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FORESTS AS CARBON SINKS

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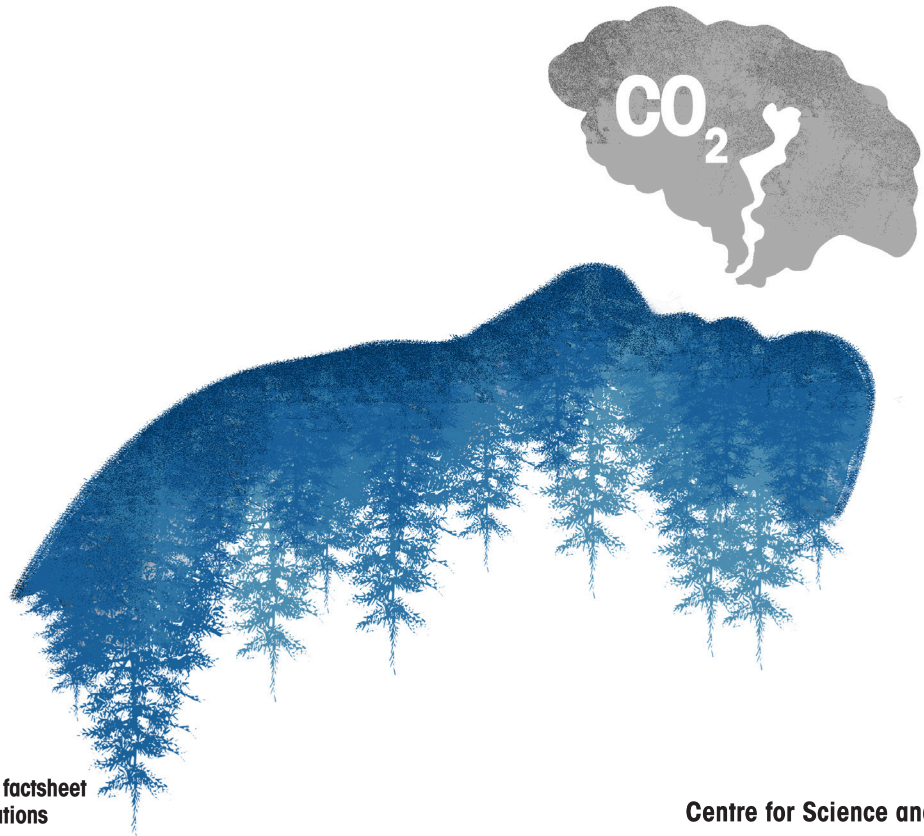

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Why are forests important for combatting climate change?
Forests will play a critical role in the world's desperate fight to combat climate change. Research published in the *Nature Climate Change* journal in 2021 found that the world's forests sequestered about twice as much carbon dioxide (CO_2) as they emitted between 2001 and 2019. It is estimated that global forests removed around 15.6 Gigatonne carbon dioxide equivalent ($GtCO_2e$) each year while emissions from deforestation and other disturbances averaged 8.1 $GtCO_2$ annually. This meant that global forests were a net sink—soaking in some 7.6 $GtCO_2$ each year—a little less than the total CO_2 emissions of China in 2020 (roughly 10 $GtCO_2$), and more than the total annual CO_2 emissions of the US.[1] This is corroborated by the Intergovernmental Panel on Climate Change's (IPCC) *Special Report on Climate Change and Land 2019* (SRCCL), which estimates that between 2007 to 2016, land use accounted for 13 per cent of anthropogenic CO_2 emissions. But it also provided a net sink of around 11.2 $GtCO_2$ per year, equivalent to 29 per cent of total CO_2 emissions within the same period.[2]

Global forests have functioned as a net sink, soaking in 7.6 $GtCO_2$ each year

The world is not on track to reduce greenhouse gas (GHG) emissions at the scale needed to avert a temperature rise of 1.5°C. The solution then is to find ways in which emissions can be removed from the atmosphere. Growing trees is a part of the solution. It is also clear that restoring land and adding to forests can benefit local people as environmental degradation impacts livelihoods and impoverishes communities. However, the questions that emerge here are—how will these forests be grown and on whose lands? Additionally, we must address who pays the price and who the beneficiaries are of this endeavour. It is also important to understand the costs of protecting nature—especially in areas that are inhabited by poorer communities—and what this means for their future.

Where are the major sinks?

Tropical forests store the most carbon, the largest of which are in the Amazon, Congo River Basin and Southeast Asia. But they also have the highest emissions due to deforestation (78 per cent of gross emissions), even though they sequester more carbon (55 per cent of gross removal) than boreal and temperate forests combined.[3] The Food and Agriculture Organization's (FAO) data also points to this; findings state that from 2010–20, the top three countries with average annual net loss of forest area were Brazil, Democratic Republic of the Congo and Indonesia.[4] Consequently, the major global net sinks lie in temperate forests (47 per cent) and boreal forests (21 per cent) due to lower emissions, compared to the tropics (31 per cent).

Recent studies point to the fact that the Amazon may be close to its tipping point—it is today a 'net' source of emissions and not a sink. In July 2021, Luciana Gatti at the National Institute for Space Research in Brazil, along with other researchers, found that the Amazon rainforest, particularly the southeastern section, is now emitting more CO_2 than it is absorbing. Its net emissions amount to 1 $GtCO_2$ per year, caused mainly by fires deliberately set to clear land for beef and soy production. These are made worse by hotter temperatures and droughts.[5]

One-third of the world's tropical deforestation is driven by international trade, mainly in beef and oilseeds

According to Florence Pendrill at the Chalmers University in Sweden, one-third of the world's tropical deforestation is driven by international trade, mainly beef and oilseeds.[6] In Brazil, one-third of the deforestation is driven primarily by the expansion of pasture land to raise cattle for beef production. This is followed by cropland expansion for soybean and palm oil, and tree plantations in native forests for paper and wood products. The annual forest loss rate in the Brazilian Amazon reached a 12-year high of 1.11 million hectares in 2019 and 2020.

At COP 26, two announcements were made—the Glasgow Leaders Declaration to halt forest loss, and the FACT (Forest, Agriculture and Commodity Trade) Dialogue on sustainable trade. Such voluntary commitments are unlikely to be effective, unless domestic policies to protect and restore forests are strengthened significantly. In Brazil, for example, environmental laws have been weakened by former President Jair Bolsonaro, further encouraging illegal deforestation.[7]

Where is the renewed interest in forest sinks coming from?

Policy interest in using forest sinks to sequester carbon dates back to the 1990s. The role of land (forests and agricultural land) as a mitigation pathway to reduce CO_2 emissions was recognized by the United Nations Framework Convention on Climate Change (UNFCCC) in 1992.

In recent years there has been a proliferation of global calls to action—the New York Declaration on Forests in 2014, the '1 trillion tree' initiative at the World Economic Forum in 2020, and the LEAF (Lowering Emissions by Accelerating Forest Finance) Coalition announced by the US, UK, and Norway in 2021.

The setting of 'net zero' targets by countries and private entities following the IPCC's *Special Report on Global Warming of 1.5°C (SR 1.5)* in 2018, is also heavily dependent on the sequestration of carbon through tree-planting projects.

Parallely, with the SR 1.5's statement on achieving net zero by 2050, several scientific studies have been published

Since 2009, introduction of the term "nature-based solutions" by the International Union for Conservation of Nature (IUCN) at COP 15, using forests to absorb CO_2 is now covered under many new umbrella terms, each with varying nuances: **nature-based solutions, natural climate solutions, forest restoration, tree planting, afforestation/reforestation, land-based mitigation, land use, land use change and forestry (LULUCF) solutions.**

providing estimates of the CO_2 mitigation potential of land/forests. The Centre for Science and Environment (CSE) reviewed 14 such studies from 2017 to 2022 in its paper, *Forests and Climate Change: The Facts, Science and Politics*. The studies vary widely in their findings, but most agree that forests offer a low-cost solution to sequester CO_2. Several among them also offer overtly optimistic estimates of how much additional CO_2 forests can capture. For example, in May 2021, the World Economic Forum published a report, *Nature and Net Zero*, in collaboration with McKinsey and Company, stating that natural climate solutions have "a practical potential of close to 7 $GtCO_2$ per year" in sequestration, and can achieve about one-third of the target set by the SR 1.5 to reduce global net emissions by about 50 per cent by 2030. It claims that these are "typically low-cost sources of carbon abatement," costing between US $10 and US $40 per tonne of CO_2 with variations between geographies and project types.[8]

The extent of the land carbon sink is not fully understood even by climate scientists running global atmospheric models

Spurred on by optimistic scientific estimations of what forests can do for climate change, about 66 per cent of countries have included forests and land sinks in their Nationally Determined Contributions (NDCs), according to IUCN.

Confidence in forest sinks has also bolstered carbon offset markets, with a focus on forest-based offsets that trade as some of the cheapest credits (US $4–50/tonne CO_2e according to IHS Markit). They rose from five per cent of all credits in 2010 to 40 per cent in 2021 (80 per cent of forestry offsets are from the REDD+ programme). McKinsey estimates that by 2030 more than half of carbon offsets will come from forest and other nature-based projects. These projects are disproportionately located in the Global South—Asia, Latin America, and Africa—the regions with the densest tropical forests and the poorest people.

Can forests really soak up all our excess CO_2 emissions?

But banking on forest sinks to soak up our excess emissions is not easy. The extent of the land carbon sink is not fully understood even by climate scientists running global atmospheric models, and wide disagreements exist between models and methods. The overoptimistic studies of sink potential referenced earlier are contradicted by equally assertive research which finds that even if the amount of vegetation that all the land in the world can hold is maximised, it would only sequester enough carbon to offset about 10 years of GHG emissions at current rates. Beyond this there will be no additional carbon storage on land, according to Bonnie Waring, an ecologist at the Imperial College in London.[9]

Some research says that even if the amount of vegetation that all the land in the world can hold is maximised, it would only sequester enough carbon to offset about 10 years of GHG emissions at current rates

The former NASA (and current Columbia University) scientist James Hansen has estimated that the soil and biosphere can store a maximum additional limit of 100 Gt of carbon (367 $GtCO_2$) via improved agricultural and forestry practices, and no more.[10]

Differences between the top-down global estimates from models, and the bottom-up estimates by countries from their GHG inventories muddy the waters further. A paper published in 2021 in *Nature Climate Change* by Giacomo Grassi, a senior scientific officer at the Joint Research Centre of the European Commission, finds that there is a missing gap of some 5.5 $GtCO_2$ per year between the land emissions estimates from global models and country inventories. This accounting discrepancy complicates efforts to determine how natural sinks can fit into mitigation plans, since countries claim large reductions to their annual emissions from the land use and forestry sector and get a free pass on their CO_2 emissions from fossil fuel use.

Countries such as Russia, Canada, Brazil, the US and China that have large forests and happen to be large emitters of CO_2 have the most to gain from 'net accounting'—the deduction of CO_2 absorbed by a country's sinks from its total emissions to arrive at a possibly lower net figure. In the US, of the 6.6 $GtCO_2e$ total emissions in 2019, some 0.789 $GtCO_2e$ was reduced by 'sinks', leaving net emissions of 5.8 $GtCO_2e$—roughly a 12 per cent reduction.[11] According to domestic authorities, Russia's forests can offset up to 38 per cent of its GHG emissions—i.e., about 0.55 $GtCO_2$ attributed to its sink in 2018—despite being the fourth highest GHG emitter. This obscures the actual need for Russia to enhance its NDC ambition and take meaningful measures to curb its fossil CO_2 emissions.

Data shows that the intact tropical forest carbon sink has saturated, while European forests are heading towards carbon sink saturation as well

Moreover, forests can be destroyed by fire and deforestation: they are impermanent and their sink strength may be reducing due to climate change itself. If business-as-usual emissions continue, the strength of the global land sink could be cut by nearly 50 per cent by 2040.[12] In its first instalment of the Sixth Assessment Report (AR6) published in 2021, the IPCC stated that sinks are under threat from increasing cumulative CO_2 emissions:

"While natural land and ocean carbon sinks are projected to take up, in absolute terms, a progressively larger amount of CO_2 under higher compared to lower CO_2 emissions scenarios, they become less effective, that is, the proportion of emissions taken up by land and ocean decrease with increasing cumulative CO_2 emissions. This is projected to result in a higher proportion of emitted CO_2 remaining in the atmosphere."[13]

Data shows that the intact tropical forest carbon sink has saturated[14], while European forests may be heading towards carbon sink saturation as well.[15]

India's carbon sink target must account for the needs of the poorest

In its NDC to the Paris Agreement, India has pledged to 'create an additional (cumulative) carbon sink of 2.5–3 gigatonnes of carbon dioxide equivalent ($GtCO_2e$) through additional forest and tree cover by 2030'. According to the *India State of Forest Report (ISFR) 2021*, the total forest and tree cover is 24.62 per cent of the geographical area of the country – an increase of 0.28 per cent since the last assessment in 2019.

Increase in forest cover has happened outside the area classfied in land records as 'forests'. It has also happened mainly in forests that are defined as 'open'—with canopy cover between 10–40 per cent. This shows that forests are growing because people are planting trees on their individual lands, including plantations of rubber, coconut or eucalyptus—non-forest species. According to the *Indian State Forest Report (ISFR) 2021,* close to 40 per cent of the carbon stock is in the "trees outside forest" category

About 15 per cent of India's carbon dioxide emissions in 2016 were removed from the atmosphere by the LULUCF sector, according to the *Third Biennial Update Report (BUR)* submitted to the United Nations Framework Convention on Climate Change (UNFCCC). India has not officially announced a baseline year from when this additional forest sink would be measured. But MOEFCC officials say that 2005 is the base year, while the carbon stock between 2005 and 2010 was used as a trend to arrive at the goal of 2.5–3 Gt by 2030. The only publicly available official roadmap to achieve India's sink goal is the FSI's *Technical Information Series (*Volume I, No 3, 2019). The report concludes that the most cost-effective solution would be restoration of degraded forest lands which can contribute up to 60 per cent of the additional carbon sink to be achieved by 2030. It is critical for India's afforestation strategy to account for the needs of the poorest who live on forest lands.

On the one hand, there is a need for enhanced protection of the remaining forests for ecological security; and on the other hand, there is a crucial need to build resilience of communities who live in these habitats. And all this needs to be done in times of increased risk because of climate change.

Excess reliance on forest sinks threatens homes, livelihoods, and food security

Excess dependence on afforestation for climate change mitigation can disregard the existing users and dwellers of these lands, leading to the appropriation of land and resources for planting trees and add to the marginalisation of the poorest in the world. At least 293 Gt of carbon is stored in the collective forestlands of indigenous peoples and local communities, according to the North America-based non-profit Rights and Resources Initiative. Limited recognition of their tenure rights would continue to expose them to relocation and loss of livelihood from land-use schemes (including environmental schemes). In fact, deforestation rates are significantly lower in indigenous and tribal territories, where governments have formally recognised collective land rights.[16]

It is speculated that the demand for carbon offsets from the private sector could increase 15-fold by 2030. This will exacerbate all the above issues—human rights, competition for land, proliferation of monoculture plantations.

This then raises critical issues of how lands will be protected and forested—particularly in the densely populated and poor tropical regions—and who will pay the opportunity cost of this protection and to whom?

Adapted from: Sunita Narain and Avantika Goswami 2022, Forests and Climate Change: The Facts, Science and Politics, Centre for Science and Environment, New Delhi, https://www.cseindia.org/forests-and-climate-change-11346

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