being in the soils.228 The loss of natural vegetation caused by fires also affects the soils, causing the release of huge amounts of carbon into the atmosphere. A new fire management policy in Brazil has the potential to bring about positive change, but challenges remain (**Box 7**).

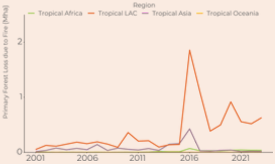
- **In temperate forests, such as those of the Mediterranean or the Western United States, a range of factors drives increasingly frequent and severe fires.** The conversion of natural ecosystems creates ever-expanding "wildland-urban interfaces," where human settlements and infrastructure intermingle with flammable natural vegetation. And both the introduction of invasive alien plant species and the abandonment of agricultural land can lead to excessive vegetation growth, increasing the frequency and severity of fires.229

BOX 6. PRIMARY TROPICAL FOREST LOSS DUE TO FIRES

Primary humid tropical forests, which have not co-evolved with fire, are burning at unprecedented rates. These irreplaceable ecosystems are suffering the impacts of extended fires at a scale never seen in historical records. From 2019-23, 3.4 million hectares of primary humid tropical forest were lost due to fires (**Figure 23**).

Fire-related primary humid tropical forest losses in tropical LAC were far greater than in the tropical regions of Africa, Asia, and Oceania. In 2016 alone, tropical LAC lost 1.9 million hectares of primary humid tropical forest due to fires. The loss of primary humid tropical forest in tropical LAC spiked again in 2020, reaching nearly 1 million hectares. Tropical Asia has historically ranked second for primary forest loss due to fire. Like in tropical LAC, primary forest loss due to fire rose sharply in tropical Asia in 2016 and amounted to 0.4 million hectares.

Figure 23. Primary humid tropical forest loss due to fires from 2001-2023, in million hectares (Mha)



Improvements in the detection of tree cover loss due to the incorporation of new satellite data and methodology changes from 2011-15 may result in higher estimates of loss in recent years compared to earlier years. For this reason, comparisons of data before and after 2015 should be viewed with caution (Weisse & Potapov, 2021).

- **In boreal forests, while the presence of some fires is natural, their increasing frequency and severity are reshaping these landscapes with significant consequences for forest structure and function.**231 Research indicates that coniferous forests are increasingly transitioning to deciduous forests across the boreal region due to more frequent fires.232 In some instances, severe and frequent fires can even prevent forests from regenerating entirely, leading to a loss of forest cover and a shift in the ecosystem.233

Governments should acknowledge altered fire patterns as a human-made phenomenon and adapt accordingly.

Many countries remain unprepared for the anticipated and ongoing increase in fire activity. A 2022 UNEP study highlights significant gaps in fire management policies and misallocated funding. Countries are narrowly investing in emergency response – dousing fires as best as they can rather than stopping them before they begin. The study calls for a shift in resource allocation, proposing a “Fire Ready Formula” that emphasizes prevention and preparedness over response.234 Adaptation strategies must be identified and implemented to mitigate the impacts of fires on ecosystems and communities. Effective fire management policies need to be developed to implement these strategies, recognizing the unique fire dynamics of different biomes.

BOX 7. BRAZIL'S NEW FIRE MANAGEMENT POLICY HAS THE POTENTIAL TO BRING ABOUT POSITIVE CHANGE, BUT CHALLENGES REMAIN

Amid a record-breaking fire season, the Brazilian government has adopted a new National Policy for Integrated Fire Management, initially drafted by the Temer administration in 2016 but shelved during the Bolsonaro presidency. The legislation aims to address the issues related to human-ignited fires while supporting a gradual replacement of the use of fire for agricultural purposes. Prescribed burns will be allowed with restrictions. One of the celebrated breakthroughs of the policy is that its standards acknowledge and respect Indigenous knowledge and practices. The policy also creates an entity responsible for developing and harmonizing national fire management policies and a National Fire Information System.230 Remote monitoring and early-warning systems will be key when managing fires over the immense Brazilian landscapes.

While implementing the new law, Brazilian states will have flexibility to account for local contexts. However, some states may face implementation challenges due to limited technical expertise and insufficient presence on the ground for enforcement. The state of Amazonas may rely on the Amazon Fund to train technical personnel, employ firefighters, and monitor fires. Other states, however, may need support from the central government or international funding agencies.

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In addition to developing and implementing appropriate fire management policies, countries should account for emissions from forest fires in their official GHG emissions reporting.

Currentguidelines by the Intergovernmental Panel on Climate Change allow countries to designate a portion of their lands as "unmanaged" and exclude GHG emissions from these lands, including those caused by fires, from official GHG reporting under the UNFCCC. Consequently, considering that recent increases in emissions from fires even in unmanaged land are at least in part (indirectly) human-induced, GHG inventories and NDCs may overstate the level of progress made toward global climate change mitigation.241 The scale of fire-related

emissions from Canada's 2023 wildfire season starkly illustrates this concern (**Box 8**). Expanding official GHG reporting under the UNFCCC to include fire-related emissions (as well as estimated removals associated with post-fire re-growth) would improve understanding of the total impact of planet-warming emissions – and how they need to be mitigated.

BOX 8. EMISSIONS REPORTING TURNS A BLIND EYE TO EMISSIONS FROM CANADA'S 2023 EXTREME WILDFIRE SEASON

Canada's record-breaking wildfire season of 2023 caused emissions of almost 3 billion metric tons of carbon dioxide-equivalent, roughly six times the country's annual average emissions due to fire.235

These emissions will largely be excluded from official greenhouse gas (GHG) reporting under the United Nations Framework Convention on Climate Change (UNFCCC). Unlike emissions from tropical deforestation, which involve a permanent change in land use, most of this carbon will be recovered by Canada's forests over time as they regrow. However, it will take forests decades to re-absorb the carbon that was emitted in just a single year.

The Intergovernmental Panel on Climate Change (IPCC) guidelines allow countries to classify forests as managed or unmanaged based on specific criteria related to human activity and management practices. According to the IPCC, managed forests are those subject to periodic or ongoing human interventions, which can include a wide range of management practices from commercial timber production to non-commercial purposes like biodiversity conservation and recreation. Unmanaged forests, on the other hand, are those that are not classified as influenced by human activities and are excluded from the national greenhouse gas inventory reporting framework.236

Canada has designated roughly 30 percent of its forest area as unmanaged, which makes emissions from fires in unmanaged forests exempt from official GHG reporting. Canada tracks but does not report GHG fluxes from forest fires and other natural disturbances in managed forests. This assumes that carbon emissions from forest fires are eventually balanced by carbon removals as forests regrow post-fire. As a result, emissions from fires in all unmanaged forests and nearly a quarter of managed forests were excluded from Canada's official GHG reporting in 2019.237

This approach to fire-related emissions also leads to other concerns related to GHG reporting under the UNFCCC. For example, the Canadian Forest Service has been criticized for how it calculates and, on paper, effectively offsets timber-related emissions with post-fire regrowth despite not acounting for the emissions from fires themselves.238 Similar concerns have been raised globally, with methodological accounting choices leading to a major gap in reported versus expected global emissions.239

The case of Canada's fires highlights an additional blind spot in the GHG reporting mechanisms of Parties to the UNFCCC, emphasizing the multiple stressors affecting forests, also outside the tropics. A more comprehensive reporting mechanism wherein countries not only track, but also report GHG fluxes across all forest land – both managed and unmanaged – is necessary to assess real progress toward global climate change mitigation targets.240

CHAPTER 4

Is the world on track to restore 30 percent of degraded and deforested landscapes by 2030?

Restoring forests and other landscapes enhances their ability to provide essential ecosystem services, such as climate regulation, flood control, and protection of biodiversity. Restoration can also generate economic benefits for local communities.[250] With an estimated 294.5 million people — 12 percent of the population in low-income countries—living on lands ripe for tropical forest restoration,[251] prioritizing local communities in these efforts can align global goals for climate mitigation, biodiversity conservation, and sustainable development, thereby improving resilience and quality of life for those most affected.

This chapter tracks progress towards the target of restoring 30 percent of degraded and deforested landscapes as set by Target 2 of the KM-GBF.

METHODOLOGY: SETTING A TARGET ON RESTORING DEGRADED FORESTS AND LANDSCAPES

Global restoration targets

The touchstone commitment for the Forest Declaration Assessment – the Glasgow Leaders' Declaration – does not contain quantifiable targets for restoration. Of the multiple restoration commitments of the last decades,[252] this report assesses progress against the latest, most ambitious and therefore guiding target for ecosystem restoration, set by the Kunming-Montreal Global Biodiversity Framework (KM-GBF). In December 2022, the Parties to the Convention on Biological Diversity (CBD) agreed, with Target 2 of KM-GBF, to "ensure that by 2030 at least 30 percent of areas of degraded terrestrial, inland water, and marine and coastal ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity".[253]

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We narrow this 30 percent target to degraded forests and deforested landscapes to produce an estimate of the area of forest landscape restoration necessary to meet Target 2 of the KM-GBF. To this end, we consider the global biophysical potential of forest ecosystems, as defined by Rayden et al. (2023). This approach includes forest areas that have been degraded, losing 20 percent or more of their potential biomass, along with deforested areas. Importantly, the approach excludes all areas that have a potential tree cover242 below 30 percent. This threshold is selected to avoid the inclusion of areas that would not naturally support tree cover, such as natural savannahs, grasslands, and other natural non-forest ecosystems.243 Thus, afforestation – the practice of establishing forests in areas where they have not naturally occurred – is not regarded as a forest landscape restoration practice in this approach.

Furthermore, the methodology excludes areas mapped as industrial and smallholder palm oil plantations,244 areas mapped as oil palm or timber plantations,245 and urbanized areas.246

Based on the selected methodology,247 approximately 3.4 billion hectares of land could support more tree cover.248 In this report, we consider a wide range of restoration practices ranging from active restoration through reforestation and tree planting, to low- to no-intervention practices such as assisted natural regeneration, and natural regeneration. The integration of productive systems such as agroforesty and silvopasture into restoration projects is also accounted as a viable restoration practice. However, we do recognize that some of these practices – particularly those involving the integration of productive systems - do not result in or aim for the re-establishment of the maximal potential biomass estimated for a given area. Despite this, these practices are accounted as essential in the restoration toolbox for the potential social-economic benefits delivered to local communities. See **Annex A** for definitions.

Therefore, when multiple restoration practices are implemented to achieve the Target 2 of the KM-GBF, at least 30 percent of this area – equal to 1.0 billion hectares of degraded forests and deforested land – should be under effective restoration by 2030.n

A target of 1.0 billion hectares of restoration by 2030 is significantly larger than previous voluntary international restoration commitments. The Bonn Challenge (2011) and the New York Declaration on Forests (2014) called for 350 million hectares of restoration by 2030. As of 2020, country restoration commitments totaled between 765 million and 1 billion hectares across all ecosystems, of which approximately 400 million hectareso were targeted at forest ecosystems.249 This report does not assess whether meeting the 1.0 billion hectares target for forest landscape restoration may be feasible; however, we do present evidence for how to scale restoration most efficiently and effectively (see **Section 4.2** and **Box 9**). See additional methodology box in section 4.2 for the data sources used in this report.

4.1 Forest restoration

Target2 of the KM-GBF calls forrestoring30percent of degraded ecosystems by 2030.254 Given ongoing limitations in restoration data (see Section 4.3), a comprehensive update on progress towards this goal is not yet available – though available data indicates some progress toward the 2030 goal.

The most recent comprehensive review of available literature (conducted in 2019) found that only 26.7 million hectares of forest area were brought under restoration from 2000-19 – just 18 percent of the Bonn Challenge's 2020 target of 150 million hectares.255 While the Bonn Challenge advanced ecosystem restoration onto government agendas when it was adopted in 2011, monitoring protocols and systems have not kept pace. By 2022, only 18 out of over 60 countries that pledged under the Bonn Challenge256 had disclosed progress,257 covering only 2.6 percent of the 2020 target.

Progress reports also vary significantly. A few countries, including Tajikistan, report having exceeded their pledges, while others, including Cameroon, report minimal progress (**Figure 24**). Countries' often ambitious restoration commitments (one third of countries who have made restoration commitments have pledged to restore more than 10 percent of their total land area258) will be challenging to achieve. Ongoing high rates of deforestation and ecosystem degradation threaten to undo restoration gains, and few countries have robust monitoring and management strategies.259

Available project-level data from Restor, one of the largest platforms cataloguing ecosystem restoration projects, indicates the total area under restoration in forests' ecosystems is approximately 4 million hectares, which is around 2.7 percent of the 2020 target and 1.2 percent of the 2030 target of the Bonn Challenge (**Figure 25**).p However, self-reported project data have significant limitations. Project-level reporting is voluntary, and the geographic distribution of project-level data is limited. Furthermore, the data stored on these platforms are often not subject to any external validation – including by the platform curators. The snapshot of restoration provided in project databases can help us understand the activities that are currently being deployed across the globe. However, their contribution to tracking progress towards global or regional restoration targets is currently limited.

[n] Target 2 of the KM-GBF does not specify the relative contribution of different ecosystems and biomes to achieving the overall goal. In the absence of explicit guidance on the percentage of forest ecosystems that should be under effective restoration by 2030, the 30 percent restoration target set for terrestrial ecosystems is also applied to forests.

[o] 400 million hectares represents the middle estimate of a range from low to middle to high, where the low estimate assumed maximum overlap of country commitments under various frameworks; while the high estimate assumed minimal overlap.

Figure 24. Country pledges under the Bonn Challenge and progress reported up to 2022 through the Restoration Barometer, in million hectares (Mha). The light orange bars represent countries' pledges, and the dark orange bars represent the progress reported by countries

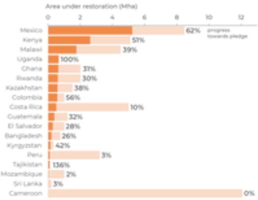
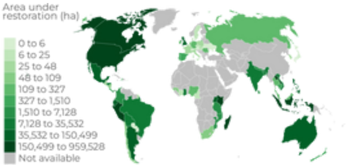


Figure 25. Country aggregates of area under restoration in hectares (ha), as reported in the Restor database



The sites included in this analysis are those which have been made publicly viewable on the Restor platform – and this subset of sites is generally of higher quality than the full suite of locations in the full database (which includes sites uploaded for private use). However, Restor makes no guarantee that the summaries provided are accurate or complete. For further details on Restor database please refer to Crowther et al. (2020). Available at: https://doi.org/10.1016/j.oneear.2022.04.003

4.2 Forest regrowth and secondary forests

Regrowth of tropical moist forests has increased since 2015, with a total of 11.34 million hectares of forests regrown from 2015-21 (Figure 26). Since 2015 the rate of regrowth has increased by nearly 750 percent in tropical LAC and by 450 percent in tropical Asia.

While regrowth oftropicalmoist forestsisnotequivalent to forest restoration,and while its use as a proxy is limited (see **Annex B**), it can indicate the scale of recovery of tropical moist forests. Based on the definition adopted in this report,q the increase in forests' regrowth results from a combination of factors, such as the increase in deforestation in tropical regions (which creates new areas available for regrowth), and the subsequent abandonment of deforested areas.260 In tropical LAC and tropical Asia, the increase in forest regrowth is particularly pronounced after 2016. This may be related to increased fires in tropical moist forests,r which have opened space for regrowth and illustrate a complex relationship between the

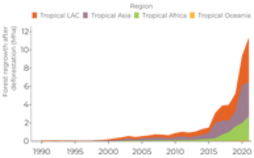
destruction of forestsand their recovery.

Regrown forests play a crucial role in mitigating the impacts of climate change, absorbing carbon dioxide from the atmosphere as they rebuild their woody structures,261 yet they are at high risk of being cleared after regrowth.262

[q] Forest regrowth is a two-phase transition from moist forest to (i) deforested land and then (ii) vegetative regrowth. A minimum of 3-year duration of permanent moist forest cover presence is needed to classify a pixel as forest regrowth (to avoid confusion with agriculture). (Vancutsem et al. 2021).

[r] Fires are typically classified as drivers for forest degradation, not for deforestation, because forests have the potential to regenerate after fire events. Vancutsem et al. (2021) considers the duration of the disturbance event to differentiate forest degradation from deforestation, with a threshold of 900 days. In the case of intense fires accentuated by severe droughts – as those occurred in 2015 in tropical LAC and tropical Asia – the duration of the disturbance has likely exceeded the 900 days threshold, at least in some areas. When this has happened, the disturbance was labelled as deforestation followed by regrowth, even though the dynamic could also be identified as forest degradation, since no land use change occurred.

Figure 26. Global tropical moist forest regrowth after deforestation from 1990-2021, in million hectares (Mha)



METHODOLOGY: AVAILABLE DATA FOR TRACKING PROGRESS ON RESTORING DEGRADED FORESTS AND LANDSCAPES

Incomplete data sources

Neither up-to-date data (i.e., as of 2023) on forest regrowth at global scale, nor a global dataset of the area under restoration are currently available. The reasons for such data gaps are multifold. From a technical standpoint, tracking forest regrowth is more challenging than detecting forest losses because regrowth is a gradual process, and regrowth rate can vary greatly based on biomes, environmental conditions and the nature of disturbance. Additionally, challenges are posed by the differentiation of naturally regenerating forests and tree plantations. While great advancements have been made, an up-to-date estimate of global natural forest regrowth is not yet available.

The challenges for compiling a global database of restoration are not technical but related to data fragmentation and lack of harmonization. In fact, multiple databases of area under restoration exist, but none are comprehensive and up to date.

Available data used in this report

In the absence of robust, complete and comparable global data, this report estimates forest restoration by looking at two metrics: 1) Tropical moist forest regrowth, which indicates the area of deforestation that has recovered after deforestation. 2) Area under restoration, which provides an indication of forest restoration efforts at global scale. While available data provides an approximate, "best guess" estimate on global restoration progress, these figures are almost certainly insufficient to support decision making.

Naturally regenerating forests are also invaluable for biodiversity conservation, providing habitats that have been lost due to deforestation and forest degradation265 These forests, especially on unmanaged lands, develop canopy structures that more closely resemble intact natural forests compared to planted or managed forests, making them better suited for delivering biodiversity benefits.266 However, naturally regenerating forests are vulnerable to both human and climate-related stressors, such as fires. Those located on managed lands face the highest risk of being cleared again after regrowth.267 Allowing these secondary forests to mature is an important measure for maximizing the climate mitigation benefits of forest regrowth (**Box 9**). To avoid clearing, measures taken to foster stewardship have been key to maintaining natural regeneration.268

The vast majority of recoverable forest areas are ecologically better suited to natural regeneration than to tree planting. Supporting both natural regeneration, and active approaches where appropriate, will help restoration efforts to be more effectively targeted and climate mitigation outcomes to be more cost-effective.

Public discourse on restoration most often focuses on active restoration approaches such as tree planting, though the vast majority of recoverable forest areas are not suited to this type of restoration. Most degraded forests are better suited to recover naturally, or with limited human intervention, which is also generally more cost effective than tree planting efforts. In certain ecological and social contexts agroforestry – the integration of agricultural production systems into forest landscape restoration – can be a more economically and socially sound option, yielding both economic and environmental benefits for local communities.

Of the 3.4 billion hectares of recoverable forests:

- The majority – 1.54 billion hectares (over 44% of the total recoverable area) – consist of degraded forests with between 50 and 80 percent of their potential biomass. These areas are likely to recover quickly through natural processes thanks to the abundant seed sources provided from remaining forest patches and potentially by surrounding intact forests.269 To enable natural forest regeneration, human pressures on forests should be mitigated or removed, which does not imply the cessation of any human activity or the displacement of local communities. On the contrary, traditional ecological knowledge and practices are found to foster forest recovery and lead to effective ecosystem restoration.270

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[s] Results presented in this box are in preprint and may be subject to revisions during the peer-review process.

BOX 9. YOUNG SECONDARY FORESTS, NOT NEW REGROWTH FORESTS, HAVE THE HIGHEST CARBON REMOVAL POTENTIALs

Allowing young secondary forests to regenerate could lead to greater and more immediate carbon removal than relying solely on new forest growth during this climate-critical period. By 2050, when many countries and corporations aim to reach net zero, a forest at its optimal age for carbon removal could sequester up to 820 percent more carbon per hectare than a newly planted forests, with an average increase of 10 percent (**Figure 27**).

While the public and private sectors restoration efforts are heavily focused on achieving carbon removal via new tree and forest planting, forests do not reach their maximum rates of carbon removal until an average of 30 years after regrowth (ecoregion-specific maximums range from 4 to 74 years (see **Figure 27).** Only 1.3 percent of observed forest areas showed peak carbon removal during their earliest stages of regrowth.263 Restoration interventions should be balanced to focus on both secondary forest regeneration and active restoration practices, also integrating production systems such as agroforestry and silvopasture. Even the maximum carbon removal potentials from secondary

forests cannot
fully recover the carbon lost from tropical deforestation within human timescales, including the carbon lost from soil and deadwood. Logged tropical forests, for example, remain a net source of carbon emissions for at least 10 years after logging.264 Therefore protecting and conserving standing forests must remain a top priority, even as restoration efforts need to scale rapidly as well.

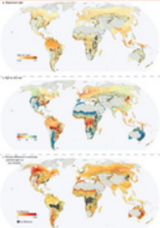


Figure 27. Carbon removal potential of secondary forests (Robinson et al. Preprint). The maps show (a) maximum rate possible over the first 100 years of stand growth, (b) age at which the maximum is achieved, and (c) places where older secondary forests can remove substantially more carbon than brand new regrowth

·A smaller portion, 1.02 billion hectares (nearly 30%), contains between 25 and 50 percent of its potential biomass. In these areas, a suite of restoration practices including active restoration practices and assisted natural regeneration could be better suited to deliver restoration outcomes. This strategy not only enhances biodiversity by reintroducing native species and benefit local communities by potentially establishing productive systems within forest landscapes, but also allows natural processes to aid in ecosystem recovery.271

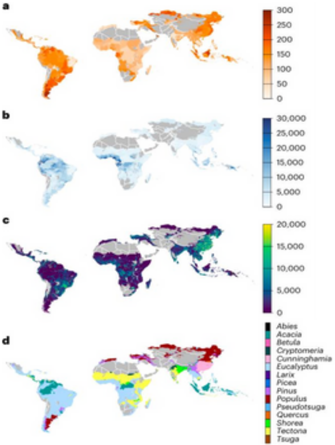
·Finally, 878 million hectares (over 25%) hold less than 25 percent of their potential biomass. In these severely degraded forests and deforested lands, active restoration practices – which also involve tree planting and the establishment of agroforestry and silvopastoral systems – may be especially suitable, particularly where natural regeneration is unlikely to happen or where would happen very slowly, or when specific tree species are needed to meet ecological or land-use goals.272

Forest landscape restoration occurs within a diverse array of social, ecological, and economic contexts, necessitating tailored approaches to achieve optimal outcomes. The decision to prioritize reforestation, natural regeneration, or production-oriented restoration interventions – or some combination of these -- should be informed by the specific conditions of each site, and defined in close cooperation with local communities.273

Restoration practitioners on the ground already recognize the value of integrating multiple restoration techniques - 93 percent of projects surveyed across 14 countries in Latin America and the Caribbean implement more than one type of intervention. The two most common interventions revealed in the survey were tree planting with no intention to harvest (81.6% of respondents) and natural regeneration (61.3%).274 A smaller but remarkable percentage of projects (37.4%) also integrated production systems into restoration projects by adopting agroforestry and silvopastoral systems.275 The area covered by restoration projects using more than one type of intervention ranged substantially (from less than 1 hectare to more than 1,000 hectares), and the likelihood to adopt natural regeneration was the same for project operating at large (more or equal than 500 hectares) or very small scales (less than 5 hectares).276

Although forest carbon removals are not a substitute for gross emissions reductions, evidence suggests that secondary forests offer immense potential for meeting global climate targets.277 A recent analysis found that nearly half of the forests across over a hundred low- and middle-income countries would sequester more carbon at lower cost if allowed to naturally regrow, rather than being replanted (**Figure 28**).278 The mitigation potential of low-cost restoration activities (less than USD 20 per metric ton of CO_2e) could be up to ten times higher than previously estimated by the IPCC.279

Figure 28. Costs, likely plantation genus and carbon accumulation from reforestation. a, Implementation cost of natural forest regeneration (US$ ha−1). b, Implementation cost of plantation, including replanting (US$ ha−1). c, Opportunity cost of reforestation (US$ ha−1). d, Most likely plantation genus. (Busch et al. 2024)



Financial instruments aiming to protect and restore forests often do not recognize the removal potential of secondary forests,311 and even cost-effective activities exceed the average price paid for nature-based removals in the voluntary carbon markets.312

Projectsfocusing on the conservation of naturallyregenerating secondary forests, or planning to leverage natural regeneration for enabling forest recovery, are often not eligible for the issuance of carbon credits.283 This is due to issues around the definition of forests used by carbon credit certifiers, and premises that the conservation of second-growth forests provides no additionality, since they regrow naturally and are perceived as not resulting from human interventions (despite the need for human action to protect and conserve these forests).t While some argue that methodologies should be adapted to recognize the carbon removal potential of secondary forests in the carbon markets,284 others emphasize the risks posed by market-based approaches, both in the context of primary and secondary forests (**Box 10**).285

[t] The term “additionality” is commonly used in the context of carbon markets. It pertains to the notion that interventions are deemed “additional” if they lead to emissions reductions or avoidance exceeding those that would have occurred in the absence of the project’s implementation, where the financial incentives provided by the project are the primary drivers for the changes in land use or management practices.

BOX 10. BUILDING SOUND MARKETS FOR NATURE-BASED CREDITS

In recent years, natured-based credit markets have gained prominence as a potential mechanism for increasing finance for forest restoration. Modeled after carbon credits, nature-based or biodiversity credits would put a financial value on biodiversity or wider socio-ecological outcomes in a landscape.

While there is interest from corporations to utilize these credits for offsetting their nature impacts, concerns over credit integrity remain.280 Developing high-integrity nature-based credits is challenging due to issues with commensurability, high costs, monitoring difficulties for non-carbon objectives, and lack of regulation to ensure credit agency's accountability for the impact of their credits on landscapes.281 Ensuring that credits yield additional nature recovery further requires strong verification systems grounded in statistically verifiable counterfactuals.282

4.3 Restoration monitoring progress and approaches

Alack of transparency and consistent monitoringof public and private restoration efforts hinders progress tracking. Without accurate, up-to-date data, we lack a complete picture of restoration efforts underway around the globe. Finally, after many years of coordination among leading institutions, a global registry of restoration efforts is under development.

Creatinga global database ofrestoration has long beenthe holygrailfor research institutions and civil society organizations working to advance restoration progress. In the absence of a unified approach and platform, multiple restoration databases and tracking efforts have been developed, none of which are fully comprehensive.

In response to the announcement of the UN Decade on Ecosystem Restoration, restoration monitoring experts and leading initiatives are working together under the leadership of the Forest and Agriculture Organization (FAO) to develop an official monitoring platform for tracking global progress: the Framework for Ecosystem Restoration Monitoring (FERM) (**Box 11**). The FERM consists of a geospatial platform and registry of restoration initiatives, and its development team is highly focused on interoperability with existing restoration platforms. Once fully populated, the FERM will provide an unprecedented look at the total scale of global restoration progress.

Even though global restoration monitoring has taken a big leap with the development of the FERM, the quality and availability of restoration data will still be hampered by limited capacities to track complex restoration outcomes, high monitoring costs, and widely differing monitoring approaches at the project level.

Over90 percent ofrestoration projects surveyed across 14LatinAmericanand Caribbean countries have a monitoring system in place. Most indicators are centered on tree planting with a focus on inventories of tree survival (74.3%) and growth (61.2%) in the few years following planting, leaving natural regeneration largely unreported.286 In contrast, monitoring natural regeneration requires more integrated approaches and multiple ecological indicators to assess trends in species composition and the relative abundance of tree and wildlife species.287 Few survey respondents reported monitoring biodiversity recovery. Remote sensing was the primary technology used in monitoring activities (42.1%), followed by camera trapping (31.6%), while more recent technologies like bio-acoustic monitoring were rarely adopted at surveyed projects.288

BOX 11. THE FRAMEWORK FOR ECOSYSTEM RESTORATION MONITORING (FERM)

The Framework for Ecosystem Restoration Monitoring (FERM) was developed by FAO as part of the Monitoring Task Force in response to the challenge of limited access to restoration-related data, information, and indicators which are critical for scaling up ecosystem restoration. There is a need for effective tools/databases, platforms, and data to guide decision-making; for operational monitoring; and for reporting the progress and achievements.

At the time of the launch, the FERM was the official monitoring platform for tracking global progress and disseminating good practices for the UN Decade on Ecosystem Restoration. Following the adoption of the KM-GBF, the FERM also supports countries in reporting Target 2, area under restoration, to "ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and marine and coastal ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity".

The FERM provides a shared definition of restoration and makes a distinction between ecological restoration and rehabilitation. It enables the identification of indicators to measure the progress of restoration efforts at various levels across ecosystems. It also provides tools for tracking the progress of efforts in the context of the UN Decade and for the KM-GBF Target 2.

To date, the FERM consists of a registry designed to document restoration initiatives and their good practices across all ecosystems, a geospatial platform for visualizing restoration data, and a search engine for consulting restoration initiatives and good practices. A dashboard will be soon incorporated to display compiled data on ecosystem restoration from various sources, providing an integrated view of restoration progress toward commitments, area under restoration (disaggregated by country, ecosystem and initiative), and good practices.

The FERM is designed with interoperability in mind. The platform is evolving to align parameters, facilitate data sharing, ensure data quality and consistency, and identify opportunities for alignment with partner organizations.

In 2024, the FAO-FERM team is working at the interoperability with the FAO Forest Resources Assessment, the Global Environmental Facility, Restor, the IUCN's Restoration Barometer, the Restoration Resource Center by the Society for Ecological Restoration, UNCCD Land Degradation Neutrality reporting platform PRAIS, the Great Green Wall Accelerator, UNEP-WCMC's Nature Commitment Platform, the AFR100 monitoring framework, the Brazilian Restoration and Reforestation Observatory, among others. Such a degree of harmonization and interoperability will support transparent monitoring and reporting of restoration efforts. The FERM will be strengthened over time and in response to the needs of countries and CBD Parties, as well as restoration practitioners operating at different scales.

The limited adoption of integrated monitoring methods was associated with their high costs. The survey revealed that, on average, monitoring restoration progress on one hectare for one year costs over USD 1,200 – more than a quarter of the costs of actually implementing restoration on that hectare in the first 3.5 years.289 The responsibility for monitoring is often viewed as a burden for project developers alone. However, when restoration benefits are shared, the responsibility for monitoring can also be shared among all stakeholders, including funding institutions and local communities.

Due to the variety of restoration practices, monitoring costs, and the socio-economic contexts of restoration projects, no single monitoring approach is globally accepted or widely used at the project level. Despite the abundance of forest restoration indicators and metrics, a narrow but still inconsistent set of indicators is used in practice.290 Forest restoration monitoring encompasses a wide range of biotic, abiotic, and social metrics, including habitat quality, species diversity, soil properties, and income generation. Various frameworks and guidelines propose different sets of ecological, socio-economic, and management indicators to assess restoration progress.291

The overwhelming variety of indicators can confuse restoration practitioners unfamiliar with monitoring, leading to inconsistencies in data collection and challenges in aggregating and comparing results across different landscapes.292 Most restoration projects primarily focus on a few environmental indicators, often neglecting social dimensions. Commonly used metrics, such as the area and number of trees planted, fail to provide insights into the long-term performance of the restoration project, ecological functionality, or the human aspects of restoration.293

Coordinated efforts are necessary to gather consistent restoration monitoring data across geographies, biomes, and restoration activities. The Restoration Project Information Sharing Framework294 – a leading initiative organizing detailed project level information to better align with and contribute to global, national, and subnational restoration goals – provides a set of 61 monitoring indicators which align with the 10 Principles of Ecosystem Restoration of the UN Decade on Ecosystem Restoration (2021-2030).295 Depending on the social-ecological contexts, and on the objectives and priorities of restoration projects, practitioners can select relevant metrics that fit their specific project goals and local ecological contexts, facilitating improved data sharing and collaboration across various restoration initiatives worldwide.296

Data fragmentation is still a significant challenge to achieving a comprehensive overview of restoration progress, one which many countries are working to overcome at the national level. Countries like Kenya, Burkina Faso, Vietnam, and Brazil (Box 12) are establishing and strengthening processes and

infrastructure for restoration monitoring, data collection and reporting, crucial for tracking progress on the ambitious restoration target of the KM-GBF.

Establishing unified technological infrastructures that standardize data formats and protocols is essential for understanding restoration efforts across ecosystems and scales – from project-level to national, regional, and global. This would facilitate better data sharing among various stakeholders, including governmental agencies, NGOs, and researchers. Given the varying contexts, technical expertise, resources, and infrastructures across countries, countries adopt different approaches to monitoring. Examples of approaches to restoration monitoring showcase these methods (more details in **Annex C**):

- In Kenya, the country's forest and landscape restoration (FLR) monitoring framework was developed to coordinate reporting on national landscape restoration efforts and support the government in reporting on national, regional, and global restoration commitments. In August 2024, Kenya launched the National Biodiversity Coordination Mechanism (NBCM) for the effective coordination of biodiversity conservation and restoration efforts and in support of the updated NBSAP, the NBCM acts to align goals and practices at national, county, and community levels, and to successfully implement the KM-GBF and Target 2 on ecosystem restoration.

- In Burkina Faso, the existing ONEDD platform, chaired by the office of the Environment and Sustainable Development, is being utilized for restoration monitoring. Focal persons at various ministries and at sub-national level will collect and convey restoration data at the national level to ONEED for gathering, quality assurance, validation, and reporting to be used for both national level management and international reporting.

- In Vietnam, the FORMIS system was developed to monitor forest status nationwide and is managed by the Forest Protection Department. The system includes a database of users to update monitoring data on forest health but faces challenges such as limited access to technology, and discrepancies between paper records and reality, and gaps in inaccessible forest areas. The Ministry of Natural Resources and Environment (MONRE) is charged with biodiversity management, including natural wetland ecosystems' management and development. Biodiversity data (such as legal documents; national biodiversity conservation plans; information on natural ecosystems, species, genetic resources; inspection reports; international cooperation records) are managed by the Department of Nature Conservation and Biodiversity within MONRE. Efforts are underway to develop a national biodiversity database by 2030 to improve information systems, establish data sharing mechanisms, and collaborate among stakeholders to ensure continuous, comprehensive biodiversity monitoring and management.

BOX 12. PIONEERING NATIONAL-SCALE RESTORATION MONITORING IN BRAZIL: EARLY EFFORTS ENABLING THE MONITORING TARGET 2 OF THE KM-GBF.

National-scalerestoration monitoring initiatives began well before the KM-GBF Target 2 was established, setting a precedent for others to follow. The Brazilian Restoration and Reforestation Observatory (BRRO) stands out as a prime example of these pioneering efforts, demonstrating the benefits of early action for future restoration success.

Efforts to scale restoration in Brazil began in 2016, when it became the first Latin American country to pledge forest restoration as part of its climate targets under the Paris Agreement, setting a goal to restore and reforest 12 million hectares by 2030. 297 The subsequent launch of the National Plan for the Recovery of Native Vegetation (PLANAVEG) in 2017 was instrumental in coordinating policies, programs, and actions to achieve this target. Furthermore, the Native Vegetation Protection Law (NVPL) – also known as the Forest Code – introduced critical mechanisms such as Permanent Preservation Areas (APP) and Legal Forest Reserves (RL), alongside the Rural Environmental Registry (CAR). The CAR, a national electronic public registry mandated for all rural properties, uses high-resolution satellite images to improve monitoring, management, and enforcement of forest conservation laws, supporting long-term restoration. Building on this policy framework, the Brazilian Restoration and Reforestation Observatory (BRRO) was established by the Forest Restoration Task Force of the Brazilian Coalition on Climate, Forests, and Agriculture (the Coalition)u in 2021 to address the critical need for systematic restoration monitoring data in Brazil. The BRRO has become a central player in the Brazilian restoration monitoring landscape, and as a result, was invited in 2024 to co-lead the monitoring body of the PLANAVEG directive commission (CONAVEG), alongside the Ministry of Environment.

Integrating ground data with satellite imagery is essential for comprehensive and accurate restoration monitoring. The BRRO has proactively worked to establish data transfer agreements regulated by open-data licenses to ensure data transparency and accessibility. The BRRO relies on two primary sources of information: restoration polygons provided by six biome-level organizationsv and remote sensing data on reforestation and secondary vegetation produced by MapBiomas.w Restoration data are reported by institutions actively engaged in restoration efforts. Each polygon is accompanied by detailed information, including the start date, responsible organization, total area, funding source, and restoration methods, encompassing a total of 20 descriptive fields. Before integrating this data into the platform, BRRO technicians meticulously review and validate each polygon, maintaining high standards of data accuracy and reliability. Data gathered, harmonized, and validated by the BRRO are then transferred to global restoration platforms such as Restor and the Framework for Ecosystem Restoration Monitoring.

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[u] The Brazilian Coalition on Climate, Forests, and Agriculture was established in 2015 as amultisectoral movement with over 390 representatives advocating for Brazil's leadership in a low-carbon economy. The Coalition aligns with the Paris Agreement and promotes sustainable land use through dialogue, proposals, advocacy, and transparent communication. It operates via 12 task forces focused on various themes, including the Restoration Task Force. Further details are available at: https://coalizaobr.com.br/en/

Significant challenges remain for the platform. The absence of immediate, tangible benefits for reporting restoration data makes stakeholder engagement particularly challenging, and as a result, there is a need to cultivate a culture of accurate data collection and sharing. The process of mobilizing and engaging stakeholders for data reporting is lengthy and complex, influenced by unique obstacles including difficulties in understanding the platform's objectives, concerns about how the data will ultimately be used, and a lack of skilled personnel to prepare the required information in the format requested by the BRRO.

Even when qualified staff are available, dedicating their time to this task is often not prioritized by the institution. Furthermore, many institutions lack established routines for collecting geospatial data with aggregated information. Overcoming these challenges requires clear communication of the platform's benefits, building trust through transparent data use policies, providing training and resources to institutions, and fostering a culture that values the collection and sharing of geospatial data.
BRRO data supports project planning, monitoring, policy development, transparent reporting, and research. This ensures effective restoration efforts, optimal resource allocation, and progress towards Brazil's environmental goals. The primary users of the BRRO use data for different ends, including biome-level organizations and NGOs (using data to plan, monitor, and evaluate restoration projects), government agencies (to shape policy and track restoration progress, journalists (to report on environmental issues), researchers (to conduct studies), the private sector (to inform sustainability strategies), and the general public (to stay informed about restoration efforts).

[v] The biome-level organizations are the Pact for the Restoration of the Atlantic Forest, the Caatinga Restoration Network, the Articulation for the Restoration in Cerrado, the Rede Sul (for the restoration of the Pampa), the Pact for the Restoration of the Pantanal, the Alliance for the Restoration of the Amazon.

Overview of restoration efforts in Brazil

Since 2019, the tracked area under restoration has nearly doubled, increasing from 79,000 hectares to 150,000 hectares, as reported in the latest platform update in October 2024. This growth reflects data contributions from new institutions, as well as expanded restoration areas from existing partners such as Reflorestar, Renova, Black Jaguar, and Sare.

Based on data from the BRRO database, active restoration is the dominant restoration strategy in Brazil, covering nearly 54,000 hectares through projects aimed at planting trees across the entire project area. Within this strategy, the most common method is planting seedlings (**Figure 30**).

The second most common approach, covering nearly 50,000 hectares, is unmanaged natural regeneration, which allows forests to regrow through natural processes. This often occurs in buffer zones around restored areas or near standing forests. The strategy typically involves "isolating" the area to be restored, using physical barriers such as fencing, or implementing management practices that reduce human disturbances and prevent invasive species encroachment, thereby allowing natural development of the area.

The third category, covering approximately 45,000 hectares, consists of projects where the restoration strategy is not identified, often due to inexperienced practitioners being unaware of the specific practices they are implementing. Managed natural regeneration, covering an area of 23,500 hectares, involves chemical or mechanical control of species that could negatively impact restoration, such as invasive plants. Notably, agroforestry and mixed systems represent a small minority of projects in the BRRO database, covering approximately 7,000 and 1,500 hectares, respectively.

The BRRO database also provides insights into the stated motivations of project developers for undertaking restoration activities (**Figure 31**). The majority of the area, totaling nearly 98,000 hectares, is covered by projects voluntarily initiated by developers, motivated by the environmental and economic benefits the restoration project could deliver (see **Annex B** for details on the different motivations). Nearly 67,000 hectares are associated with projects where no motivation was stated. Finally, approximately 15,000 hectares are covered by projects involved in mandatory schemes, such as environmental compensations required by law for committed violations or offset schemes related to infrastructure development in the country. It is worth noting that mandatory drivers may be underrepresented in the BRRO database, as developers engaging in these activities are likely to report to local authorities and may not report to the BRRO.

[w] MapBiomas is collaborative network of NGOs, universities and technology startups. We produce annual mapping of land cover and use and monitor water surface and fire scars on a monthly basis with data from 1985 onwards. Further details available at: https://brasil.mapbiomas.org/en/o-projeto/

Figure 30. Area of restoration projects aggregated by stated motivation for the project to take place, in hectares (ha)

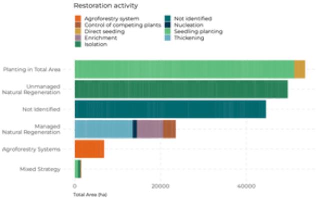
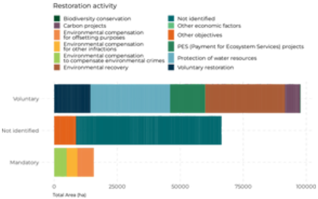


Figure 31. Area of restoration projects aggregated by stated motivation for the project to take place, in hectares (ha)



CHAPTER 5

Is the world making progress on protecting and conserving biodiversity in forests?

Our planet's extraordinary biodiversity is facing an unprecedented crisis, with species disappearing at rates faster than ever before. At least 1.2 million plant and animal species are currently at risk of extinction, with many projected to disappear by 2100.[300]

Protected and conserved areas can serve as refuges for endangered species, allowing them to thrive without the pressures of human activities such as deforestation, forest degradation, and overexploitation, while also favoring local economies and development.[301] Target 3 of the KM-GBF aims for at least 30 percent of terrestrial, inland water, marine, and coastal areas – especially areas of particular importance for biodiversity – to be effectively conserved and managed by 2030. Halting and reversing this biodiversity loss is a complex problem and depends on the political commitment to stop and reverse forest loss[302] given that forests cover 31 percent of the world's land area and contain more than 80 percent of all terrestrial species of animals, plants and insects.[303] Deforestation and degradation of forest ecosystems are among the most significant drivers of biodiversity loss and ecosystem service decline globally.[304] Alongside other ecosystems, the world must protect and conserve forests to address the interconnected crises of climate change, and biodiversity loss. Many conservation approaches have been implemented – including, most prominently, forest certification and reduced impact logging, payments for ecosystem services, protected and conserved areas, and community forest management. All of these were found to produce positive conservation outcomes in some circumstances and to fail in others[305] – which highlights that conservation efforts can backfire or make no meaningful impact. This chapter tracks progress on protecting biodiversity in forests against indicators within Target 1 and Target 3 of the KM-GBF.

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METHODOLOGY: ASSESSING PROGRESS ON PROTECTING AND CONSERVING BIODIVERSITY IN FORESTS

The Kunming-Montreal Global Biodiversity Framework (KM-GBF) takes an all-of-society approach that considers the integrated nature of terrestrial, freshwater, marine, and coastal ecosystems.

This report narrows in on forest ecosystems explicitly, and as a result, considers the following indicators to assess the progress on protecting and conserving biodiversity in forests:

- The percentage of forested Key Biodiversity Areas (KBAs)298 covered by protected areas and other effective area-based conservation measures (OECMs)299
- The losses of tree cover in forested KBAs

For additional methodological notes, see the **Annex B**.

5.1. Percentage of forested key biodiversity areas covered by protected areas or other effective area-based conservation measures

Preserving forestedKey Biodiversity Areas(KBAs) through protected and conserved areas, other effective area-based conservation measures (OECMs) or the recognition of Indigenous and traditional territories, is crucial for protecting and conserving biodiversity. Encouragingly, in 2023, 49 percent of all global forested KBAsx were covered by protected areas, and 3 percent were covered by OECMs (Figure 32).

Several regions have even higher overlapsbetween protected areas andforested KBAs than the global average: tropical Africa (76%), temperate Europe (67%), tropical LAC (56%), and temperate Latin America (52%). While these figures do not directly track progress on Target 3 (which has a much broader scope than forested KBAs alone), this tells us that countries have widely utilized protected areas to protect and conserve these forested areas with immense conservation value. Legal conservation of biodiverse forests and other ecosystems (and compliance with such policies) is essential for meeting the goals and targets of the KM-GBF.

Protected and conserved areas are one of the most studied and effective policies for forest protection,306 though with marked differences between continents and forest types.307

When theamount of above-ground carbon (AGC) isconsidered toevaluate the effect of protected areas, the tropical forests of South America presented substantially higher values inside protected areas than outside protected areas. Similar effects were also detected, although less obviously, in the tropical forests of Africa and Asia.308 The temperate forests in Oceania, and to a lesser extent, in Europe also displayed significantly higher values of AGC inside protected areas than

ʿ KBAs are sites that contribute significantly to the global persistence of biodiversity and are identified based on a set of criteria relating to threatened or geographically restricted species or ecosystems, biological processes, ecological integrity, and irreplaceability (IUCN, 2022). Forested KBAs are a subset of all KBAs that are characterized by forest coverage and by the presence of at least one forest specialist that triggered KBA criteria at the site (Crowe, O. et al., 2023).

Figure 32. Percentage overlap between fKBAs and protected areas across regions, based on latest data as of 2024

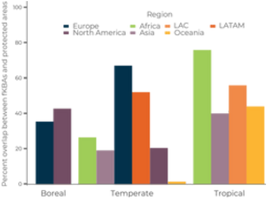


Table 5. Area covered by forested KBAs, and their percentage of overlap with protected areas

Protected areas		
Region	Area covered by fKBA (Mha)	Overlap
Tropical Africa	112	76%
Temperate Europe	64	67%
Tropical LAC	230	56%
Temperate Latin America	17	52%
Tropical Oceania	30	44%
Boreal North America	2	43%
Tropical Asia	104	40%
Boreal Europe	58	35%
Temperate Africa	2	26%
Temperate North America	21	20%
Temperate Asia	96	19%
Temperate Oceania	8	1%
Global	744	49%

Other Effective area-based Conservation Measures (OECMs)		
Region	Area fKBA (Mha)	Overlap
Temperate Africa	2	23%
Tropical Africa	0.3	3%
Boreal North America	2	2%
Tropical LAC	33	2%
Tropical Asia	9	0%
Global	47	3%

outside. Protected areas also have positive effects on other biomes, such as African grasslands.309

As a global standard for identifying areas of high conservation value, mapping sites within KBAs could be used for prioritizing and identifying potential OECMs. OECMs present an opportunity to support and protect forest KBAs from land use change or severe threats (such as mining and other extractive industries). Mapping KBAs not currently under protected area status will be essential for identifying and securing them as OECMs, while also enhancing governance and effective conservation outcomes. Additionally, KBA mapping for potential OECMs can contribute to biodiversity monitoring periodically.

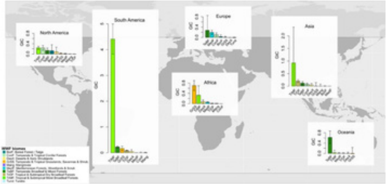
Officially designating areas as protected may fulfill conservation targets on paper – creating "paper parks" – but genuine conservation success depends on effective and equitable management, concrete enforcement, and sufficient resources.

Implementation failures of protected areas are variable and site-specific, but they often result from a critical lack of resources or human capacities that can mean that compliance falters.310 Compliance has been described as protected areas' Achilles' heel.311 For protected and conserved areas to be effective in the long run, financial resources, community engagement, political support, and management capacity must all be present and sustained over time.312,313 As Target 3 specifies, protected areas and OECMs must be "*effectively* conserved and managed" (emphasis added) through ecologically representative, well-connected, and equitably governed systems.

Nearly half of all forested KBAs remain unprotected. Conservation efforts should have priority in areas with the highest potential biodiversity loss and level of threat. Protected areas systems can be "residual" in nature, meaning that they were established in landscapes that are already poorly suited for producing commodities (and are therefore least threatened).314 Therefore, new conservation efforts should prioritize areas where the potential biodiversity loss is greatest, the connectivity potential is high, as well as where deforestation threats are most severe (such as areas with higher populations and greater proximity to cities and roads)315 provided that concerns for harms to local communities are effectively considered and solved.

Countries are increasingly engaging with KBAs, yet still fewer than 30 Parties to the CBD established specific targets related to KBAs in their National Biodiversity Strategies and Action Plans (NBSAPs) or national reports. A study conducted by the KBA Secretariat in 2021 revealed that about one third of the 189 Parties to the Convention for Biological Diversity (CBD) recognized KBAs in their NBSAPs or national reports.316 These targets typically aim to further identify KBAs within their country borders or focus on the conservation of existing KBAs.317 A higher level of commitment will be needed to meet the 2030 targets of the KM-GBF.

Figure 33: Total additionally preserved above-ground carbon (AGC) aggregated by continent and biome



Protected areas effectively preserve additional AGC across continents and biomes, with forest biomes dominating the global signal, particularly in South America. The additional preserved AGC (Gt) in WWF biome classes (total Gt + /− SEM*area). World base map made with Natural Earth. The full set of analyzed GEDI data are represented in this figure (n = 412,100,767).

5.2. Tree cover loss in forested Key Biodiversity Areas

5.2.1. Globaltreecoverlossinforestedkeybiodiversity areas

In2023, over 1.4 million hectares of treecover waslost within forested KBAs. If we apply the same linear reduction pathway methodology as we do for overall deforestation, then tree cover loss in forested KBAs is 19 percent higher than it should have been to be on track to eliminate tree cover loss in forested KBAs by 2030 (Figure 34).

This level of tree cover lossin forestedKBAsrepresents aten percent increase from 2022, when the global interim Assessment-identified target for tree cover loss in forested KBAs was met. The loss of tree cover in these areas destroys the habitats of forest specialists, which are species that depend on forest habitats for their survival or reproduction. This means that when it comes to forests' part in achieving Target 1 of the KM-GBF, the world is off track.

5.2.2. Tropical regional tree cover loss in fKBAs

Tropical forests are home to an astonishingdiversity of species. However, except for Oceania, all tropical forest regions were off track in 2023 to halt tree cover loss in forested KBAs by 2030 (Figure 35).

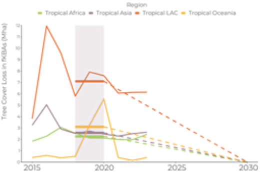
Theonly tropicalregion on track for haltingtree coverloss inforested KBAs by 2030 is tropical Oceania, which is primarily constituted by the Australian continent. Australia hosts between seven and ten percent of global biodiversity, with many species exclusively found there and nowhere else.318 Over the past two centuries, following European colonization, Australia suffered the largest decline in biodiversity of any continent, including the highest rate of extinctions in the modern world.319 The 2018-2020 baseline of area of tree cover loss in forested KBAs for tropical Oceania is strongly influenced by the devastating fires of 2019-2020. In fact, the baseline for tropical Oceania is the second highest after tropical LAC, where the area covered by forested KBAs is eight times larger than in tropical Oceania. Considering this, the improvements recorded by our indicator for tropical Oceania are laudable, but the 87 percent decrease from baseline levels is primarily

Figure 34. Global tree cover loss in forested KBAs (fKBAs) from 2015-2023, in million hectares (Mha)

Key metrics on tree cover loss (TCL) in forested Key Biodiversity Areas (fKBAs) in million hectares (Mha)

Region	Baseline (Mha)	TCL in fKBAs Target 2023 (Mha)	TCL in fKBAs 2023 (Mha)	Change from Baseline (%)	Deviation from 2023 Target (%)
Global	1.77	1.24	1.48	-16%	+19%

Figure 35. Tropical tree cover loss in forested KBAs (fKBAs) from 2015-2023 in thousands hectares (Kha)



Key metrics on tree cover loss (TCL) in forested Key Biodiversity Areas (fKBAs) in thousand hectares (Kha)

Region	Baseline TCL in fKBAs (Kha)	TCL in fKBAs Target 2023 (Kha)	TCL in fKBAs 2023 (Kha)	Change from Baseline (%)	Deviation from 2023 Target (%)
Tropical Africa	226.08	158.26	243.75	+8%	+54%
Tropical Asia	257.01	179.91	262.68	+2%	+46%
Tropical LAC	709.59	496.71	613.80	-13%	+24%
Tropical Oceania	309.83	216.88	40.47	-87%	-81%

due to the inflated baseline. Sustained conservation efforts are required to halt the shocking rate of extinction recorded in the region.320

Tropical forests, despite covering less than ten percent of Earth's land surface, support over half of all vertebrate species.321

5.2.3. Temperate regional tree cover loss in fKBAs

ForestedKBAs arealso seriously threatened outside the tropics. All temperate regions were off track in 2023 to halt the destruction of forest habitats in forested KBAs by 2030 (Figure 36).

Temperate Europe had the highest area of tree cover loss in forested KBAs in 2023 among all temperate regions and a 46 percent increase from 2022. This is highly concerning since, as of 2020, only 23 percent of species and 16 percent of habitats covered by an EU nature directive were considered as being under a favorable conservation status.322

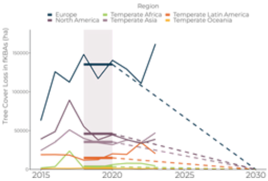
Fortunately, the EU member states have decided to act. The EU Nature Restoration Law was approved in June 2024, providing an opportunity for country members to support the recovery of species and habitats, averting the unprecedented social-economic crisis that would result from the mismanagement of looming nature-related risks.323

In temperate Latin America, tree cover loss in forested KBAs decreased by 41 percent from 2022 to 2023 but was still a striking 38 percent above baseline levels.

Though Latin America is better known for its vast tropical rainforests, it is also home to precious enclaves of temperate biodiversity. The Valdivian temperate rainforest, which spans Chile and Argentina, is a biogeographic island, separated by climatically similar areas by extensive ocean barriers and deserts.324 Characterized by its extraordinary endemism and diversity, the Valdivian rainforest hosts 700 to 800 species of plants, including the ancient alerce, one of the longest living tree species on the planet.325 Of all vertebrates inhabiting the Valdivian forests, 45 percent are found nowhere else on the planet, making the conservation of these forests a global conservation priority.326

Trends observed in temperate Asia are also alarming. In 2023, tree cover loss in forested KBAs was 33 percent higher than baseline level and 37 percent higher than the year prior. Temperate Asia encompasses multiple biodiversity-rich countries, such as China, Iran, and Turkey. In the face of limited progress on past

Figure 36. Temperate tree cover loss in forested KBAs (fKBAs) from 2015-2023, in hectares (ha)



Key metrics on tree cover loss (TCL) in forested Key Biodiversity Areas (fKBAs) in 2023 in hectares (ha)

Region	Baseline (ha)	TCL in fKBAs Target 2023 (ha)	TCL in fKBAs 2023 (ha)	Change from Baseline (%)	Deviation from 2023 Target (%)
Temperate Africa	3,486	2,440	4,511	+29%	+85%
Temperate Asia	35,396	24,777	47,152	+33%	+90%
Temperate Europe	135,219	94,653	161,565	+19%	+71%
Temperate Latin America	14,816	10,371	20,383	+38%	+97%
Temperate North America	45,948	32,164	38,749	-16%	+20%
Temperate Oceania	1,508	1,056	1,408	-7%	+33%

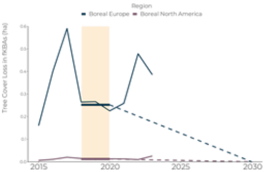
biodiversity conservation goals, such as the Aichi Targets,327 new momentum is needed to scale up conservation efforts under the KM-GBF.

5.2.4. Boreal regional tree cover loss in fKBAs

Tree cover loss in forestedKBAs was off track in borealregions (Figure 37). Boreal European and Boreal North American forests saw 118 percent and 192 percent greater losses, respectively, in forested KBAs than was needed to be on track to eliminate such loss by 2030.

Protecting and conserving large, intact areas of boreal forest and empowering Indigenous communities and local actors to manage their lands are crucial steps in safeguarding these irreplaceable ecosystems, their wildlife, and associated social values. Many boreal forest species face significant threats due to habitat loss, fragmentation, and climate change. The woodland caribou, for example, is particularly vulnerable, with populations declining across Canada's boreal region due to industrial development and loss of old-growth forests.328 Other at-risk species include the Eurasian Pygmy Owl, which relies on mature forests for nesting.329 The loss of these keystone and indicator species can have cascading effects throughout the ecosystem.

Figure 37. Boreal tree cover loss in forested KBAs (fKBAs) from 2015-2023, in hectares (ha)



Key metrics on tree cover loss (TCL) in forested Key Biodiversity Areas (fKBAs) in hectares (ha)

Region	Baseline (ha)	TCL in fKBAs Target 2023 (ha)	TCL in fKBAs 2023 (ha)	Change from Baseline (%)	Deviation from 2023 Target (%)
Boreal Europe	25,235	17,664	38,578	+53%	+118%
Boreal North America	1,246	873	2,548	+104%	+192%

CHAPTER 6

Recommendations

The world is increasingly off track to meet the goals of halting and reversing deforestation and degradation by 2030. All actors and sectors must intensify efforts to regain lost ground and accelerate progress in the coming years. With less than six years remaining until 2030, immediate action to protect forests is essential. And leaders cannot become complacent after short-term success. One year's or even one decade's reduction in deforestation does not imply that long-term goals have been achieved. Curbing deforestation and degradation is an ongoing effort, not a one-time achievement. Accelerated progress is possible – if governments, financial actors, and corporations step up to the challenge.

All leaders must unite and prioritize forest protection and restoration. The world cannot sustain its "business-as-usual" exploitation and destruction of forests and other natural ecosystems. Without a widespread, transformative embrace of alternative economic models, the world will not meet its ambitious goals for sustainable development, climate, and nature.

1. Deforestation and degradation

1.1. Despite facing different pressures and scale of impacts, all forests must be protected and conserved. Among all ecosystems, primary forests and other intact natural ecosystems should be foremost priority for protection and conservation.

Though boreal, temperate, and tropical forests face different pressures and impacts, we cannot overlook the importance of forest protection across geographies or biomes.

Additionally, primary forests can take hundreds or even thousands of years to re-establish the structures and the ecological functions that characterize a primary forest. Even if a primary forest is cut down and replaced by a new, naturally regrowing forest (a secondary forest),[y] that loss is not fully compensated. Even after a century, a new forest will not host the great

[y] Naturally regenerating secondary forests would be considered degraded compared to the primary forests they replaced - hence, the loss of primary forests can also be considered degradation. In this report, however, we count primary forest loss within deforestation.

variety of species lost from the primary forest, nor will it store the same amount of carbon.330

Some forests, such as the Amazon, have captured public attention in the past decades. However, it is imperative not to overlook other equally important biomes, such as grasslands and savannahs, which form an essential part in the global balance between ecosystems and store billions of metric tons of carbon in their soils.331

1.2. All countries share responsibility for protecting and conserving forests and other natural ecosystems and making supply chains more sustainable and conversion-free, and they must do so equitably.

In our interconnected global economy, no country is exempt from responsibility for deforestation. Both producer and consumer countries share significant accountability for commodity-driven deforestation and conversion. This includes industrialized, high-income consumer countries – such as those in Europe and North America – which have historically pursued development pathways that rely on unsustainable exploitation of natural ecosystems.

It is also crucial to address equity concerns, for example by recognizing that the transition toward deforestation and conversion-free commodity production can pose risks for smallholder farmers and producers and ensure that these risks are adequately managed and mitigated. As agricultural supply chain companies work to remove deforestation and ecosystem conversion from their supply chains – both to meet voluntary commitments and to comply with new regulation – small-scale producers and suppliers will be hard-pressed to meet new requirements. High costs, lack of data collection technologies, and ongoing land tenure issues may force them out of deforestation-free markets, unless direct support is provided.332 Efforts like establishing capacity-building hubs, covering compliance costs, and mainstreaming smallholder representation in inclusive policymaking could go a long way toward ensuring a just transition.333

1.3. Governments must recognize and embrace the challenge of addressing overconsumption as a cause of commodity-driven deforestation and conversion and hold themselves accountable to related targets.

Protecting and conserving forests requires a range of solutions and collaborative efforts—no single approach or actor can do it alone. While efforts for mitigating forest impacts will vary by sector and geography, in all sectors with unsustainable levels of demand, the root issue of overconsumption must be addressed, as reflected in Target 16 of the Kunming-Montreal Global Biodiversity Framework (KM-GBF). To this end, circular models of design and production should be adopted to lower materials demand.

Furthermore, under Target 15 of the KM-GBF, Parties to the Convention on Biological Diversity should consider adopting ecosystem-specific indicators for industry sectors known to pose particularly severe risks to and impacts on these ecosystems. For example, agriculture and mining would be key sectors to monitor for forest protection and restoration. Parties should therefore consider adding “commodity-driven deforestation” (see **Chapter 1**) as a complementary metric within the KM-GBF monitoring framework, allowing Parties to track their progress in reducing these sectors’ impacts on ecosystems of high conservation value, such as forests. Similar indicators could be developed for other equally important ecosystems, such as grasslands and wetlands.

1.4. The debates around the definition of "degraded forests" should not be allowed to hinder the conservation and sustainable management of temperate and boreal forests.

Defining degradation may seem like a matter of semantics, but it can have real world impacts. A narrow definition of forest degradation could leave certain forest or non-forest ecosystems without protection and vulnerable to further harm.
Forest degradation is widely recognized to involve a decline in specific attributes, functions, or ecosystem services due to human activities, but debates on the attributes to consider and on the exact threshold remain open.334 These attributes may include changes in forest structure, species composition, loss of carbon stocks, reduction in biodiversity through habitat destruction or hunting, forest fragmentation, the spread of invasive species, declines in water quality, and other disruptions to ecosystem services.335

The complexity and variability of these attributes across different regions and over time make monitoring and addressing global forest degradation challenging. However, there is strong evidence that some attributes – such as biodiversity and carbon stocks – have been declining for decades in several regions.336 This calls for immediate action, regardless of ongoing definitional debates.

2. Restoration

2.1. Moving forward, large-scale and well-coordinated efforts are necessary to advance toward Target 2 of the KM-GBF to restore 30 percent of degraded ecosystems and to monitor and transparently report progress.

Policy measures are essential for enabling and fostering the establishment of robust monitoring infrastructures and effectively scale restoration at the national level.

A consistent and harmonized monitoring system of public and private restoration efforts is necessary for progress tracking. Without accurate, up-to-date data, we cannot get a complete picture of restoration efforts underway around the globe.

A few national-scale restoration monitoring initiatives began well before the KM-GBF Target 2 was established, and, if aligned with KM-GBF targets and goals, set precedents for others to follow. Integrating ground data with satellite imagery is essential for comprehensive and accurate restoration monitoring.

2.2. Governments should recognize and support different types of restoration according to distinct contexts and objectives. They should implement measures to support the prioritization of (assisted) natural recovery processes where they are better suited and more efficient that active restoration practices – ultimately aiming for sustained, large-scale outcomes.

Protecting secondary forests is crucial, and much of the recoverable forest area may be more suited to (assisted) natural regeneration than to active tree planting approaches. Naturally regenerating forests are invaluable for biodiversity conservation, offering habitats that have been lost due to deforestation and forest degradation,337 and can develop canopy structures that more closely resemble those of intact forests compared to managed or planted forests. 338 However, they are very susceptible to human- and climate-related stressors, such as fires, and are subject to the highest risk of being cleared again after regrowth. 339 As a result, governments should expand existing incentives and measures for forest restoration to explicitly include protection of and assisted natural regeneration of secondary forests.

3. Forest fires

3.1. Governments should acknowledge altered fire patterns as a human-induced phenomenon and implement adaptive strategies accordingly.

Even with wildfires anticipated to increase by 30 percent by the end of 2050 compared to 2022, many countries remain unprepared.340 Countries' fire management policies often have significant gaps, with a focus on emergency response once fires have started, rather than on preventative measures.341 Adaptation strategies must be identified and implemented to mitigate the impacts of fires on ecosystems and communities, including by integrating Indigenous, traditional, and contemporary fire management practices into policy, strengthening data collection and our understanding of wildfire behavior, and improving firefighter safety.342 Effective fire management policies that recognize the unique dynamics of different biomes will be critical for the successful implementation of adaptation strategies.

Countries should also account for emissions from forest fires in their official greenhouse gas (GHG) emissions reporting. Without doing so, GHG inventories and NDCs may inflate countries' climate mitigation achievements – which undermines and slows real progress. Current guidelines by the Intergovernmental Panel on Climate Change allow countries to designate a portion of their lands as "unmanaged" and exclude GHG emissions from these lands from official GHG reporting under the UNFCCC. Emissions from fires within managed lands may not reported to the UN343 because of the potential for forests to regrow and sequester the GHG emitted during fires. However, the actual recovery timeline after fires is uncertain,344 and future carbon sequestration may not ultimately compensate for emissions from forest fires, leading to an overestimation of progress – underscoring the need for accurate reporting of forest fires within national GHG inventories.

4. Biodiversity in forests

4.1. KeyBiodiversity Areas(KBAs) and other areas identified as high integrity and high conservation value forests should be prioritized within global and national forest conservation efforts.

Leaders should prioritize the preservation of forested KBAs and other high integrity and high conservation value forest areas, which may not always make headlines but sorely need protection. KBAs are sites that contribute significantly to the preservation of global biodiversity, and nearly half of all KBAs are of importance for forest-dependent species.345

On one hand, it is encouraging that just over 50 percent of forested KBAs are covered by protected areas or other effective conservation methods (OECMs). On the other hand, that still leaves nearly half of forested KBAs unprotected, and forest loss in these areas remains high. Considering the high conservation value of forested KBAs, the protection and conservation of forest KBAs should be prioritized under the Target 3 of the KM-GBF.

4.2. Significant overlap exists between designated protected areas and forested KBAs, but protected area status cannot guarantee forest conservation outcomes if these areas are not effectively and equitably managed. Protected and conserved area regulations must be properly enforced, and not just be "protected" on paper.

While implementation failures of protected areas are variable and site-specific, they often result from a critical lack of resources or human capacities that can mean that compliance falters.346 Compliance has been described as protected areas' Achilles' heel.347 For protected areas to be effective for the long run, financial resources, community engagement, political support, and management capacity must all be present and sustained over time.348 However, novel approaches to forest protection should also be embraced under Target 3 of the KM-GBF. Both biodiversity resources and carbon sinks are known to be better preserved in Indigenous Territories than in other unprotected areas.349 Therefore, the recognition of land rights to Indigenous People represents immense, untapped opportunities for forest conservation.350 Furthermore, under Target 15 of the KM-GBF, Parties to the Convention on Biological Diversity should consider adopting ecosystem-specific indicators for industry sectors known to pose particularly severe risks to and impacts on these ecosystems. For example, agriculture and mining would be key sectors to monitor for forest protection and restoration. Parties should therefore consider adding "commodity-driven deforestation" (see **Chapter 1**) as a complementary metric within the KM-GBF monitoring framework, allowing Parties to track their progress in reducing these sectors' impacts on ecosystems of high conservation value, such as forests. Similar indicators could be developed for other equally important ecosystems, such as grasslands and wetlands.

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