Direct Air Capture Coalition

Email to: Supervisory-Body@unfccc.int
Title: Input to A6.4-SB005-AA-A09 annotated agenda and related annexes
Date: May 25, 2023

**Direct Air Capture Coalition response to *Information note on removal activities under the Article 6.4 mechanism Version 4.0*.**

Dear Article 6.4 Supervisory Body,

Thank you for the continued engagement to clarify the role of carbon removals in Article 6 to achieve our shared climate goals.

The Direct Air Capture Coalition (DAC Coalition) is a global non-profit organization consisting of over eighty companies, civil society groups, and research and academic institutions working together to help advance and accelerate the responsible development and deployment of direct air capture technology to address climate change.

We would like to first acknowledge and thank the Supervisory Body for their work on the inclusion of carbon removals in the Article 6.4 mechanism and for providing the opportunity to respond to the Information Note entitled "Removal activities under the Article 6.4 mechanism" (A6.4-SB005-AA-A09 version 0.40):

In summary, we would like to draw particular attention to the following matters:

- Scientific consensus around the role of engineered removals
- Tonne-year accounting and the importance of **permanent** and **durable** $CO_2$ storage
- The wording used in Table 3.2 around pros and cons of "engineering-based" removal
- The role of engineered removals in meeting Nationally Determined Contributions
- Acknowledgement of previous stakeholder submissions from *SB004 Call for Inputs*

We appreciate that direct air carbon dioxide capture and storage (DACCS) is among a suite of emerging engineered approaches to carbon removal, however, the current approach illustrated in the Information Note disadvantages DACCS under the Article 6.4 mechanism. This runs contrary to the extensive Intergovernmental Panel on Climate Change (IPCC) modeling which unequivocally demonstrates its role in reaching scientifically-backed climate goals.

The DAC Coalition remains available to support you in this ongoing process.

Sincerely,
Aaron Benjamin
UK and Europe Lead
**Direct Air Capture Coalition**

## Signatories:

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## Alignment with Scientific Consensus

Ensuring that the UNFCCC is aligned with the scientific consensus is critical to engendering trust in the international carbon market and the mechanisms that underpin it.

The 2022 IPCC AR6 WG3 states that the need for carbon removal is now “unavoidable” and goes on to set a target of 5-16 Gt/year (of removal) by 2050 to keep us on track with our climate goals. This will require a truly global effort that requires an all-hands-on-deck approach to meet rates of scaling rarely seen before.[1]

In order to reach this goal, a portfolio of solutions including engineered removal will need to be deployed given the natural resource constraints of relying solely on land-based activities (e.g competition for land-use, water consumption, biomass scarcity, etc.) as well as questions around the permanence of land-based removal. The conclusions made by the IPCC have been reflected in subsequent reports commissioned by the International Energy Agency, which attributes to Direct Air Capture (DAC) 60 Mt of carbon dioxide capture and sequestration per year by 2030 in order to stay aligned with Net-Zero Emissions Scenario.[2] The Energy Transition Commission 2022 Report projects DACCS, despite current technology readiness and economic feasibility, will be removing 4.5 Gt/year by 2050. It is precisely the ability of DACCS to operate at scale (as stated in Appendix I on Page 91 of the Information Note) that makes it an essential part of the solution portfolio. Excluding it from Article 6.4 mechanisms will present significant disadvantages at a critical time in this industry’s growth trajectory.

The Information Note also alludes to using tonne-year accounting methods to quantify credits under Article 6.4. We would like to join various calls and the wider academic literature, including previous submissions to the Supervisory Body,[3] raising concerns about tonne-year accounting’s premise that temporary carbon storage can be equated to the permanent removal and storage of $CO_2$. For further information, we would recommend the comprehensive work done by CarbonPlan[4] and CarbonDirect[5] on this matter.

[1] https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf
[2] IEA (2022), Direct Air Capture, IEA, Paris https://www.iea.org/reports/direct-air-capture, License: CC BY 4.0
[3] https://unfccc.int/sites/default/files/resource/SB004-call-for-input-Derik%20Broekhoff%2C%20Matthew%20Brander%2C%20Lambert%20Schneider.pdf
[4] https://carbonplan.org/research/ton-year-explainer
[5] carbon-direct.com/insights/accounting-for-short-term-durability-in-carbon-offsetting

# Stated List of Pros and Cons

Table 3 of the Information Note presents an one-sided view of engineered-based removals that does not reflect the latest evidence.

**3.2. Eligibility of activity types under the Article 6.4 mechanism**

39. Based on the public input from stakeholders and other sources consulted, table 3 summarizes the pros and cons of the eligibility of different types of activities under the A6.4 mechanism.

**Table 3. Pros and cons of the different activity types being made eligible under the mechanism**

| Activity type | Pros and cons |
|---|---|
| **Engineering-based activities** | **Pros**<br>– Engineering-based removal activities result in permanent net removal of carbon dioxide from the atmosphere.<br>**Cons**<br>– Engineering-based removal activities are technologically and economically unproven, especially at scale, and pose unknown environmental and social risks (P-12, R-83:a, R-84:a, R-50:c,d). Currently these activities account for removals equivalent to 0.01 MtCO2 per year (P-15:a) compared to 2,000 MtCO2 per year removed by land-based activities.<br>– These activities do not contribute to sustainable development, are not suitable for implementation in the developing countries and do not contribute to reducing the global mitigation costs, and therefore do not serve any of the objectives of the Article 6.4 mechanism. |

## “Technologically and economically unproven”

DAC represents a set of engineering-based removal technologies categorized by various reports operating at Technology Readiness Level (TRL) 5-9.[6] With several commercial facilities already operating, or being built, and demand for DAC credits significantly outstripping the supply, we believe it is premature and inaccurate to state that DAC is technologically and economically unproven.

It is worth noting that policy approaches are already in place aimed at helping DACCS come down the price curve. Fiscal incentives like the 45Q tax credit in the United States, DAC Hubs funding, and research and development grants (e.g the UK’s £100m DAC greenhouse gas removal competition or the $1Bn committed to carbon removal in the American CHIPS and Science Act) are driving forward the innovation that will reduce costs.

As an emerging technology, it is important to acknowledge the existing technology and economic uncertainties, however, we anticipate that DAC, with the right policy support, can reap

[6] See Mind the Gap: How Carbon Dioxide Removals Must Complement Deep Decarbonisation to Keep 1.5°C Alive; IEA (2021), Net Zero by 2050; TRL adjusted from (0-9) Royal Society (2018) Greenhouse Gas Removal Report scale to (0-11) scale for comparison with other sources, per Mind the Gap Report. TRL describes the level of maturity a certain technology has reached from initial idea to large-scale, stable commercial operation. The IEA reference scale is used.

the economic benefits of economies of scale and mitigate technology risk with increased learning rates whilst following *similar* innovation trends to its counterparts in renewable energy technology.[7] We are already seeing examples of this maturation within the private sector with large-scale collaborations commencing and commitments being made which would not be within the realm of plausibility should DACCS not be economically and technologically feasible at scale.[8] In the period 2020-2022, 75% of the $200 million or 510,000 tonnes of purchased carbon removal went to DAC projects.[9] Demand from large corporations and financial institutions[10] is providing significant amounts of advanced capital to help develop, deploy, and improve the technology, and identify quickly which projects have the technical and economic ability to scale. In the absence of public funding, this is a hugely significant demand signal that can provide the step-change needed to prove DACCS feasibility at scale. Disadvantaging engineered removals under the Article 6.4 mechanism, will only serve to hinder this process. Furthermore, by the estimates included in Table 4, the cost of DACCS is already within the range of the cost of a tonne removed by afforestation and biochar. It is therefore unclear how the statement that engineering-based removals are economically unproven can be made.

## "Pose unknown environmental and social risks"

Environmental and social justice, as well as risk, are an essential part of planning the scale-up of DACCS and topics that are paid significant attention to. While there is ongoing work identifying the risks involved in DACCS, numerous stakeholder submissions to "Call for input 2022: activities involving removals under the Article 6.4 Mechanism of the Paris Agreement" lay out the importance of cradle-to-grave Life Cycle Assessments (LCAs)[11] as well as the safety and efficacy of subsurface $CO_2$ injection[12] as laid out and enshrined by the 2011 UNFCCC Durban Decision[13]. The wording used in the Information Note is speculative and does not account for much of the research being undertaken on what equitable and just DAC deployment looks like[14],[15],[16] with environmental and social justice a high priority in countries where DAC is already being deployed where it enjoys bipartisan and public support as well[17]. Moreover, across

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[7] Lackner KS, Azarabadi H. Buying down the cost of direct air capture. Industrial & engineering chemistry research. 2021 May 26;60(22):8196-208.
[8] https://carbonengineering.com/news-updates/construction-direct-air-capture-texas/
[9] State of CDR Report (page 36) -https://static1.squarespace.com/static/633458017a1ae214f3772c76/t/63c8876b8b92bf2549e83ed5/1674086272412/SoCDR-1st-edition.pdf
[10] https://climeworks.com/news/jp-morgan-chase-signs-landmark-cdr-agreement-with-climeworks
[11] https://unfccc.int/sites/default/files/resource/SB002-call-for-input-CarbonEngineering_0.pdf
[12] https://unfccc.int/sites/default/files/resource/SB002-call-for-input-CARBFIX.pdf
[13] https://cdrlaw.org/resources/ccs-projects-as-kyoto-protocol-cdm-activities/
[14] https://www.dataforprogress.org/memos/advancing-equitable-deployment-of-regional-dac-hubs
[15] https://www.xprize.org/prizes/carbonremoval/articles/from-the-ground-up
[16] https://carbonremovals.org/events/building-equitable-frameworks-for-direct-air-capture-deployment-in-emerging-economies/
[17] https://www.politico.com/newsletters/the-long-game/2023/05/18/americans-like-direct-air-capture-with-caveats-00097566

numerous demonstration facilities, Direct Air Capture companies from Europe to the United States are committed to adhering to and exceeding local regulations to protect employees; and conducting extensive safety assessments to ensure that all operational activities protect people and the environment to the highest possible standards. Community engagement workshops as well as environmental assessments are commonplace in those DAC projects that are breaking ground (see CarbonCapture Inc's Project Bison[18]) and are often stated as a funding requirement[19]. One of the key benefits to DAC is its potential to stimulate job creation with estimates that a megaton facility can provide as many as 3500 jobs across the value chain[20] and provide those workers currently employed in sunset industries a transition into roles that support the transition, hence directly contributing to SDG9 (Decent work and economic growth).

## "Does not contribute to sustainable development"

Despite its nascency, DACCS is demonstrating significant potential to contribute to sustainable development and prove itself as an anchor technology in the new green economy.
Given the ubiquitous nature of CO2 dispersion and its modifiable components, DACCS has the benefit of being highly flexible with its siting meaning the technology is not restricted to the locations where it is currently being developed primarily in the Global North. For example, Kenya is emerging as a prime location for DACCS. Its vast basaltic reserves along the Great Rift Valley, fast-growing workforce, and 93% renewable grid make it an exciting prospect for DAC developers. That is without mentioning the direct high-level political support DAC is receiving in Kenya[21] (spurred on by the 2022 US-Africa Leaders Summit[22]) in recognition of the benefits DACCS can have on the country.

To disfavor engineered removals in the Article 6.4 mechanism would be to hinder the prospect of funding techniques like DAC in locations where they are most suited, preclude sustainable development and technology transfer around the globe. Companies like Octavia Carbon are already producing DAC machines and stimulating job creation and the local economy in Nairobi today. Cella, a mineral storage company, is partnering with Kenyan geothermal companies to host DAC companies, developing durable CO2 storage options while generating energy purchase opportunities critical to meeting Kenya's energy goals. Given Kenya's low emission and lower-middle income status,[23] funding via international carbon markets is absolutely essential to help scale and develop clean energy infrastructure throughout Kenya.

Widening the lens, the Global South's abundance of untapped renewable energy potential is key: DACCS has a relatively high need for renewable energy and a vibrant DACCS industry can

[18] https://www.carboncapture.com/project-bison-wy
[19] Frontier, Request for prepurchase proposals
https://d37ugbyn3rpeym.cloudfront.net/docs/climate/2023-prepurchase-rfp
[20] https://rhg.com/research/capturing-new-jobs-and-new-business/
[21] https://carbonherald.com/president-of-kenya-calls-on-the-us-to-explore-green-energy-potential-of-africa/
[22]
https://www.whitehouse.gov/briefing-room/statements-releases/2022/12/13/fact-sheet-u-s-africa-partnership-in-supporting-conservation-climate-adaptation-and-a-just-energy-transition/
[23] https://www.worldbank.org/en/country/kenya/overview

provide anchor industrial demand that will enable investment in renewable energy, thus improving energy access through additional generation capacity, and financial buffers to cross-subsidize energy provision to un- and underserved populations. This abundance paired with low existing emissions, means limited moral hazard for the deployment of new renewable energy capacity - as there is little high emission industrial infrastructure to displace. As a general principle to CDR development within the global south, it must be safeguarded that it's defined and decided upon by the needs of local communities, the local economy and based on the perspectives of people living within the areas.

In addition to this, DAC can contribute to both adaptation and mitigation efforts in low and middle-income countries by providing a source of income and value-added products like freshwater or $CO_2$ for utilization. Capture6, a direct air capture company, is exploring setting-up facilities in Kiribati to produce freshwater whilst removing $CO_2$. Others including Takachar, Mati, InPlanet, Everest are all operating within the engineered-carbon removal spectrum across the Global South.

Moreover, DAC companies in North America are creating new green, durable jobs in regions that have declining economies due to the clean energy transition and ongoing losses of fossil fuel jobs. Publicly announced DAC projects in planning and moving forward in Texas, Wyoming, Colorado, and Louisiana will directly help transition economies and prevent communities from losing livelihoods.

In summary, as engineered carbon removal is estimated by many to become a multi-trillion dollar industry by 2050,[24] failure to adopt acceptable development frameworks under Article 6.4 will mean the loss of job creation and economic development benefits in both the Global South and Global North that significantly disadvantage vulnerable populations..

Working with the UN's Sustainable Development Goals framework, we believe that DAC can also contribute via:

| Sustainable Development Goal | Examples of DAC Contribution (non-exhaustive) |
|---|---|
| SDG 7 - Affordable Clean Energy | By acting as an anchor use-case that provides guaranteed demand via offtake agreements, DAC can help build out renewable energy infrastructure whereby excess energy produced not used by DAC can be sold back to the grid. |

[24] https://www.bcg.com/publications/2022/usa-competitive-advantage-in-key-emerging-clean-tech

| | |
|---|---|
| SDG 8 - Decent Work and Economic Growth | High-quality, new green jobs is a key co-benefit to DAC with estimations of 3500 jobs across the value chain per megaton facility. |
| SDG 9 - Industry, Innovation and Infrastructure | Given the current shortfalls of DAC, innovation is a key selection pressure to drive down costs and commercial viability |
| SDG 11 - Sustainable Cities | The use of DAC technology is not limited to carbon removal with geologic storage, with a number of companies (e.g Heirloom and Mission Zero Technologies) diversifying their approach and revenue streams by aiding the decarbonisation of concrete by mixing removed $CO_2$ with cement. |
| SDG 13 - Climate Action | Carbon removal is climate change mitigation and provides us with a set of technologies capable of preventing overshoot scenarios. |

For a more thorough analysis of the trade-offs of DACCS we would encourage the SB to consider IPCC AR6 WG3 Table 12.6 or State of CDR Report pages 18/19.

## Meeting Nationally Determined Contribution (NDC) with Engineered Removals

As a tool for meeting net-zero globally, Article 6.4 should provide countries with a supportive mechanism to help them reach their NDCs. Increasingly, countries are incorporating the use of engineered carbon removals into their NDCs to help them abate hard-to-decarbonize sectors, for example the United Kingdom's Net-Zero Strategy[25] sets out specific targets for engineered removals in the interim to 2050. Belgium's National LTS focuses on DACCS and BECCS, Sweden has a target of 1.8Mt$CO_2$/year by BECCS and the European Union has aspirations to be using industrial removals to address 5Mt/yr by 2030. Given the diminished importance placed on permanent and durable storage in the information note, the proposed framework will make it harder for these countries to achieve their NDCs.

25 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf

## Reconsidering Previous Stakeholder Input

Significant stakeholder input does not appear to be reflected in the Information Note. We encourage the SB to revisit the following inputs to include a more balanced perspective from stakeholders

- DAC Coalition input - the importance of differentiating durable carbon removals from high-reversal risk removals, technology development and innovation management
- Broeker, Brander, Schneider - Tonne-year accounting input - critique of tonne-year accounting
- Carbon Engineering Input - recommendations on GHG accounting, responsible DACCS deployment, DACCS supporting sustainable development
- Bellona Input - critique of tonne year accounting, addressing high-reversals risk removals
- Climeworks input - defining and expanding geologic storage, critiques on tonne-year accounting
- AirCapture input - durable $CO_2$ storage in long-lived products and DAC as a tool for decarbonization as well as removal
- Carbfix input - environmental risk of geologic storage