

■ Carbon dioxide removal in the G20 pledges: limited and lacking credibility

THE STATE OF
Carbon Dioxide Removal

Insight Report

William F. Lamb, Carley C. Reynolds

Lead authors: William F. Lambⁱⁱ, Carley C. Reynoldsⁱ

Contributing authors: *Oliver Geden*ⁱⁱⁱ, *Stephen M. Smith*^{iv}, *Naomi E. Vaughan*^{vvi}, *Gregory F. Nemet*^{vii}, *Katie Lebling*^{viii}, *Morgan Edwards*^{vii}, *Jan C. Minx*ⁱ, *Matthew J. Gidden*^{ix}

i Potsdam Institute for Climate Impact Research (PIK), Member of the Leibniz Association, Potsdam, Germany

ii Priestley International Centre for Climate, University of Leeds, Leeds, UK

iii German Institute for International and Security Affairs (SWP), Berlin, Germany

iv Smith School of Enterprise and the Environment, University of Oxford, Oxford, UK

v School of Environmental Sciences, University of East Anglia, Norwich, UK

vi Tyndall Centre for Climate Change Research, University of East Anglia, Norwich, UK

vii University of Wisconsin-Madison, Madison, WI, US

viii World Resources Institute, Washington, DC, USA

ix Center for Global Sustainability, University of Maryland, College Park, MD, USA

Please cite as: Lamb, W.F., Reynolds, C.C., Geden, O., Smith, S.M., Vaughan, N.E., Nemet, G., Lebling, K., Edwards, M., Minx, J.C., Gidden, M.J. Carbon dioxide removal in the G20 pledges: limited and lacking credibility. *A State of Carbon Dioxide Removal Insight Report*. <https://www.stateofcdr.org>, doi: <https://doi.org/10.17605/OSF.IO/X8U9M> (2025).



This work was supported by Quadrature Climate Foundation State of Carbon Dioxide Removal grant; the European Union ERC-2020-SyG 'GENIE' (951542) grant; and the UK Natural Environment Research Council 'CO2RE Hub' (NE/V013106/1) grant.

Cover concept & illustration: topographic style representation of a corn (*zea mays*) photosynthetic cell (etioplast) after it was exposed to light. Microscopic photography sourced from [Cell Image Library](#). Credit: Liliana Resende.




Executive Summary

Countries must sharply reduce emissions and scale up carbon dioxide removal (CDR) to meet the temperature goal of the Paris Agreement, but the role of CDR in current pledges remains limited and lacks credibility. Only three G20 members submitted a new Nationally Determined Contribution (NDC) by the February 2025 deadline.

Less than half submitted one by the end of September 2025. As it stands, only eight provide enough information to judge the contribution of CDR to meeting their targets. Even fewer parties have taken actions to make these pledges credible, namely by setting net zero emissions targets into law, implementing CDR policies and measures, and

comprehensively planning for scaling up CDR. Without more transparency and credible commitments, it remains highly uncertain whether parties plan to support CDR and if these plans are sufficient to put the world on track for scaling it by the mid-century.

Introduction



Steep reductions in fossil fuel, agriculture and deforestation emissions alongside efforts to scale-up carbon dioxide removal (CDR) are required to limit climate change. Current CDR levels stand at about 2 GtCO₂ per year, mainly from ‘conventional’ methods such as afforestation and reforestation. CDR will need to scale up several-fold by the mid-century, including through the deployment of ‘novel’ methods such as biochar, direct air carbon capture and storage, or bioenergy with carbon capture and storage (BECCS). As COP30 in Brazil draws closer, we take stock of how countries are communicating their plans to implement CDR in the coming years.

The Paris Agreement was reached at COP21 in 2015, where countries committed to a long-term temperature goal. As part of the agreement, parties are obligated to report their climate targets and actions to the United Nations Framework Convention on Climate Change (UNFCCC).

In 2024, for the 2nd Edition of the [State of CDR](#), we assessed the Nationally Determined Contributions ([NDCs](#)) and Long-Term Strategies (also known as [LT-LEDS](#)) for the amount of CDR that countries pledged to deliver. We found that few countries were transparent about CDR in their pledges, and that there was ultimately a gap between pledges and the amount of CDR required in pathways that meet the Paris temperature goal.

A key development this year is that parties are submitting new NDCs. These NDCs are intended to communicate strengthened pledges to reduce net greenhouse gas emissions up to 2035. The deadline for NDC submissions was in February 2025. In addition, parties were obliged for the first time to submit Biennial Transparency Reports ([BTRs](#)) by the end of 2024. Among other aims, these BTRs are meant to describe in more detail how parties plan to reduce net emissions.

As of 30th September 2025, only seven members of

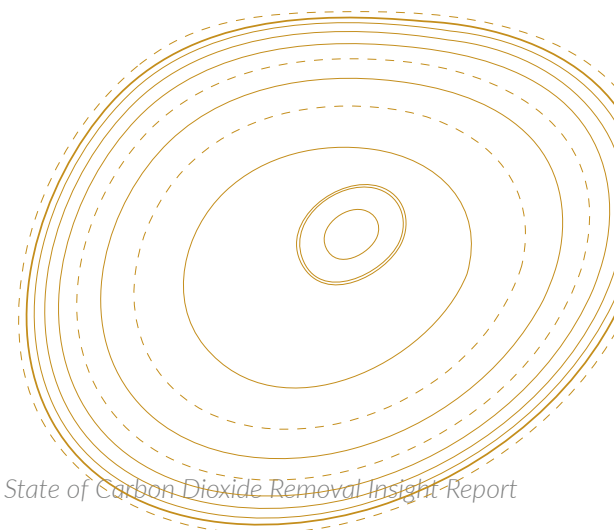
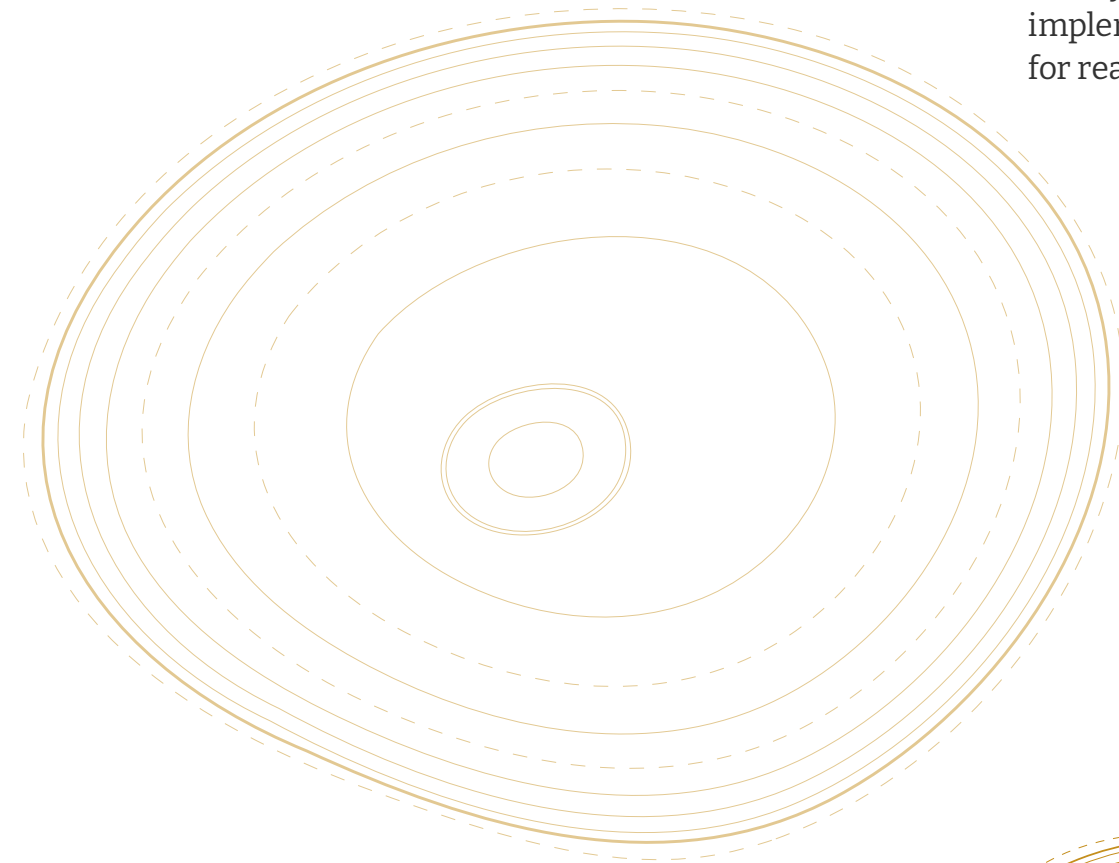
the G20 have submitted a 2035 NDC: Australia, Brazil, Canada, Japan, Russia, the United Kingdom and the United States. On the other hand, many more countries have submitted a BTR, including all members of the G20 apart from India.

What do these new submissions say about the intention of G20 members to pledge and accelerate climate action? In this Insight Report, we focus on how CDR is represented in recent submissions. For detailed assessments of emission reduction pledges, we recommend the [Climate Action Tracker](#) and [Climate Watch](#). We show that, to date, parties to the Paris Agreement have missed an opportunity to improve the transparency and credibility of their plans to scale up CDR. As such, there remains a significant “CDR gap” between national pledges and scenarios that hold warming to well below 2°C.

While gross emissions reductions are rightly the focus of effort in the next decade, it is critical

to establish the policy and investment conditions now that will enable CDR to deliver at scale by 2050 and beyond. To set these conditions, parties should:

- adhere to the norms and obligations of the Paris Agreement and submit NDCs on time
- clearly describe the contribution of CDR to their national pledges by distinguishing gross emissions reductions from removals in the NDCs
- set announced net zero targets into law
- implement and strengthen policies in the next five years to support the sustainable scaling of CDR methods
- comprehensively plan for scaling CDR by developing projections of future removals and by publishing an implementation plan for reaching net zero





Current national CDR proposals in the G20

The BTRs and available 2035 NDCs do not fundamentally change our prior assessments of CDR pledges. While the new NDCs offer an opportunity to strengthen the 2030 targets, none of the G20 submissions have so far done so. We therefore focus on the extent to which BTRs increase transparency of CDR pledges and how these pledges evolve by 2035 under the new NDCs.

Table 1 summarises our current assessment of CDR pledges for the G20 members. As it stands only eight parties have clarified

the expected contribution of removals in the land use, land use change and forestry (LULUCF) sector to their overall mitigation targets in 2030 or 2035. This is important because the majority of current ‘conventional’ CDR takes place in the LULUCF sector in the form of afforestation, reforestation and forest management. Clarifying these removals would also help to distinguish them from intentions to reduce emissions from deforestation in the LULUCF sector. In addition to LULUCF, only a single member

of the G20 – the United Kingdom – has clarified the contribution of ‘novel’ CDR to the 2030 or 2035 pledges. Countries are not formally required to provide this transparency under the UNFCCC, but without it, observers and other parties will struggle to determine policy intentions for CDR.

According to our assessment (see Supplementary Material for more detailed G20 reviews):

- Indonesia has the highest estimated LULUCF pledge. Indonesia still has high

levels of deforestation and aims to achieve most of its national mitigation targets through net reductions in land use emissions. While it is unclear how much would be achieved through reduced emissions versus increased removals, we estimate removals would increase compared to recent levels.

- China has a dedicated target to increase forest stock levels by 6 billion m³ compared to 2005 by 2030, which we estimate as implying an additional 48 MtCO₂ per year removals compared to recent levels in the sector. According to China's latest BTR, this target is likely to be overachieved.
- India has a separate target to increase removals from forest and tree cover, and its 2023 State of Forests Report forecasts that this will be exceeded.
- The European Union includes a distinct LULUCF target in its 2nd NDC, but recent trends in the sector indicate

that it is not on track to meet this goal.

- The United Kingdom has clarified that LULUCF removals will only minimally contribute to its target, but indicated a contribution of 'novel' CDR of up to 23 MtCO₂ per year by 2035. This is primarily anticipated to be met by BECCS.
- Japan, South Korea and Türkiye anticipate reductions, rather than increases, to current net LULUCF removals by 2030.

Overall, our estimate of pledged CDR in the G20 currently ranges from an additional 214 to 265 MtCO₂ per year in 2030 above the 2014-2023 average. Given that current levels stand at around 2 GtCO₂ per year, this represents a relatively small increase, from a group of countries that account for 60% of global land area and over 85% of global GDP in 2024.

While many more NDCs may come forward in the coming months, the pledges we collate to date have not delivered a step-change in ambition. This puts the Paris Agreement mitigation targets in a precarious position, as prior

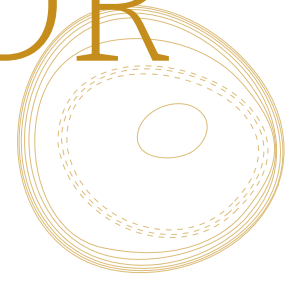
assessments of the NDCs indicated a high likelihood that they are insufficient to limit the long-term temperature increases to 1.5°C or well below 2°C.

An important development this year has been the political shift that occurred in the United States. The previous administration had actively engaged in both national and international climate policy, submitting a new NDC two months before President Trump took office. Since February, the new administration has sought to reverse a series of federal climate policies, including components of the Inflation Reduction Act – the signature climate policy under President Biden which contained provisions for supporting CDR. In addition, the United States will formally withdraw from the Paris Agreement in January 2026. After this withdrawal, the United States NDC will no longer exist. Strengthened efforts from other countries will be required to keep the long-term temperature goal in reach.

G20 Member	Submitted 2035 NDC?	Current LULUCF CO ₂ emissions (e.g. from deforestation)	Current LULUCF CO ₂ removals (e.g. from afforestation)	Pledged change in LULUCF CO ₂ removals by 2030 [and 2035]	Pledged change in novel CDR by 2030 [and 2035]
Argentina	✗	54	-13	-	-
Australia	✓	29	-103	-	-
Brazil	✓	886	-383	-	-
Canada	✓	55	-28	-	-
China	✗	5	-1263	-48	-
European Union	✗	125	-390	-53	-
India	✗	14	-423	-49 to -69	-
Indonesia	✗	1157	-483	-119 to -148	-
Japan	✓	9	-69	+30	-
Mexico	✗	18	-216	-	-
Republic of Korea	✗	4	-47	+15	-
Russia	✓	38	-1133	-	-
Saudi Arabia	✗	0	-9	-	-
South Africa	✗	35	-69	-	-
Türkiye	✗	3	-70	+12	-
United Kingdom	✓	15	-21	0 [0]	-3 to -5 [-13 to -23]
United States	✓	176	-1131	-	-

Table 1: Current and proposed CDR for the G20. Documents submitted to the UNFCCC by 30th September 2025 were assessed. Current LULUCF emissions and removals refer to the 2014-2023 decadal average. Pledged changes by 2030 and 2035 are measured against this baseline. France, Germany and Italy are members of the G20 but are represented by the European Union's NDC submission and are therefore excluded. We also exclude the African Union, which does not submit a pledge for its members. Green coloured cells indicate an increase in removals, orange a decrease in removals. All units in MtCO₂ per year. Data: UNFCCC 2025, [LULUCF Data Hub 2025](#).

Credibility of CDR pledges



Although only eight parties have made transparent CDR pledges, many more have committed to reaching net zero emissions. Parties have therefore already acknowledged – at least implicitly – the need to implement CDR in the next few decades. How can we judge whether they will deliver? This is a challenging but important question to answer, since politics is inherently inconsistent and policy makers may set future targets without a strong intention to meet them. Future uncertainties also mean that even well-intentioned targets may not be met. Nonetheless, if policy makers wish to demonstrate credibility, they can do so through *actions* that make target achievement more predictable and likely.

In addition to providing transparency, parties can take three types of action to improve the credibility of CDR pledges and net zero

targets: (1) establishing net zero targets in law; (2) implementing CDR policies and measures; and (3) comprehensively planning for scaling CDR.

By establishing net zero targets in law, parties set the expectation that even if CDR is not a priority in the next five to ten years covered by the NDCs, it will become so thereafter. Targets that are legally binding are more difficult for future administrations to ignore or reverse. In some national contexts these binding targets can also expose future administrations to legal challenges if they fail to meet them – an important ‘commitment device’ that increases the costs of failure. Based on the [Climate Action Tracker](#) assessment, just seven members of the G20 have taken this step, while a further eight have only announced or proposed net zero targets in policy documents.

Implementing policies and measures builds credibility by supporting the sustainable scale-up of CDR. For conventional CDR these measures may include regulatory instruments such as designated protected areas, economic incentives for afforestation, or education and training for restoration practices. For novel CDR they may include public-private research partnerships, tax credits for removals, or direct investments in demonstration plants and storage infrastructures. Wider framework policies for governing removals have also been developed in different jurisdictions. Many parties already describe such policies and measures in their BTRs, although the weight of currently implemented CDR policies leans heavily towards conventional methods, with novel CDR measures mainly described by developed countries. It should be noted,

however, that few parties describe the anticipated outcomes of their currently implemented policies – and

that substantially increased policy action will be needed to scale-up global removals to gigaton levels by 2050.

G20 member	Transparency	Legal status	Current implementation		Comprehensive planning	
	NDC provides sufficient information on CDR?	Net zero target in law?	BTR describes conventional CDR measures?	BTR describes novel CDR measures?	BTR has LULUCF projections?	Published plan to reach net zero target?
European Union	✓	✓	✓	✓	✓	✓
Republic of Korea	✓	✓	✓	✓	✓	✓
United Kingdom	✓	✓	✓	✓	✓	✓
Japan	✓	✓	✓	✗	⊖	⊖
Türkiye	✓	⊖	✓	✗	⊖	⊖
Indonesia	✓	⊖	✓	✗	⊖	✗
China	✓	⊖	✓	✗	✗	⊖
India	✓	⊖	✗	✗	✗	✗
Australia	✗	✓	✓	✓	✓	✗
Canada	✗	✓	✓	✓	⊖	⊖
Russia	✗	✓	✓	✗	⊖	⊖
Saudi Arabia	✗	⊖	✓	✓	✗	✗
South Africa	✗	⊖	✓	✗	✓	✗
Argentina	✗	⊖	✓	✗	✗	✗
Brazil	✗	⊖	✓	✗	✗	✗
Mexico	✗	✗	✓	✗	✗	-
United States*	✗	✗	✓	✓	✓	-

Table 2: Credibility assessment of the G20 countries. Notes: A tick indicates that the criteria is fulfilled, a horizontal line indicates that the criteria is partially fulfilled, and a cross indicates that the criteria is not fulfilled. See Supplementary Information for more detail. The transparency criteria refers to whether an estimate can be made in Table 1. *The United States has fulfilled criteria related to its BTR released in 2024, but will exit the Paris Agreement in 2026. Data: UNFCCC 2025, Climate Action Tracker 2025.

Finally, comprehensive planning facilitates reflection and learning on how to scale CDR over a period of several decades. The new BTRs provide an opportunity in this regard, as they come with the reporting obligation that parties must provide projections of emissions and removals for at least 15 years, for total net emissions and at a sector level. Flexibility is given to developing country parties in meeting this obligation. Six members of the G20 (primarily developed) did so specifically for LULUCF, describing how net emissions or removals in this sector may change with 'current' or 'additional' measures. Five further members have provided more limited projections. In other words, these parties have considered how their removals may develop in the coming decades and whether action is necessary to sustain them. This is a useful and important development in transparency and credibility, considering that conventional CDR on land is vulnerable to reversals through wildfires, pests and other climate impacts. In a similar vein, parties can improve credibility by producing a government-endorsed analysis that describes the emissions pathways and types of

sector-specific actions, policies and measures that will be taken to reach long-term targets. Adapting from the [Climate Action Tracker](#) assessment, we find that just three G20 members (the EU, the United Kingdom and the Republic of Korea) have published detailed plans, while a further five have released documents but without sector specific detail.

Taking these aspects together, only a handful of G20 members can be considered to have transparent and credible intentions for scaling CDR. Currently only the European Union, the United Kingdom and the Republic of Korea meet all credibility criteria. The European Union has set its goal to increase net LULUCF removals into law along with its net zero target, published analysis on how this can be achieved, and has identified measures to scale conventional and started to address novel CDR in its BTR (in addition to more extensive member state action not described in the BTR). Yet, while meeting these criteria can indicate whether the pledges should be considered credible, they do not guarantee that current efforts are sufficient. For example, the European Union's latest projections for the LULUCF sector show

that current trends and measures are far off track from the target, reflecting growing concerns among experts that it may no longer be within reach (see Supplementary Materials). The Republic of Korea, on the other hand, aims to reach net LULUCF levels below the current average, and projects they are nearly on track to achieve this and prevent an even steeper decline in the land sink.

Considering other members of the G20, there remains significant uncertainty in how much governments plan to rely on removals versus emissions reductions to achieve targets. Where sufficient information is presented to make an estimate, as is the case for China, India and Indonesia, parties have yet to signal credible intentions to scale CDR – in particular by setting net zero targets into law and comprehensively planning for reaching them. Conversely, parties such as Canada or Australia meet some of these criteria and even describe existing CDR policies and measures in their BTRs, yet have failed to demonstrate transparency on the targets themselves.

