

Task Force 02

SUSTAINABLE CLIMATE ACTION AND INCLUSIVE JUST ENERGY TRANSITIONS

The Strategic Role of Carbon Markets: Incentivizing Carbon Dioxide Removals in support of a low-carbon economy

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Abstract

The shift towards a low-carbon economy is pivotal to ensure sustainable environmental, social and economic development, yet it is hindered by significant technological, financial, and other challenges. This policy brief outlines the critical role of carbon dioxide removals (CDR) to achieving that objective. It emphasizes the need for policy frameworks, such as carbon markets, in incentivizing CDR solutions and fostering their growth in a way that is transparent, validates their additional emission removal benefits, and secures trust to invest in CDR technologies and solutions.

By putting a price on carbon emissions, carbon markets serve as essential tools for financing CDRs. This policy brief delves into the effectiveness of carbon pricing in promoting the uptake of CDR technologies and solutions. It presents a thorough examination of current carbon market dynamics in supporting CDR globally, identifying areas for improvement, and opportunities to amplify their impact. It also sets out recommendations for overcoming current economic and financial barriers to efficient investment in CDRs, with the goal of providing policymakers and industry stakeholders with actionable insights.

Key-words: Carbon dioxide removal; Carbon markets; Low-carbon economy; Policy frameworks.

Diagnosis of the issue

I. Global context

At the heart of global climate policy, the Paris Agreement's goal to limit global average temperature increase to well below 2°C above pre-industrial levels, with a further aspiration to get as close to 1.5°C as possible, stands as a critical benchmark. The urgency to adhere to this threshold is not merely an environmental imperative but part of a comprehensive approach to mitigate the multifaceted crises of biodiversity loss, extreme weather events, and the socio-economic costs and instability that accompany rising temperatures.

The world is currently not on track to deliver the goal of the Paris Agreement, as per the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC, 2023) and the emissions gap assessment by the International Energy Agency (IEA) (Figure 1).

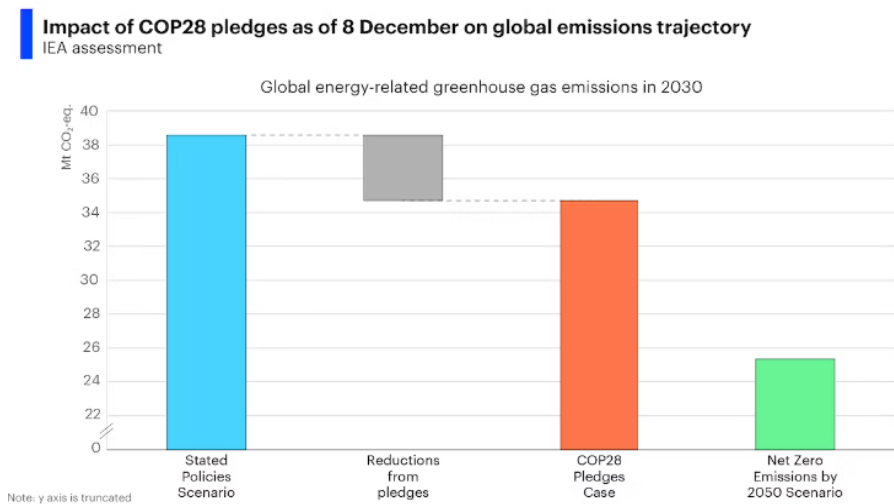


FIGURE 1. 2050 emissions gap (as of December 8, 2023)

Source: [\(IEA assessment of the evolving pledges at COP28 - News - IEA\)](#)

A significant acceleration and intensification of actions is required, both in terms of raising national ambitions and better implementation of current policies, to bridge the gap to a Paris Agreement-compliant trajectory by (Figure 2).

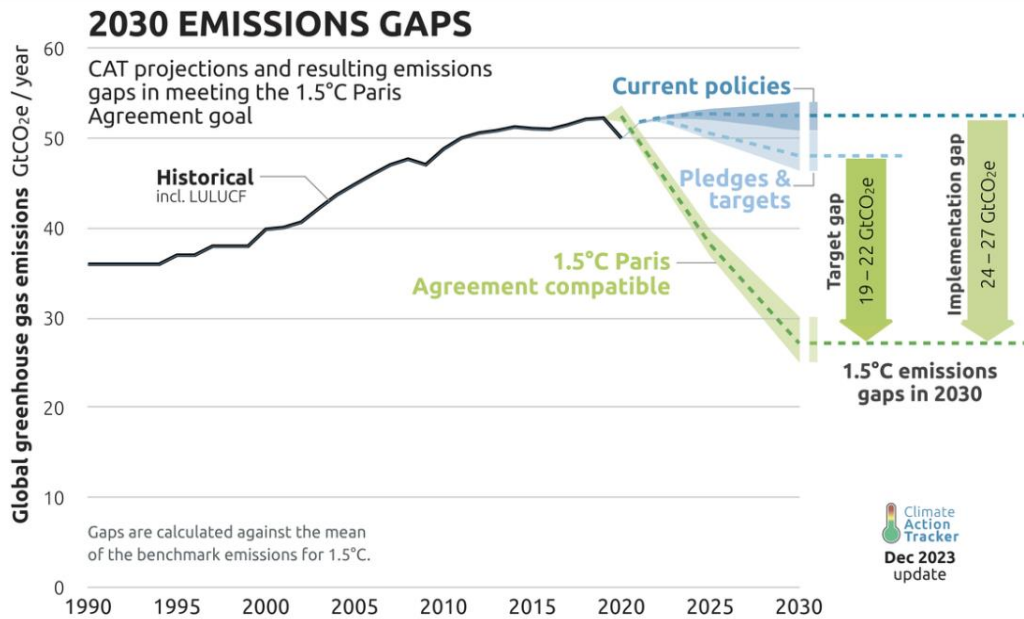


FIGURE 2. The gap to a 2030 emissions reduction trajectory compliant with the Paris Agreement. *Source: CAT Emissions Gap | Climate Action Tracker.*

Deep, rapid, and sustained reductions in greenhouse gas (GHG) emissions are needed. And while mitigation remains the primary objective of climate policy, CDRs play a critical role in most Paris Agreement-compliant scenarios; for example, to offset growing emissions from hard-to-abate sectors where mitigation technologies are not yet

commercial. CDRs play an essential role in limiting overshoot and bringing global temperatures back down to levels agreed under the Paris Agreement.¹

II. The role of CDRs

CDRs include both technologies and natural carbon sinks that remove carbon from the atmosphere.

- Technologies such as carbon capture and storage (CCS) on power generation and industrial processes, direct air capture (DAC) not linked to specific energy sources and uses, and CCS on biofuel plants and biomass-based power generation. The latter two are a source of negative emissions.

- Natural carbon stores in the biosphere, land, and ocean. Cutting down forests and draining peatlands, such as for agriculture, has led to a significant release of stored carbon. Oceans are also an important carbon store, and maintaining their capacity to absorb and store carbon is essential for stabilizing global temperatures.

The Energy Transitions Commission (2023) estimates that 10 GtCO₂ of CDRs will be required annually by 2050 (Figure 3), whereas Shell's Sky 2050 scenario estimates a little under 15 GtCO₂ per year of CDRs by 2050.

¹ Overshoot refers to temporarily exceeding the Paris Agreement temperature objective during this century. AR6 defines eight categories of potential future pathways (C1–C8). C1 pathways have limited or no overshoot, while C2 pathways overshoot but return to 1.5°C and C3 pathways overshoot 1.5°C but likely remain below 2°C in 2100.

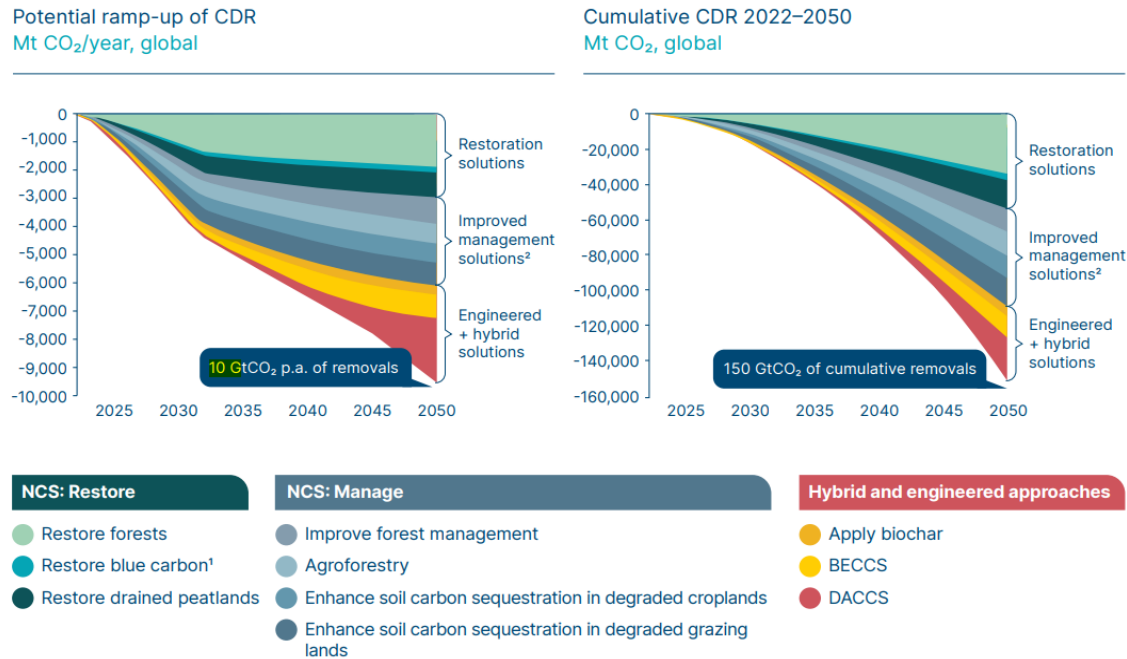


FIGURE 3. The role of CDRs in achieving the goal of the Paris Agreement

Source: *Fossil Fuels in Transition: Committing to the phase-down* ([energy-transitions.org](https://www.energy-transitions.org)).

Investment in natural carbon sinks today is relatively limited, especially given the scale of the need. Moreover, current worldwide operational capacity of CCS is around 0.043 GtCO₂ per year or 0.1% of global emissions.² If projects announced and under development are included, this figure rises to 0.3 GtCO₂ or 0.6% of emissions today (BloombergNEF, 2022). Overall, investment in CDRs remains well short of what is required.

Among the outcomes of COP28, Article 28 emphasizes the strategic importance of CDR technologies in achieving net-zero emissions, signifying a collective shift towards

² Carbon removals through natural carbon sinks are not at a significant scale today. In fact, land-use change continues to drive increases in emissions.

innovative solutions in carbon management alongside carbon mitigation strategies. Getting global agreement on guidance to operationalize Article 6 of the Paris Agreement will be another step forward in incentivizing and rewarding investments in CDRs. G20 debates can act as a catalyst for harmonizing policies and regulatory frameworks across member countries, including recognizing CDRs as permissible contributions toward achieving national targets and incorporating them within the scope of emissions trading schemes around the globe.

Emerging and developing countries possess significant potential for deploying these technologies/solutions due to their geographical and environmental characteristics. For example, based on Shell’s Brazil Scenarios Sketch, Brazil could achieve net zero by 2040 through large-scale investments in CDRs, mainly land-use emissions avoidance and removals and CCS (Figure 4).

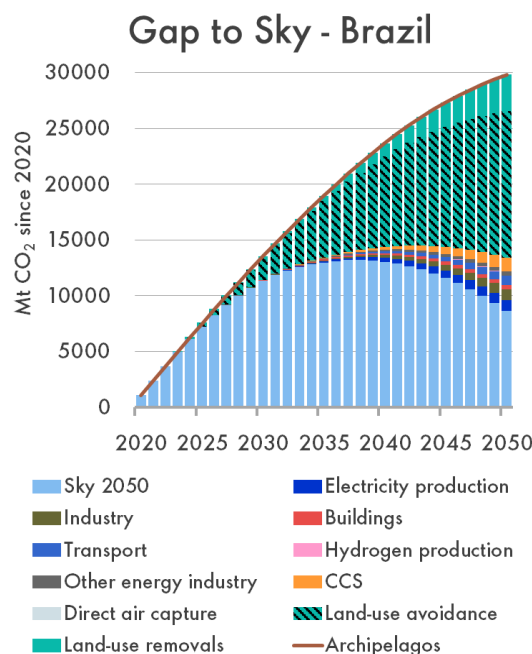


FIGURE 4: Accelerating Brazil’s emission reductions through CDRs

Source: Shell scenario analysis.

However, the capital-intensive nature of these projects underscores the necessity for equitable financing mechanisms that address the specific needs and circumstances of these nations, ensuring a just and inclusive transition (Comello, 2022). To bridge the gap in CDRs, a significant increase in incentives is necessary. Both policy and financial interventions will be crucial for achieving the desired rate and capacity.

III. The importance of pricing carbon

Carbon pricing is fundamental for making the economic case for investment, creating economic incentives and mobilizing financial resources into CDRs. While carbon utilization, such as for enhanced oil recovery, can provide a revenue stream to make CCS commercially viable in the near-term, large-scale investment in permanent carbon removals will require a robust and credible carbon pricing framework. Carbon pricing also generates revenue that can be reinvested in sustainable technologies and practices, to further facilitate the transition to low carbon. It can also serve as an economic signal, encouraging businesses and consumers towards low-carbon alternatives that reduce their carbon footprint.

There are three principal forms of carbon pricing: carbon taxes, carbon markets, and carbon subsidies, each offering unique advantages and facing distinct challenges in their implementation.

- Carbon taxes directly impose a cost on GHG emissions, incentivizing emitters to reduce their emissions. A carbon tax is an economically efficient way of driving emissions reduction at the lowest cost and is relatively straightforward to implement. However, while a carbon tax puts a price on emissions, it does not result in a specific

reduction in the volume of emissions, which can lead to discrepancies between policy intentions and actual environmental outcomes.

- By contrast, carbon markets — encompassing emissions trading systems (ETS) and carbon crediting — put a cap on the volume of emissions and provide a dynamic framework for pricing emissions based on market demand and supply of emission trading allowances. By capping total emissions and enabling the trade of emission allowances, ETSs are also economically efficient in driving lowest cost emissions reductions.

- Carbon subsidies offer incentives for the reduction and capture of GHG emissions. By reducing financial barriers to adopting CDR technologies/solutions, such policies play a crucial role in accelerating the transition to low carbon. However, subsidies tend to be time-limited due to their pressure on public finances and debt sustainability and need to be carefully designed to avoid being protectionist.

Carbon pricing creates economic and financial incentives to invest in carbon removals. For example, the US Inflation Reduction Act offers tax credits for CO₂ captured and financial support for the capital expenditure of such projects that make these projects substantially more investible. The policy has significantly influenced the CCS landscape, leading to the announcement of more than 50 CCS projects in the year following its enactment (RystadEnergy, 2023). In the European Union, the rising EU ETS price trend has started to incentivize businesses to consider carbon management. For example, Yara International, a large fertilizer producer, entering a binding commercial transport and storage agreement with Northern Lights to permanently store 800,000 tons of CO₂ from its Netherlands ammonia production plant from 2025.

Over the last two decades, the integration of CDR methods with regulatory compliance markets³ has evolved, particularly through baseline-and-credit systems. These frameworks award emission credits based on the difference between actual removals and a predetermined baseline. The credits can then be sold or traded, thus incentivizing efficient emission reductions.

In the meantime, we have also seen a significant increase in the voluntary carbon market (VCM) for offsets and removals, especially as corporate climate commitments have soared. VCMs exist alongside compliance markets and enable companies, non-profit organizations, and individuals to purchase carbon credits on a voluntary basis. VCM credits don't currently count towards national commitments, but they help companies offset their individual carbon footprints. Although still small, the size of voluntary carbon markets has quadrupled since 2020, with ~\$2 billion of carbon offsets traded in 2021. As pressure to reduce emissions increases, demand for carbon credits from CDRs is set to surge, in both compliance and voluntary markets. A high-quality carbon offset market could potentially be worth \$1.1 trillion on an annual basis in 2050 (BloombergNEF, 2024).

IV. Leveraging global finance

The world will need significant CDRs to achieve the goal of the Paris Agreement, particularly nature based CDRs, which tend to be concentrated in the Global South. Realizing their full potential to meet the climate challenge is, therefore, likely to also have

³ i.e. using CDRs to meet legally binding obligations to reduce emissions.

the additional benefit of redirecting global financial and capital flows to these economies, supporting jobs and growth while also improving the natural environment.


A combination of carbon pricing at the national level and consensus at the global level on implementation of Article 6 of the Paris Agreement could unlock the full investment and environmental potential of CDRs, not only for compliance with domestic climate targets but traded internationally, for instance, to provide compliance units for other national trading systems and targets.

The proliferation of corporate climate and net-zero commitments means that VCMs are also expected to surge exponentially, with increasing demand for carbon offsets and credits to meet corporate targets. As VCMs allow organizations to offset their carbon emissions on a voluntary basis, setting credible, robust, and internationally recognized and agreed standards for credits becomes paramount. Without this, the full potential of private finance in CDRs cannot be unlocked.

V. An opportunity for Brazil

Brazil's journey towards establishing a national compliance carbon market takes a significant step forward with the proposed GHG emissions trading system (SBCE). This legislative effort aims to introduce a comprehensive legal framework for enforcing mandatory GHG emission caps, excluding the agribusiness sector.

The cap-and-trade system offers flexibility through purchase of verified emissions trading allowances, each representing 1 ton of CO_{2eq}, for companies covered by the scheme to meet their emission reduction targets. A distinctive feature of the proposed scheme is its acknowledgement of the vital role Nature Based Solutions (NBS) plays in the broader strategy to combat climate change and to significantly bolster Brazil's efforts



to reduce its GHG emissions. This approach not only aligns Brazil with global environmental objectives but also showcases the potential of NBS to contribute to global climate action as well as making an attractive destination for financing and investment in CDRs. Through these innovative strategies, the SBCE underscores Brazil's commitment to environmental stewardship and its proactive stance in addressing the global challenge of climate change.

Brazil could be a significant beneficiary of the growth in the global carbon offset market, both in terms of the supply of these offsets and as a global hub for CDR trading. The collective supply of future nature-based carbon offset supply from Brazil (from avoided deforestation and reforestation) could reach an estimated 30.5 billion tons by 2050, double the next largest market (BloombergNEF, 2024). Harnessing this opportunity requires developing the right standards and institutional frameworks now, that ensure ‘additionality’⁴, permanent sequestration, and minimization of leakage. While these standards need to reflect international and accepted practices, Brazil has the opportunity to lead the world in establishing standards for high quality offsets.

⁴ i.e., emissions savings that would not have occurred without the prospect of selling credits.

Recommendations

Strengthening the global impact and coherence of carbon markets entails adopting successful strategies from a variety of systems, extending beyond just emissions trading to include carbon crediting mechanisms, to drive the lowest-cost emissions reductions. Moreover, enhancing the interoperability of carbon markets across borders can significantly improve market liquidity and minimize compliance and other costs. Achieving this objective requires a collaborative cross-border effort to link carbon markets and standardize monitoring, reporting and verification procedures, with the potential for the G20 to play a pivotal role in driving progress.

Supporting the advancement and implementation of CDR through targeted funding, as well as with incentives for research and development, is paramount. This support should span a variety of technologies, including but not limited to CCS for thermal power generation and heavy industrial processes, negative emissions through CCS on bioenergy use, and DAC. Simultaneously, the role of NBS in mitigating climate change must be emphasized through the protection, restoration, and sustainable management of critical ecosystems such as forests, wetlands, and peatlands.

Addressing the challenges that developing countries face in transitioning to low carbon is also critical. Providing comprehensive financial support through public, private and multilateral funding can facilitate the adoption of carbon pricing mechanisms that allow for the implementation of both technological and nature-based CDR solutions. The G20, as a group, can help develop the needed funding frameworks and financial structures, and support developing economies in reducing their emissions.

Finally, supporting corporate and sectoral commitments to carbon neutrality, including through VCMs, will be important for achieving climate goals. Encouraging entities to set and pursue science-based targets for emission reductions is a crucial step. Enhancing transparency and accountability — through standardized monitoring, reporting and verification standards for CDR credits/offsets and improved corporate emission reporting standards — will also play a significant role in ensuring additionality of these credits in reducing emissions over and above ongoing mitigation efforts.

The recommendations can be summarized as follows:

- Support market-based mechanisms for carbon pricing in developing countries to drive economically efficient and cost-effective emission reductions.
- Incentivize low-carbon choices and encourage private investment in low-carbon technologies and projects.
- Broaden the sectors covered by carbon markets and incorporate CDR strategies in the form of CCS technologies and NBS.
- Implement internationally agreed and standardized monitoring, reporting and verification requirements for carbon credits/offsets that ensure CDRs provide additional emission reductions, permanent sequestration, and minimize leakage.
- Enhance the interoperability of carbon markets across borders to improve market liquidity, lower overall transaction costs.
- Agree guidance for operationalizing Article 6 of the Paris Agreement to incentivize efficient levels of investment in CDRs.
- Support the development and deployment of CDR solutions and technologies with targeted funding, research and development incentives, and through technical assistance tailored to building capacity.

Scenario of outcomes

Recognizing carbon markets as crucial tools to unlock economically viable CDRs unveils a multifaceted landscape of significant outcomes.

1. Balance near-term costs with the longer-term emissions reductions

Market-based carbon pricing mechanisms can drive economically efficient and cost-effective reductions in global greenhouse gas emissions. However, costs may increase for industries now falling under stricter regulations and higher carbon price. This could place a temporary strain on economies, particularly those heavily reliant on high-emission industries.

2. Support CDRs without displacing mitigation activities

Encouraging the development and deployment of CDR technologies offers a path towards negating existing carbon emissions. However, there is a risk that excessive focus on CDRs could divert attention and funding away from emission reduction strategies.

3. Balance efficiency and equity

Provide financial support and incentives for carbon pricing in developing countries aimed at fostering equitable climate action. This recognizes the disproportionate impact of climate change on these countries and their limited resources and capacity to respond.

4. Ensure a role for CDRs while making sure they provide additionality

Credible and robust standards for carbon credits/offsets need to be set and agreed among G20 parties to prevent perverse market outcomes and distortions and avoid CDRs becoming an avenue for greenwashing or a cosmetic improvement to a country's or company's environmental image.

5. Navigate contradictions and trade-offs

The adoption of the proposed recommendations sets the stage for a transformative yet challenging journey towards global climate resilience. It necessitates a balance between advancing technological solutions and preserving natural ecosystems, promoting economic growth while ensuring environmental sustainability, and fostering global co-operation amidst diverse national interests.

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