Policy Brief

Global Policy Instruments to Mobilize Carbon Dioxide Removal

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Joint policy brief by

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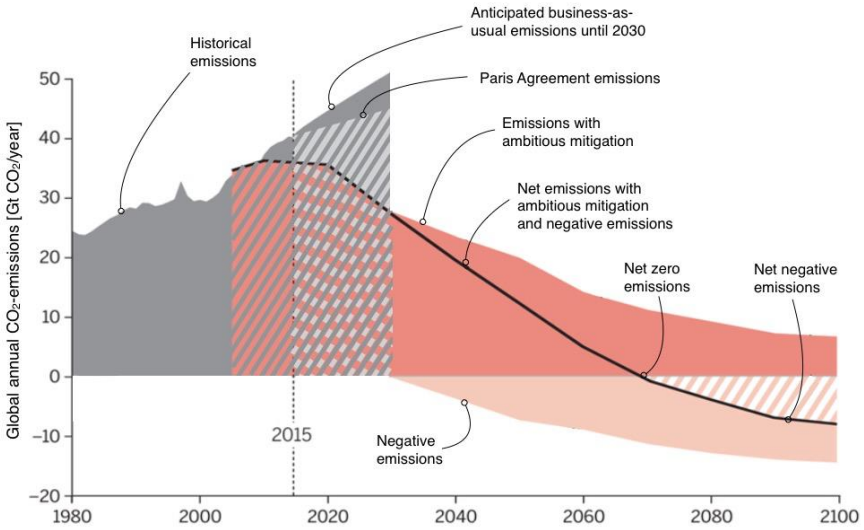
Key Messages

- International policy instruments that mobilize practices and technologies for removing CO_2 from the atmosphere and reliably storing it (Carbon Dioxide Removal, CDR) are currently non-existent despite most mitigation pathways for 2°C or 1.5°C relying on implementation of CDR at scale.
- Feasibility of CDR at large-scale is highly uncertain due to high costs and political challenges. Practical experience is necessary for better understanding feasibility and driving down costs.
- For cost-effective global CDR deployment, one or several policy instruments would need to mobilize international financial flows and ensure that activities generate sustainable development benefits.
- The sustainable development mechanism established in Article 6.4 of the Paris Agreement could be a good basis for supporting deployment if it includes a robust approach to evaluating sustainable development impacts, potentially by building on the Sustainable Development Goals (SDGs).

Find more information on this subject in the research article:
The political economy of negative emissions technologies: consequences for international policy design. The article is openly available on the website of Climate Policy.

Removing and storing CO_2 is necessary for climate stabilization

Carbon Dioxide Removal (CDR) is a subset of climate change mitigation technologies, complementing more conventional greenhouse gas (GHG) emissions reductions options. At the current GHG emissions level, the carbon budget for staying below 2°C will be used up in 1-2 decades at most and the budget for 1.5°C might already have been depleted. Stabilizing the climate system requires reaching a "balance between anthropogenic emissions by sources and removals by sinks."[1] Once GHG emissions are reduced and removals scaled up to match the remaining rate of emissions, any additional removal can start to lower atmospheric CO_2 concentrations. This is known as overshoot-and-return (see following visualization).



2°C scenarios include a rapid scale-up of CDR (beige area) in addition to deep emissions cuts (red area)[2].

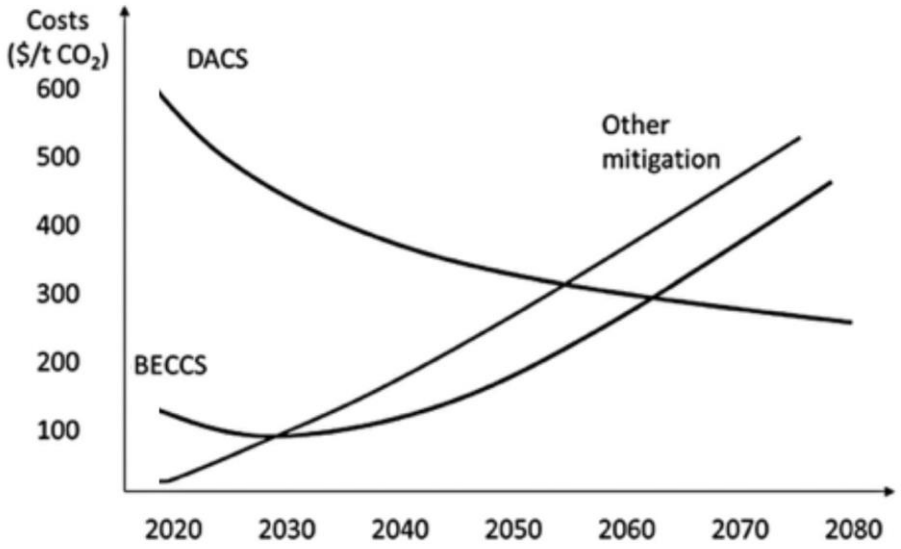
In the average 2°C scenario assessed by the IPCC Fifth Assessment Report in 2014, CDR is eventually assumed to reach 10–20 Gt CO_2 per year. Removing 10 Gt CO_2 annually through bio-energy with carbon capture and storage (BECCS) would mean increasing power generation capacity from biomass tenfold to 1000 GW and equipping 100% of these plants with carbon capture and storage (CCS) technology. Such an expansion would rival or exceed past record-breaking transformations in the energy sector, such as the rollout of nuclear power in France in the 1970s and 1980s, or the scale-up of coal power capacity in China over 1990–2015. Scenarios for 2°C involve steep increases in mitigation costs, which requires carbon price incentives to rise at similar rates in order to enable emissions reductions and CDR alike. Furthermore, current mitigation pledges under the Paris Agreement (Nationally Determined Contributions, NDCs) fall severely short of a 2°C pathway.

CDR is costly and requires incentives

Currently the associated costs for CDR options appear substantially higher than those of current mitigation activities: $20-100 per tonne of CO_2 removed and stored for afforestation, $45 to several hundred dollars per tonne for BECCS, and direct air capture and storage (DACS) starting at several hundred dollars per tonne. Costs can vary significantly due to locational factors such as availability of biomass resources and geological storage capacity. While technology learning can reduce costs, due to the need for dedicated technical infrastructure capital and operating costs will remain. Large-scale BECCS might also result in resource

[1] Paris Agreement Article 4.1
[2] Honegger et al., 2017, adapted from Anderson and Peters, 2016

scarcity, where increasing biomass competition leads to rising operating costs. Similarly, competition over geological storage required for both BECCS and DACS could increase costs.



Cost estimates, assuming existence of incentives for CDR (BECCS, DACS) and other mitigation.[3]

Co-benefits and trade-offs

Most common CDR options lack the co-benefits that often motivate conventional mitigating action. Under specific circumstances, some CDR practices could result in co-benefits, including no-till farming and other soil carbon enhancing practices, novel types of cement production, and timber use in construction, habitat and forest restoration as well as soil mineralization with carbon-binding minerals. Yet the effectiveness and scalability of such approaches is not well understood. In light of various trade-offs, potential for sustainable applications of various CDR options are limited and there are concerns regarding potential harm in case of billion-tonne scale deployment.

No CDR without a mandate or incentives

Deployment of CDR requires either mandates or a business case offering a reliable revenue for removing and storing CO_2. Reliable quantification of CO_2 removal is essential. While such policies could be put in place at national levels to form part of one country's NDC, there is a need for an international instrument as well: In light of regional differences in CDR potentials. Given that it is up to progressive industrialized countries to lead on CDR deployment, international collaboration is crucial. A global instrument for CDR needs to allow for voluntary transfers of mitigation units in return for payment of a price for each tonne of CO_2 of avoided emissions or generated removals by the country that receives the units. Such transfers would help mobilize potential mitigation opportunities (including CDR) in countries that are unable to afford the corresponding costs as part of their NDC.

The Sustainable Development Mechanism

The market mechanism under Article 6.4 of the Paris Agreement – widely known as the 'Sustainable Development Mechanism' (SDM) – could be the cornerstone of such a policy instrument, given that this mechanism will be more stringently regulated than activities under other cooperative approaches (Article

[3] Updated based on Honegger and Reiner, 2018

6.2). Initially CDR would not be competitive with other mitigation options on the free market, but the mechanism could facilitate bilateral financial transfers for CDR, where mitigation units accrue to the financier.

In light of the higher costs of CDR compared to conventional mitigation, additional payment of the acquiring country on top of the market price would initially be necessary so that CDR can be advanced even where it is not yet competitive with other mitigation options to enable technology learning. The received units might then be counted towards the buyer country's mitigation target *or* the corresponding expenditure toward its climate finance pledges.

Credible quantification and accounting under Paris regime

A CDR policy instrument would need to ensure credible quantification of removals as well as their proper accounting under the Paris regime – embedded in existing infrastructure (national inventories and communications). This is particularly important given the lack of co-benefits. It would require agreed and conservative methodologies and monitoring of storage sites. Methodologies could be proposed either by market participants or the supervisory body of the SDM. Existing methodologies, e.g. for CCS, could be modified for CDR options. A centralized registry and robust international oversight would strengthen reliability of CDR as mitigation options.

Efficient and effective administrative process

In order to be efficient and effective, a CDR policy instrument would need to provide an effective administrative process with limited transaction costs, such that also poorer countries would immediately be able to benefit from the mechanism. To prevent a loss of accumulated experience, national project approvals could be done by the same designated national authorities that performed this task under the Kyoto Protocol's Clean Development Mechanism (CDM). Similarly, the SDM supervisory body could be modelled on the CDM's Executive Board, it would, in this case, track activities and transactions, approve new project types and corresponding quantification methodologies.

Alignment with the sustainable development goals

An effective policy instrument would need to ensure alignment of supported activities with the sustainable development goals and their national operationalisation processes and prevent social and environmental impacts from large-scale CDR. Yet this is also very challenging, given countries' historical reluctance to accept international procedures and criteria for assessment of sustainable development benefits and acceptance/rejection of project proposals. A transparent process for this might, however, be a prerequisite for strengthening the acceptability of CDR.

Challenges: Public perception and counter-intuitive role of CDR

Acceptability and prospects for wide-scale deployment are closely associated with perception and portrayal of a specific technology. Some media reports and NGOs have expressed concerns over CDR believing that it was a false solution pushed by experts or industry with a self-serving agenda, where CDR is characterised as 'illusory' or posing a 'moral hazard' leading to reduced efforts on more conventional mitigation options. While there is an ongoing shift in attention recognizing CDR in principle as a necessary part of the global effort to stabilize the climate system, local opposition to e.g. implementing CCS projects and to public spending for CDR abroad will likely remain a significant challenge.

BECCS deployment at billion-tonne scale could have significant effects on important dimensions of sustainable development such as food prices and availability. In a hypothetical world in which carbon price

levels are consistent with an ambitious climate mitigation target, prices of carbon-, biomass-, and food crops are directly related. The availability of BECCS would then alleviate upward pressure on food crop prices as it would allow reaching the goal with a lower total land requirement than if removals were limited to afforestation or bio-energy without CCS.

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This work was supported by the German Federal Ministry of Research and Education (grant number 01LS1621A).

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