
LAND USE

N° 7 Deforestation is slowing… but is not stopping the decline of the carbon sink

- Annual global tree cover loss has slowed since peaking in 2016, but remains above the 2000-2015 average. The carbon stocking capacity of forests therefore continues to weaken.
- Indonesia has significantly slowed its rate of deforestation, which is accelerating in the Democratic Republic of Congo and Brazil.
- International targets for combating deforestation (New York Declaration), accelerating reforestation (Bonn Challenge) and promoting biodiversity (Aichi Targets) have generally not been met.
- Financing for biodiversity and forests is growing. "Nature-based" carbon credits are driving the development of voluntary carbon markets.

KEY FIGURES

Deforestation slowing down but still high

- **25 million hectares (Mha) of forest cover** lost on average each year since the 2016 peak of 29.6 Mha. Noteworthy slowdown in Indonesia from the 2016 peak (2.2 Mha) to 2022 (0.8 Mha) (GFW, 2023).
- **4 Mha** humid primary forests lost on average each year since the 2016 peak of 6 Mha (*ibid.*).
- **2/3 of the loss of primary forests** between 2013 and 2019 was due to conversion for commercial agriculture, and 3/4 of that conversion was illegal (Forest Trends, 2021).

The forest carbon sink continues to shrink

- **-7.72 $GtCO_2e$/year**: net sink for the period from 2001 to 2022, resulting from 8.84 $GtCO_2e$/year of emissions from forests and -16.6 $GtCO_2e$/year absorbed (GFW, 2023).
- **-5.8 GtC sequestration capacity** in tropical forests from the 1990s to the 2010s – the carbon equivalent of a decade of fossil energy emissions from the United Kingdom, Germany, France and Canada combined (CIRAD, 2020).
- **0.22 $GtCO_2e$/year** of net emissions from the Brazilian Amazon between 2001 and 2019, now a net source of emissions (Harris et al, 2021).

Despite increased commitments and funding

- **69% of companies with the highest forest risk** had a policy against deforestation in 2023 (41% in 2015), and 39% of financial institutions (0 in 2015) (Forest500, 2015; 2023).
- **$130 billion funding** to support biodiversity in 2020, compared to $52 billion in 2012 (Global Canopy, 2012; The Nature Conservancy, 2020)
- **$263 million/year**: average multilateral funding of REDD+ projects between 2015 and 2021 (CFU, 2022).
- **+321%** value of nature-based carbon credits sold on the voluntary market from 2020 to 2021 (Ecosystem Marketplace, 2022).

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TRENDS
LAND USE

The tree that hides the forest: increasing commitments and a slowdown in deforestation mask the shrinking carbon sink

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Changing land use practices over recent decades have intensified the inter-related crises of climate change, biodiversity loss, and desertification. After reaching a peak in 2016, the loss of global tree cover began to slow down, although erratically. The loss of primary forests is mainly due to deforestation for commercial agriculture, which has seen a rise in resulting emissions, and a reduction in the net carbon sink of forests. The impacts of increased state and private commitments to combat deforestation and bigger financial flows towards forests and biodiversity still await confirmation. Regional exceptions persist, and conservation works best when local communities are involved.

Evolution of forest cover and emissions

2015 – 2022: Loss and degradation of forest cover remains high

Following a historic peak in 2016, annual tree cover loss[a] has remained above its 2015 level, at a rate of 25 million hectares a year (Mha)[1] – an annual loss equivalent to the total surface area of Ecuador. About one quarter of total loss is permanent, in areas where deforestation is mainly commodity-driven or for urbanization (**FIGURE 1**).[2,b] Overall, despite different trends between regions, the commodity-driven deforestation rate has not diminished since 2001,[3] maintaining an average pace of 5 Mha/year since 2017.

Most of the permanent loss concerns humid primary forests in tropical zones – from 2015 to 2020, primary forest loss remained higher than during the five preceding years[4] (**FIGURE 2**). These forests

a "Tree cover loss" here refers to the total loss as presented on Global Forest Watch, including "*humid primary forests, dry and non-tropical primary forests, secondary forests and tree plantations*", measured using Landsat satellite images. This loss comprises deforestation – due to human activity – and loss due to fire, disease, storms, etc.

b Here, "commodity-driven" deforestation designates the permanent conversion of forest land for non-forestry purposes such as commercial agriculture, mining, or energy infrastructures; "shifting cultivation" designates small- or medium-scale conversion of forests for agriculture that is later abandoned; "forestry" designates large-scale operations within managed forests and tree plantations.

store about half of the world's carbon,[5] harbour the greatest biodiversity, and provide numerous ecosystem services.[6] A study by Forest Trends revealed that nearly two-thirds of tropical forest lost from 2013 to 2019 was due to commercial agriculture (in particular soy, palm oil, beef products, plus smaller-scale products like cocoa, rubber, coffee and corn).[7] Three-quarters of this agricultural conversion took place illegally.

FIGURE 1

TREE COVER LOSS AND SHARE OF MAIN DRIVERS, 2015 – 2022

Source: Climate Chance, based on Global Forest Watch data

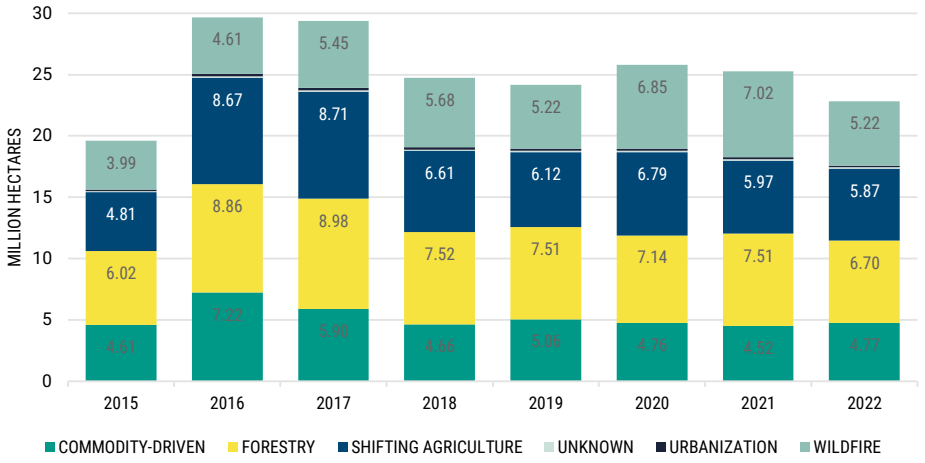
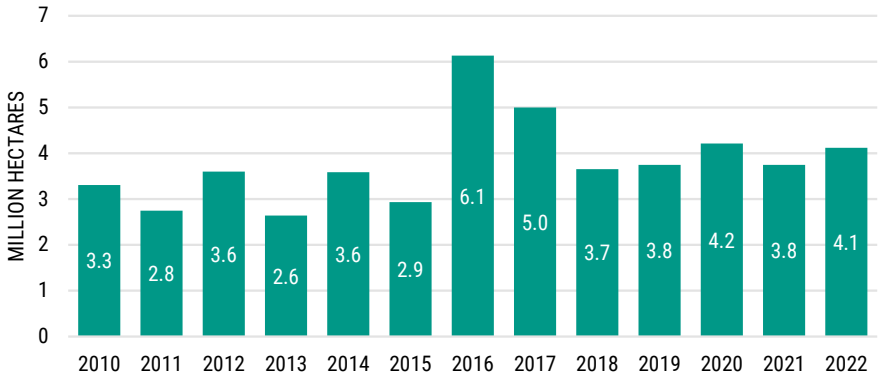


FIGURE 2

LOSS OF HUMID PRIMARY FORESTS, 2010-2022

Source: Global Forest Watch, 2023



The remainder of the loss can be put down to so-called "temporary" factors (forestry, forest fires, and shifting cultivation in some cases), since these forests can sometimes grow back: but the process is generally slower and much harder to measure. In addition to this loss of forest area, several scientific studies published in 2020 and 2021 highlight a second key mechanism:[8, 9, 10, 11] forest degradation, a term that covers occasional perturbations to extract wood, small-scale fires and storms. In January 2020, of the 1,071 million hectares of remaining humid tropical forest, about 10% were degraded. **Degradation is reportedly responsible for about 73% of biomass loss and 44% of carbon emissions related to land use, compared to 27% and 56% for deforestation respectively**. In addition to considerable emissions, these areas are at greater risk of deforestation. Researchers estimate that 7.5 years after perturbation, almost 50% of degraded forests have been deforested.

This loss and degradation of forests coupled with global changes in land use patterns generate several interconnected impacts, in particular biodiversity loss and desertification. Despite an increase in the number of protected areas, the collapse of biodiversity continues.[12]

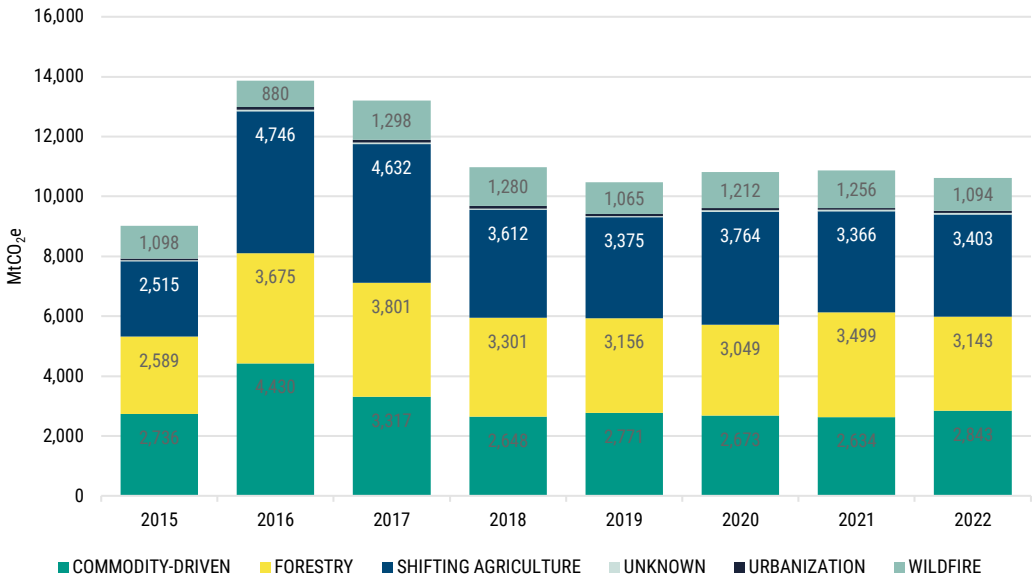
Emissions continue to rise while the carbon sink is declining

According to the IPCC, between 2006 and 2017, activities related to agriculture, forestry and land use represented about 13% of anthropogenic CO_2 emissions, 44% of methane emissions, and 81% of nitrous oxide, amounting to an estimated 12±2.9 $GtCO_2e$ per year. In a natural response to these increased emissions, the land carbon sink has absorbed 11.2 $GtCO_2$ per year, but the persistence of the sink is uncertain, given the impacts of climate change.[13] Emissions related to the use of land are harder to assess than those resulting from energy combustion, with current estimates varying depending on the definition of forests or cultivated land, and the data source (national bookkeeping models, digital models or satellite imagery). According to Harris et al., the differences between national and global estimates can be as much as 4.3 $GtCO_2$ a year – the equivalent of the annual emissions of India.[14]

FIGURE 3

EMISSIONS DUE TO TREE COVER LOSS, BY DEFORESTATION DRIVER

Source: Climate Chance, based on Global Forest Watch data



Emissions coming from all of these forest modifications (whether anthropogenic or otherwise, measured by satellite imagery),[c] were estimated at 8.1±2.5 $GtCO_2e$ per year from 2001 to 2019 by the same authors. During the same period, forests absorbed about 15.6±49 $GtCO_2e$ per year, representing a net annual sink of -7.6±49 $GtCO_2e$. According to the same study, tropical and sub-tropical forests contribute the most to global carbon fluxes in terms of emissions and absorptions, but only represent 30% of the planet's net carbon sink, the remainder being attributed to temperate and boreal forests. The Brazilian Amazon was therefore a net carbon source of 0.22 $GtCO_2e$/year from 2001 to 2019, mainly due to commodity-driven deforestation. Globally, deforestation for commodities, shifting cultivation, and forestry represents more than three-quarters of emissions due to tree cover loss (**FIGURE 3**).

Taken overall, the global food system represents up to one-third of all global anthropogenic emissions.[15] The CO_2 emissions generated by the conversion of forests into agricultural land are the main source, followed by CH_4 produced by enteric fermentation

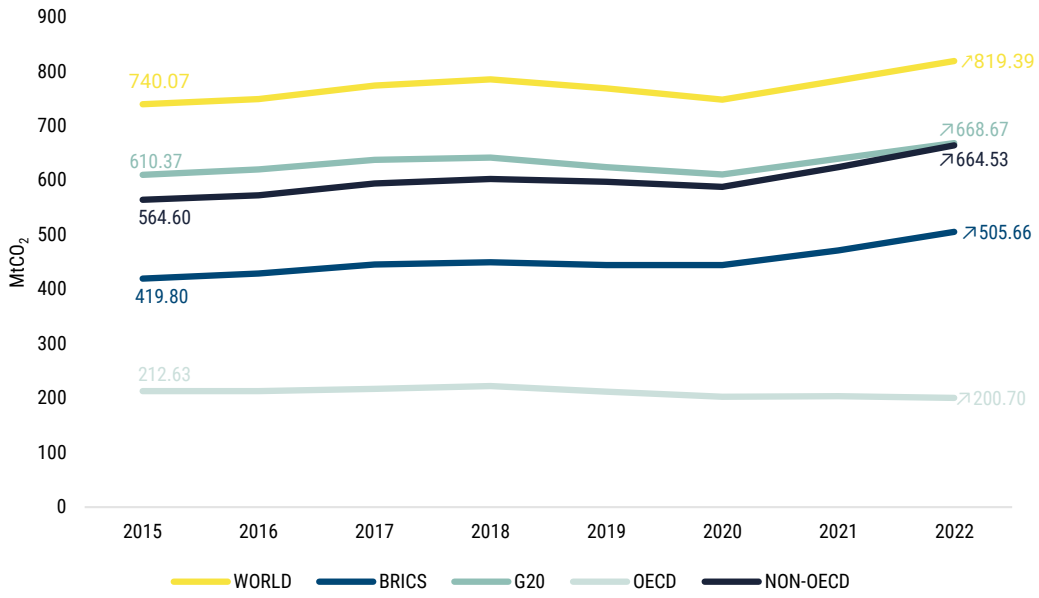
c Whereas the emissions featuring in IPCC reports and the Global Carbon Budget are calculated using bookkeeping models or a dynamic model of global vegetation, the figures given here were calculated based on forest cover data obtained from satellite imagery.

of livestock and the use of manure. Except for OECD countries, emissions related to energy usage in the agriculture, forestry and fisheries sector (energy combustion for crops, support activities, and post-harvest activities on production sites) have been increasing since 2015, in particular in the BRICS (+20% in 2022 compared to 2015)[16] (**FIGURE 4**).

FIGURE 4

EMISSIONS RELATED TO ENERGY USAGE IN THE AGRICULTURE SECTOR

Source: Climate Chance, based on data from Enerdata



Increasing regional differences

Regional trends reveal different trajectories and emerging positive signals. Of the three large nations with humid tropical forests, Brazil and the Democratic Republic of the Congo (DRC) have undergone increased forest loss since 2015, while Indonesia has, on the contrary, seen a sharp drop in deforestation (**FIGURE 5**).

In the case of Brazil (which represented 43% of total primary forest loss in 2022), most of the loss was due to clear-cut deforestation, and recent increases in forest loss coincided with the weakening of environmental protection policies and enforcement agencies by the Bolsonaro government, and with the reduced rights of indigenous peoples.[17] In the Congo, losses are rather due to smaller-scale clearance for short-term cultivation in response to increasing food demand, and the production of charcoal.[18] In 2021, the government also announced the end of a moratorium on forest exploitation, but the impact of this policy is not necessarily apparent in the figures.[19] The relative success of Indonesia in its continued slowdown of deforestation since 2016 can be explained by a progressive reinforcement of standards in the palm oil sector – as analysed by the Observatory in 2021[20] – coupled with more government policies aimed at reducing peatland fires.

Forest carbon sinks also appear to have regional differences: one study showed that the carbon absorption peak was reached in 1990 in the Amazon. In African forests, the peak was reached ten years later.[21]

The paradox of forest fires

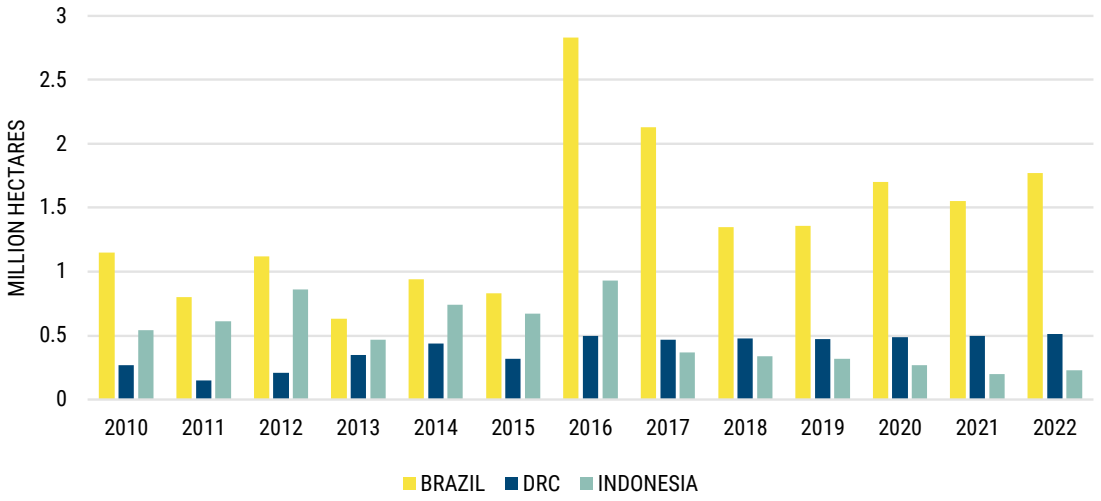
Apart from tree cover loss caused by human activities, forest fires play an increasingly large role – rising from 3.9 million hectares in 2015 to a peak of 7 million in 2021 (**FIGURE 1**) – due to increased temperatures and drier conditions in the tropical, sub-tropical and temperate regions of Australia and Boreal Eurasia.[22] Nevertheless, in absolute terms, the total burned surface area is decreasing (-25% from 1998 to 2015), partly thanks to a slowdown in prairie and savanna fires, due to increasing conversion of these lands into cropland, pastureland or urban areas.[23] Consequently, CO_2 emissions related to fires have followed a global downward trend since the 2000s (**FIGURE 6**).

These apparent paradoxes can be explained by interactions between fire regime control mechanisms: quantity of combustible matter, humidity, ignition (outbreak of fire) and suppression (fire extinction). These changes in fire regime also coincide with the appearance of a new type of fire, more complex and harder to control, described by Aude Valade, researcher at Cirad, in the 2021 Global Synthesis Report on Climate Action, *i.e.* megafires. These massive fires have exceptionally intense fire lines, propagation speeds, and unpredictable behaviour, as observed in recent years in California, Australia and Siberia,[24] and even more recently in Canada.[25]

FIGURE 5

TREE COVER LOSS IN BRAZIL, DRC AND INDONESIA

Source: Global Forest Watch, 2023



International commitments out of sync with local conservation

Steep rise in funding, but monitoring of impacts remains unresolved

Funding for biodiversity more than doubled from 2012 to 2020, going from $52 billion dollars annually[26] to about $130 billion.[27] The same goes for financial flows aimed at protecting forests: multilateral financing of REDD+ projects (reducing emissions from deforestation and forest degradation in developing countries) supported by the United Nations amounted to an average $263 million a year from 2015 to 2021.[28] Studied by the Observatory in 2022,[29] voluntary carbon markets, whose value went from $278 million in 2015 to over $2 billion in 2021, increasingly channel the action of companies looking to offset their emissions.[30] Credits related to forestry and land use are among the most in demand and have the highest values, in particular when they generate benefits for biodiversity, the sign of a greater focus on the interconnection of multiple planetary crises. However, most of these "nature-based solution" credits, including REDD+ projects, support emissions-avoidance schemes; not only do they make no contribution to increasing the natural capture of carbon by reforestation or afforestation – "only" preserving it – but the methodologies they use to evaluate their impacts have been accused of underestimating the emissions avoided, protecting land that is not under threat, and implementing debateable forest management practices.[31, 32] Even REDD+ credits do not clearly pass close examination[33] (**CF. "COMPANIES" TRENDS**).

Concrete commitments from companies, but insufficient progress

Following growing pressure from civil society in the early 2000s to eliminate deforestation from supply chains, corporate commitments began to take shape and develop, starting with the Consumer Goods Forum created in 2010, which aimed at net-zero deforestation by 2020.[34] Multi-stakeholder initiatives have seen the day, like the New York Declaration on Forests in 2014, by which 190 different organizations committed to bring deforestation to

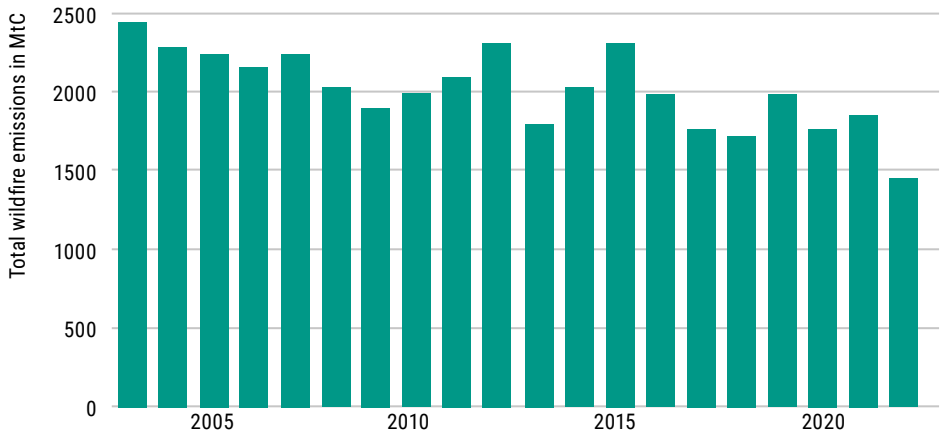
an end in 2020, and the Bonn Challenge, which aims to reforest 350 million hectares by 2030. Following COP26 in 2021, the "Glasgow Declaration" reaffirmed the objective to "halt and reverse forest loss and land degradation by 2030".[35] A first review produced in 2020 by the Climate Chance Observatory showed that most of the targets set for that year had not been reached;[36] in fact, the pandemic had diminished surveillance, and deforestation was continuing relentlessly.[37] Current progress towards 2030 targets is also proving insufficient.[38, 39]

A study by the World Benchmarking Alliance of the 350 biggest food and agriculture companies found that only 2% of them communicated their environmental impacts, while none of them "holistically address their dependencies on nature".[40]

FIGURE 6

GLOBAL EMISSIONS DUE TO FOREST FIRES

Source: CAMS, 2022



Since 2014, the Forest 500 initiative has been identifying companies and financial institutions that represent the greatest risk of deforestation due to their participation in, exposure to or financing of supply chains for soy, beef, leather, palm oil, wood, paper pulp and paper. In 2015,[41] 59% of the 250 companies evaluated had no deforestation policy, either concerning a specific product or general deforestation targets. None of the 150 financial institutions studied had a policy on deforestation. In 2023,[42] 31% of the 350 firms evaluated still had no policy, while 61% of the financial institutions most exposed to the risk of deforestation had no policy on the matter for their loans and investments. **Only 2% of Forest 500 companies that had made net-zero commitments and aligned themselves on a 1.5 °C objective attained a sufficiently high score to put them on track to respect those commitments**. Commitments also vary according to the sector: palm oil and timber are the commodities with the highest commitment levels, whereas leather, beef and soy come in at under 50%.

Forthcoming policies and legislation could encourage companies at risk for forests to act more, such as the EU Deforestation Regulation, which requires that goods produced after 29 June 2023 to be commercialized on EU markets in 2025 must not have contributed to deforestation or forest degradation after 2020.[43, 44] The regulation applies to coffee, cocoa, rubber, palm oil, soy, beef and wood, and all derived products including leather, charcoal and printed paper. Although it triggered strong reactions from the EU's commercial partners,[45] institutional investors like Aviva, the Norwegian sovereign wealth fund NBIM, and others, are already planning to withdraw from supply chains at risk.[46]

Local communities at the heart of conservation and resilience

Since the 2000s, research has shown that community forest management contributes to reducing deforestation and illegal forest exploitation,[47, 48, 49, 50] while generating substantial socio-economic advantages thanks to a fairer share of income from forest exploitation. It is now recognized that local communities and indigenous peoples have been sustainably managing forest resources for centuries through community management approaches. In Brazil, the deforestation of indigenous community forests would have been 22 times greater without their legal recognition. In the Mexican Yucatan, the

figures are even more striking: the rate of deforestation within community forests was 350 times lower than in other areas.[51, 52] In Mexico, a highly decentralized country, 80% of forest areas are managed by communities.[53] In the Asia-Pacific region, 15 million hectares are managed by communities, which is equivalent to the size of Cambodia, and this management enabled local inhabitants to better resist the pandemic.[54] However, in practice, community forestry comes up against obstacles. In Central African forests – analysed for the Observatory in 2021 by Marie-Ange Kalenga, from the NGO Fern – legal frameworks, land rights issues and access to financing hinder potential progress.[55]

Civil society has played an increasingly large role recently when it comes to land rights issues and even the rights of nature,[56] involving more frequent legal action. This is the case in Ecuador, where oil fields and mining projects have been cancelled following legal decisions or popular referendums (**CF. "CIVIL SOCIETY" TRENDS**). Forest exploitation, mining, and widescale industrial agriculture have been identified as the main sources of conflict with civil society activists, and more than three-quarters of fatal attacks in 2021 took place in the Amazon.[57]

Cooperation with the local population has turned out to be more effective for conservation – through protected areas managed by the community or multi-use conservation areas – with advantages for biodiversity and forest carbon stocks.[58] Examples include the Cardamom Mountains in Cambodia,[59] and Madre de Dios in Peru,[60] two cases studied by the Observatory in recent years. Often coordinated by NGOs on the field, local cooperatives have boosted the socio-economic and ecological resilience of women and families in particular, like on plantations growing coffee in Uganda and Rwanda,[61] cocoa, bananas and plantains in Costa Rica,[62] and the restoration of mangroves in the Sundarbans Delta in India.[63]

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