CENTER FOR GLOBAL DEVELOPMENT

CGD NOTE | NOVEMBER 2022

How Much Should the World Pay for the Congo Forest's Carbon Removal?

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At last year's United Nations Conference on Climate Change (COP26), 141 leaders committed to halt and reverse forest loss and degradation by 2030. Forests, particularly tropical ones, are known to play a crucial role in removing carbon from the atmosphere, partially offsetting the effect of greenhouse gas emissions. This is a highly valuable service to the global climate, meaning the world should be willing to pay to ensure it happens. In this policy note, we look at just how valuable that service is, and put that in the context of aid efforts to protect forests.

Executive summary

We find that, under conservative assumptions about the social cost of carbon, forests provide a valuable service to the world. We estimate the value of carbon removal at $770 billion a year, equivalent to around 1 percent of global output (GDP). Deforestation works in the opposite direction, significantly offsetting around half of this effect.

As the largest tropical rainforest acting as a significant carbon absorber, the Congo Basin forest provides a service to the world by removing carbon from the atmosphere with a value of $55 billion per year, equivalent to 36 percent of the GDP of the six countries that are home to the forest (Cameroon, Central African Republic, Republic of the Congo, Democratic Republic of Congo, Equatorial Guinea, and Gabon). This asset can and should be seen as akin to mineral or oil deposits that have significant benefits for the countries that host them. The mining sector represented 29 percent of DRC's GDP in 2018 and oil rents represented 32 percent of Congo's GDP in 2021.

Deforestation not only destroys a forest's ability to remove carbon, but it also releases significant quantities of carbon into the atmosphere. In the Congo Basin forest, the value of carbon removal is significantly offset by deforestation worth $25 billion per year, with the net removal valued at $30 billion per year. Deforesting a relatively small proportion of the forest can have carbon impacts that outweigh the value of the forest's carbon removal—indeed, this is happening in Southeast Asia's forests, which were net carbon contributors in the last two decades. This is also the case in Brazil's share of the Amazon, where carbon removal would have been worth $35 billion per year but instead, deforestation has meant annual damage valued at $11 billion per year.

The high value of carbon removal and avoiding deforestation contrasts starkly with the level of public finance provided to support forests. We analyse concessional finance provided over the past decade and find that, across all of Africa, the level of support for forests rose to its highest in a decade at $321 million in 2020. The value of the carbon removal service the Congo Basin forest provides is over a 150 times the average level of international public finance for Africa's forests ($170 million in the 10 years to 2020), even after taking account of deforestation.

With these limited incentives, it is perhaps not surprising that lower-income countries are pursuing deforestation. While it is possible that countries could "securitise" forests into a financial asset where offsets are sold to the private sector, the urgency of the situation suggests that there is a need for international public support to provide substantial payments to countries to preserve their forests and avoid deforestation.

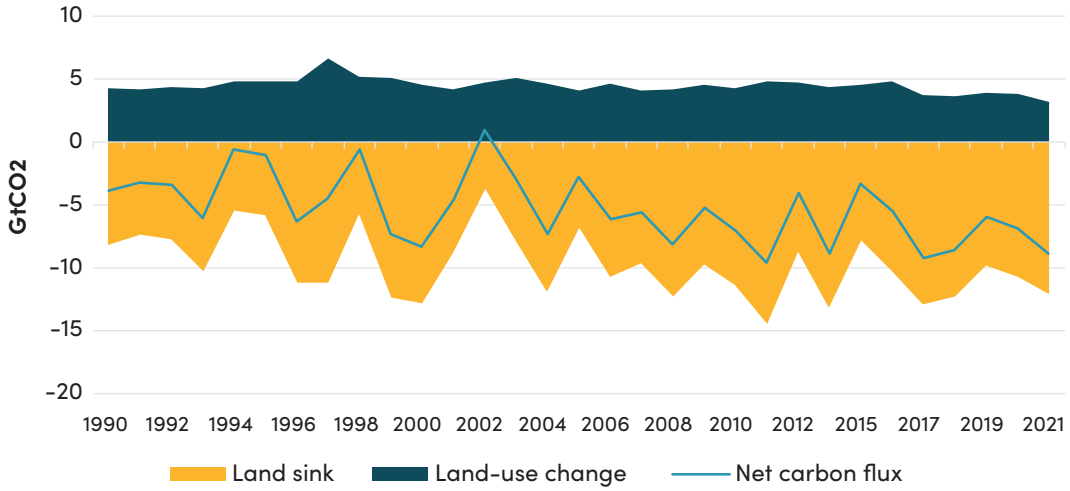
Forests' role in the carbon cycle

Forests around the world are "carbon sinks": they absorb carbon from the atmosphere through photosynthesis and store it within biomass, soil, and litter, contributing to the global carbon stock. Destroying forests then has two effects: first, it reduces the carbon removed (flow); and second it releases the carbon stored (stock).

Globally, total greenhouse gas emissions were roughly 46 giga (or billion) tonnes of carbon dioxide equivalent in 2019. Forests store a large quantity of carbon—one estimate puts this at 485 gigatonnes, over 10 years' worth of emissions. So, avoiding deforestation is crucial.

However, forests also *remove* carbon through sequestration. As illustrated in figure 1, over the last 30 years, land vegetation has almost constantly absorbed more carbon than emitted through deforestation, providing a climate service at the global level.

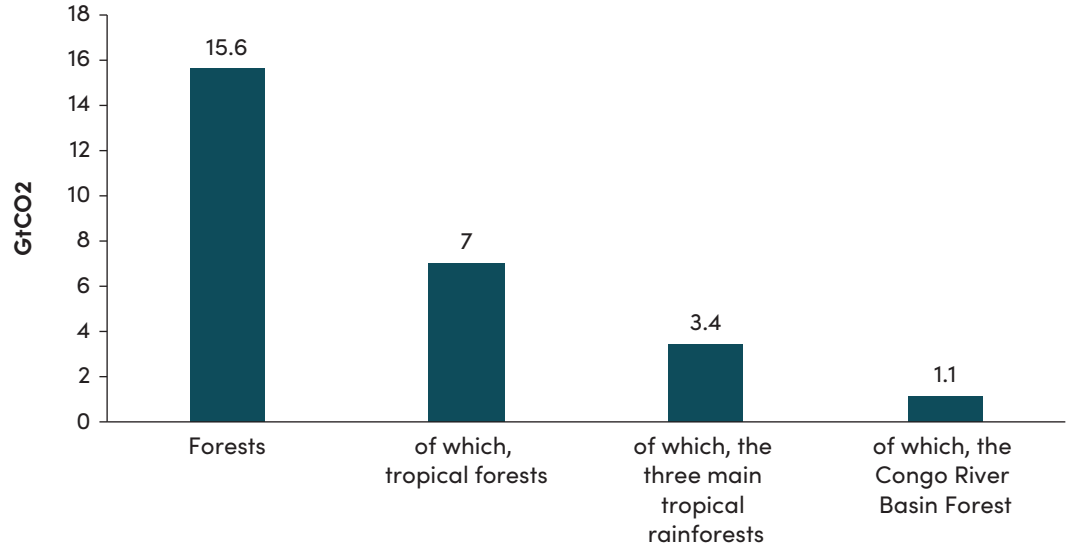
Figure 1. Carbon removals and emissions due to change in land use (including deforestation), 1990–2021



Source: Carbon Brief

A recent paper suggests forests may remove 16 gigatonnes per year (figure 2) or 7.6 gigatonnes in net terms (after taking account of emissions, including from deforestation). While there are wider uncertainty bands around these estimates, it is clear that tropical rainforests are particularly important in this process as they collectively sequester more carbon than other types of forests but suffer the most from deforestation. In addition, separate studies also found that they have a cooling effect on the planet beyond the above estimates through transpiration.

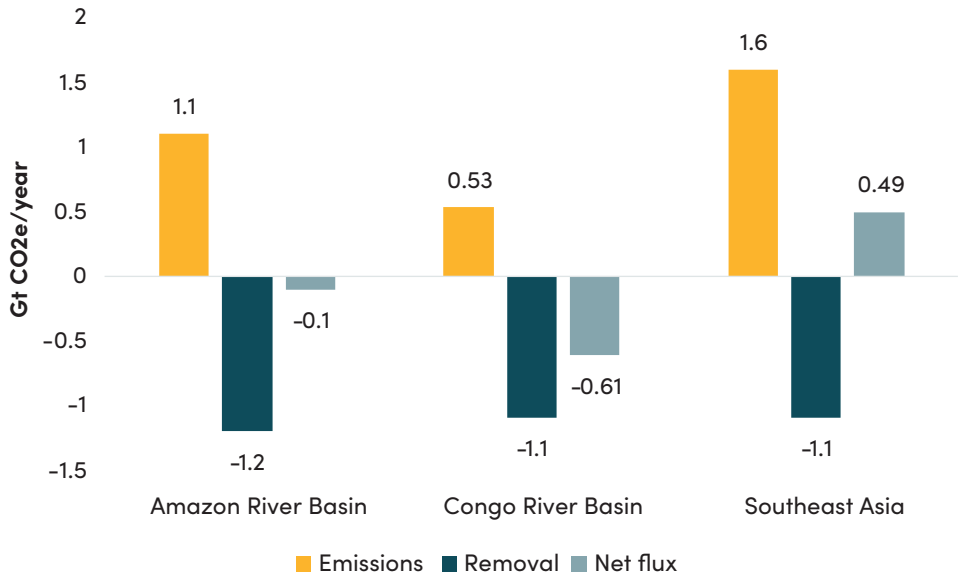
Figure 2. Distribution of forests' coverage and relative gross carbon removals



Source: Harris et al. (2021) and Harris and Gibbs (2021).
Note: These figures report the central estimates from the paper by Harris et al. 2021 but note they also report wide uncertainty bands. The respective net removal figures are 7.6; 1.7; 0.12; 0.61.

The three largest tropical forests—the Amazon River Basin, the Congo River Basin, and Southeast Asia—collectively account for 44 percent of annual sequestration by forests, according to recent work. With 3.4 gigatonnes of carbon removed per year (see figure 2), this is equivalent to annual emissions of Germany, Japan, France, Italy, the United Kingdom, and Canada combined.

Figure 3. Annual average carbon fluxes of the three main tropical rainforests, 2001–2019



Source: Harris & Gibbs (2021).

The Southeast Asia forest is actually emitting more than it removes due to deforestation—and so a net contributor of carbon—while the Amazon River Basin and the Congo River Basin are still net carbon sinks, removing more carbon than they emit. Between 2001 and 2019, the Amazon rainforest remained a carbon sink, but it could become a net carbon source if annual deforestation continues to increase. In fact, forests in the Brazilian Amazon already constitute a net carbon source, emitting 0.22 billion tonnes of carbon per year for the last 20 years. Brazil is therefore adding to emissions with damage valued at some $11 billion a year. Without deforestation, Brazil's share of the Amazon forest would provide a global service worth some $35 billion per year. Over the same period, the Congo River Basin remained a strong net carbon sink—capturing close to 0.6 billion tonnes of carbon per year—but here, too, deforestation linked to new oil drilling projects threatens.

Valuing forest ecosystems' carbon removal service

Carbon removal is just one of the "ecosystem services" provided by forests; others include maintaining biodiversity, controlling floods and erosion, and filtering water supplies. Many economists warn that the provision of these ecosystem services is largely unfunded. However, carbon removal is distinct from other ecosystem services in that it is a global public good—one that we all benefit from. We focus our efforts here on valuing that service.

Quantifying a cost or benefit of an ecosystem service ensures that it is properly valued. A number of studies have attempted to price or estimate the social cost of a tonne of emissions. In a previous paper, we reviewed several perspectives on the social cost of carbon. One authoritative review by the US Interagency Working Group on Social Cost of Greenhouse Gases suggests—with assumptions about when climate damage peaks and how much we discount the future—emissions had a social cost of just over $50 per tonne in 2020. Averting a tonne of emissions would, therefore, have a corresponding social benefit of that amount. New research seeking to better quantify the cost of uncertainty suggests a figure over three times this amount, so this cost may represent a significant underestimate. Still, as the lower figure is that used by US government at this time, we base our valuations on it.

Applying a social benefit of carbon of $50 per tonne to the global forest carbon gross removal calculated by Harris et al. suggests that the annual value of gross global carbon removal is some $770 billion, or close to 1 percent of the world's GDP, compared to 3 percent for oil production. This is substantially offset by the destruction of rainforests; given the density of carbon in rainforests, destroying even a small proportion of the forest creates large emissions. Between 2001 and 2019, the average annual emissions resulting from deforestation amounted to 8.1 gigatonnes, worth some $400 billion per year, leaving a net removal value of $370 billion. Still, it's perhaps misleading to consider only the value of net removals—this would substantially understate the value provided by forests (and, in turn, exacerbate the risk of further deforestation).

Indeed, if forest owners had greater financial incentive to maintain their forests intact, they would be less likely to contribute to further deforestation. Among the 10 largest forested countries, six are low- or middle-income countries (Brazil, China, the Democratic Republic of Congo, Indonesia, Peru, and India).

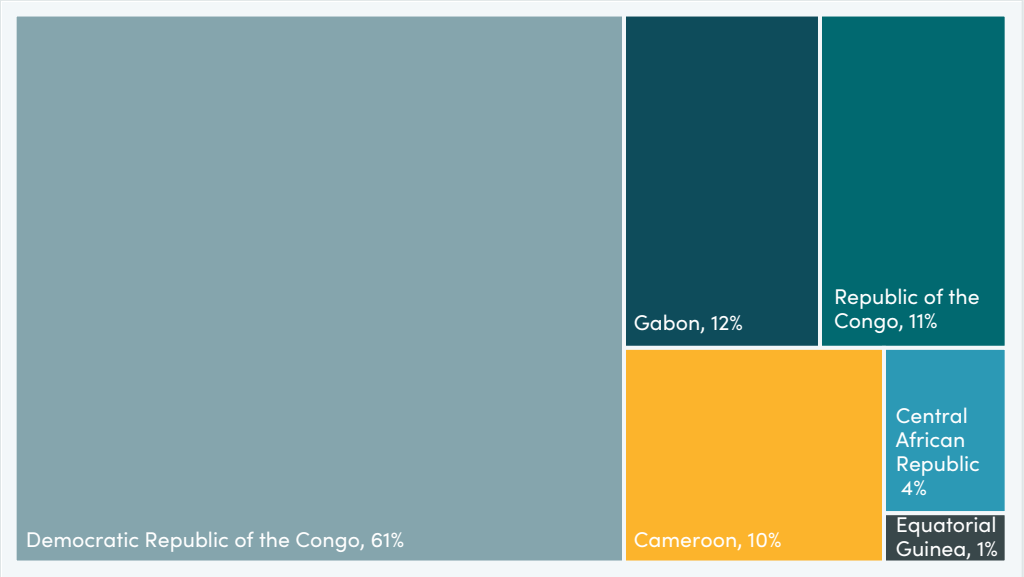
Valuing the Congo River Basin

The Congo River Basin forest—located in one of the poorest areas of the world—contributed more in net carbon removal than any other tropical forest in the previous decade.

With an annual gross removal of 1.1 gigatonnes between 2001 and 2019, the ecosystem service the Congo River Basin provides to the world is immense. At a price of $50 per tonne of carbon in 2020, this represents a service with an annual value of some $55 billion, or 36 percent of the GDP of the region covered by the forest in 2021.

The Congo River Basin forest covers 298 million hectares and is spread over several countries (see figure 4). To put the value of the forest's carbon removal service in context, it corresponds to five times the current annual government budget of its largest host country, the Democratic Republic of Congo (DRC). Oil reserves within the DRC are also significant, with a planned auction estimating the DRC has reserves of 16 billion barrels, potentially worth $650 billion. The value of carbon removal could rival the value of those oil reserves over a period of 12 years.

Figure 4. Distribution of the Congo River Basin Forest area by country



Source: Les forets du Bassin du Congo -Etats des Forets, 2010.

One of the main mechanisms for supporting the Congo Basin is the Central African Forest Initiative (CAFI). The funding for CAFI totals just over $230 million since 2015, and therefore is well-short of even one year's value of the climate service provided, which we estimate above as $55 billion per year. Total funding then is less than half of 1 percent of the annual value (0.4 percent).

Should the world be willing to pay the full value for carbon removal?

Our calculations demonstrate that countries that are home to the Congo River Basin are providing an extremely valuable service to the world. If those countries are not rewarded for that service, they may have little incentive to maintain it. With very low income levels in each of these countries, it's not surprising that they are pursuing economic opportunities that involve deforestation.

Even so, the value of the carbon removal service is only a guide to what these countries would need to be paid to preserve the forest. That payment would be the subject of negotiation between the buyer (the world), informed by any alternatives it has for sequestration, and the seller (the Congo River Basin countries), who would need to be paid more than any benefits foregone from deforestation. The benefits foregone may be substantially greater at the edge of the forest, next to transport and agricultural land, whereas they may be much smaller in the centre. So, it's possible that, in principle, the world may not need to pay the full value of the carbon removal services that forests play in order to preserve them. Conversely, in a future world if the only way to catch a plane was to purchase a forest offset via an auction, perhaps the willingness to pay could be much greater.

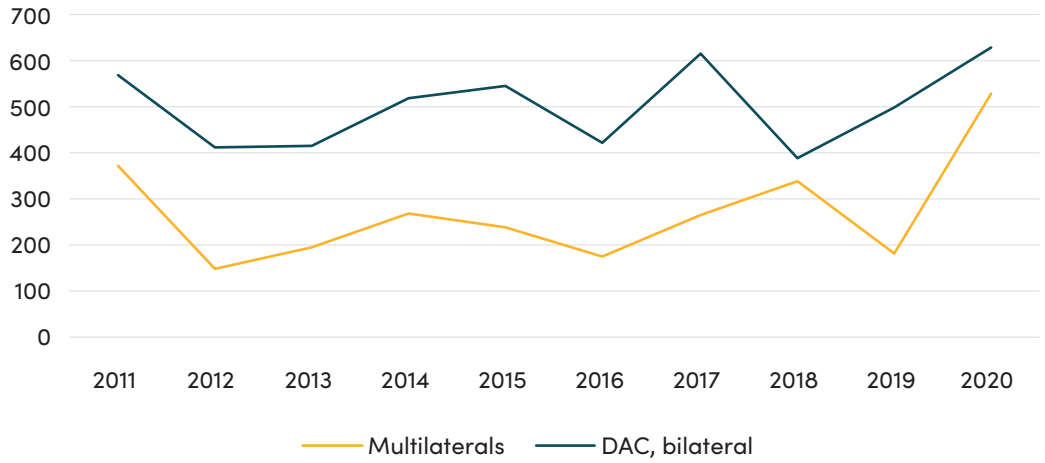
Aid and forest protection

There have been long-standing efforts to protect forests and their carbon removal through the use of aid. This is controversial as removing global emissions alone has very little direct benefit for the recipient country and, by definition, aid, specifically official development assistance (ODA), must promote and specifically target the economic development and welfare of developing countries. Forestry projects may also have local benefits and these may justify the categorisation as aid. ODA remains the main financial mechanism for supporting forests; and here we consider their overall value to compare with forest valuations.

ODA to forests is spread between bilateral and multilateral efforts. As illustrated in figure 5, ODA to forests remained mostly flat in the last decade despite a push in 2020, mainly driven by additional multilateral funding. Hence, in 2020, ODA to forestry reached its highest in a decade, above $1.1 billion. Among bilateral donors, Germany, the United Kingdom, and France are particularly active in providing assistance for forest protection, representing almost two-thirds of total ODA to forests provided by DAC donors. On the multilateral front, there are a plethora of initiatives, many funding work on Reducing Emissions from Deforestation and Forest Degradation (REDD). Such initiatives include UN-led work, and others including, the Amazon Fund, the Forest Carbon Partnership Facility, the Congo Basin River Fund, and the BioCarbon Fund. Next to ODA, other official flows, which do not meet the ODA criteria, particularly on the level of concessionality, amounted to $233 million in 2020.

The available evidence suggests forestry projects compare well with other ways of removing or mitigating emissions. The high-quality evaluation evidence on the effectiveness of climate aid is currently limited. Still, across the projects undertaken by the Green Climate Fund and the World Bank's Climate Investment Funds, forestry projects had among the among the lowest cost per tonne of CO_2 averted.

Figure 5. ODA to forestry sector, 2011–2020, gross disbursements, US$ millions, constant prices

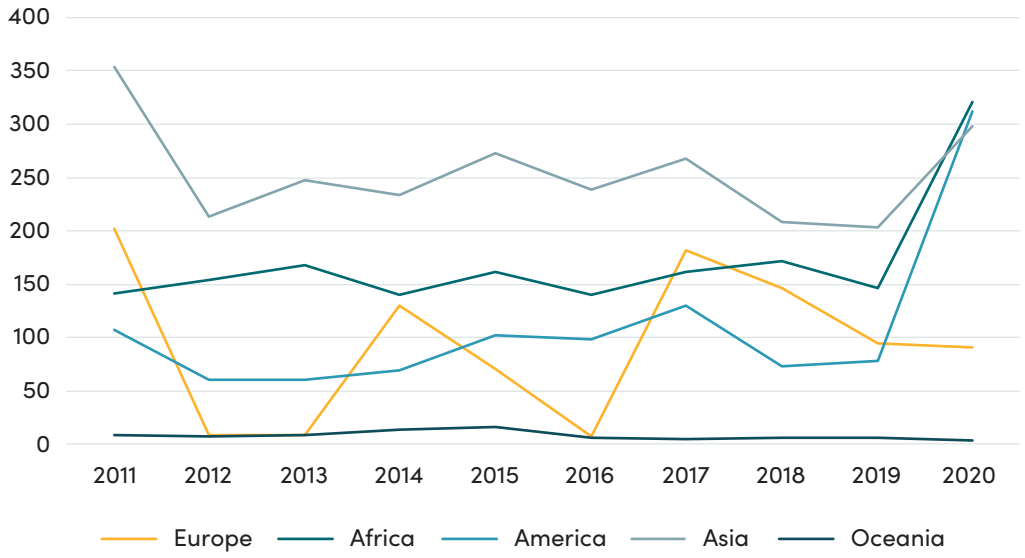


Source: OECD CRS.
Note: ODA for forestry also includes projects which are not targeted at forest protection, but we have kept the aggregate figures for the analysis.

Asia has been the top destination for ODA to forestry, ahead of other regions. Still, as noted above, the Southeast Asian forest has now become a net carbon emitter. Africa and the Americas experienced a strong increase in ODA to the forestry sector in 2020. In 2020, Africa received the highest level of ODA, amounting to $321 million, and averaged $170 million over 2011–2020.

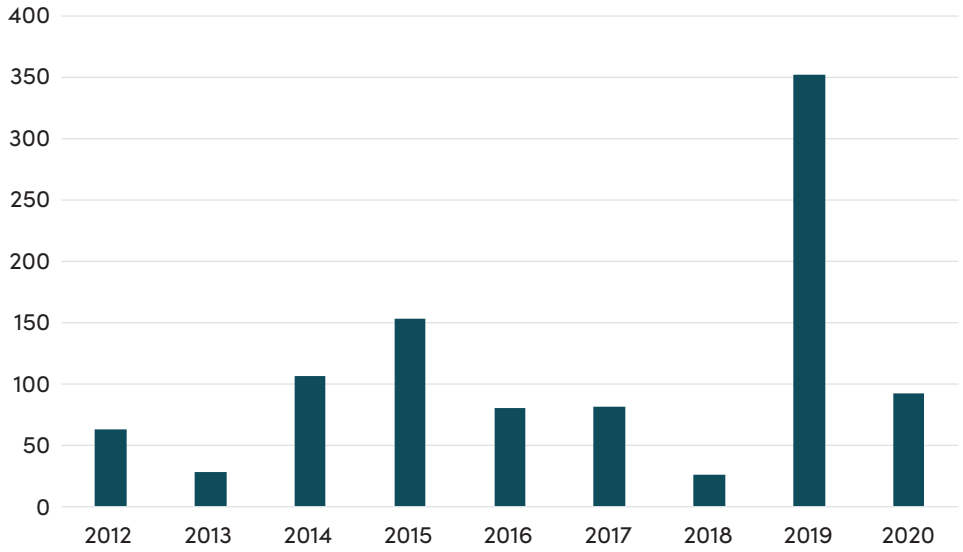
Given the magnitude of the funding requirements at stake, public money alone is not sufficient. Therefore, governments have tried to mobilise private sector finance to contribute to forest protection. Between 2012 and 2020, amounts mobilised have not increased and remained stable at around $100 million a year (see figure 7), except for a surge in 2019 (data from the OECD CRS suggests significant private mobilisation from the United States in Vietnam). Since 2015, around a third of the mobilisation takes place in Africa.

Figure 6. Regional distribution ODA to forestry sector, 2011–2020, gross disbursements, US$ millions, constant prices



Source: OECD CRS.

Figure 7. Private sector mobilisation to forestry sector, 2012–2020, gross disbursements, US$ millions, constant prices



Source: OECD CRS.

Private sector mobilisation has therefore amounted to under 10 percent of ODA resources for forests overall and within Africa, suggesting that the efforts to catalyse private finance have had limited results.

Conclusion

ODA and private sector mobilisation for forest protection are still a drop in the ocean given the value of the climate service provided by forests to the world. While the total annual funding for forest protection barely reaches $1 billion, the carbon removal service provided by forests would be close to 300 times this amount.

In the Congo River Basin forest, one of the few tropical rainforest still acting as a significant net carbon remover, fundings do not match the price of climate service at $55 billion, or $30 billion after taking account of deforestation, while as total ODA for forestry in Africa only reached $170 million on average over the last decade. Even after deforestation, the value of carbon removal by the Congo River Basin is around 150 times levels of international public finance.

With proper incentives, the countries that are home to the Congo River Basin Forest would be less likely to contribute to further deforestation. Among the 10 largest forested countries, six are low- or middle-income countries (Brazil, China, the Democratic Republic of Congo, Indonesia, Peru, and India). If the country custodians of forests were being paid for the service they provide, that finance could be reduced or removed if deforestation offset those benefits, which would transform the incentives to preserve then and avoid the emissions.

As described in previous CGD work, the international community has had several attempts to create a carbon market for forests. However, without concrete success so far, at COP27 and beyond, leaders should take this reality into consideration to design a clear market mechanism to enable a fair price to be paid to developing countries in order to preserve forests and their carbon absorption capacity as a vital climate service for all.

This note has been updated since its initial publication to use rounded figures for the value of the Congo's net emissions and deforestation.

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