Input to SB005 annotated agenda and related annexes

24 May 2023

Paebbl is a young European SME, whose aim is to develop and commercialise scalable CO_2 mineralisation technology, to permanently re-store carbon into durable filler materials that can be used for the production of industrial applications, such as concrete. Our technology is CO2-source agnostic, and we aim to scale it to be usable to store both DAC-sourced as well as flue-gas sourced CO2. We geo-mimic a natural process, but accelerate it using energy-efficient technology. We get CO_2 to react with abundantly available silicate minerals, water, and organic accelerants, permanently binding the carbon into a solid state mineral slurry/powder. The obtained mineral powder is a carbon negative substitute for calcium carbonate.

We welcome the opportunity to submit our opinion to the open call for input on carbon removals, notably on the *engineering-based activities* mentioned in the information note on removal activities under the Article 6.4 mechanism.

Table 3. on the pros and cons of the different activity types being made eligible under the mechanism draws a distorted and unjust picture of the emission reduction potential of engineering-based activities, such as carbon storage and utilization by mineralization.

First, it is stated that:

> "*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.*"

It is recognized that Article 6.4 of the Paris Agreement will deliver a global standard for methodologies for carbon removal activities, in particular taking into account removal activities that are still under development, as countries may have to rely on industrial removals to achieve their climate objectives. Therefore, not including engineering-based removal activities in Article 6.4, and therefore **branding those as ineffective and unsustainable, will considerably hamper the efforts of the industry to find innovative technologies contributing to emission mitigation through carbon removals**. The Paris Agreement itself determines that one of the aims of "the mechanism" is "*to incentivize and facilitate participation in the mitigation of greenhouse gas emissions by public and private entities authorized by a Party*". Investing entails a risk-benefit element, where ensuring certitude of having engineering-based removal activities covered under this international framework would facilitate the maturing of carbon removal technologies.

Finally, when regarding emission reductions both permanent storage and substitution potential should be taken into consideration, to ensure that emissions across industries are reduced to the extent possible and sustainable products with lower ecological footprints are incentivized.

Second, it is noted that:

> "*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 $MtCO_2$ per year (P15:a) compared to 2,000 $MtCO_2$ per year removed by land-based activities."

Although the technical readiness level of new technologies may not be proven yet (lower than TRL 9), research is and has been conducted on the status, costs, potentials, risk and impacts, co-benefits, trade-offs and spillover effects and the role in mitigation pathways of carbon removal methods (e.g., table 12.6 of the Intergovernmental Panel on Climate Change (IPCC) report and table 1.1 of the report by Smith et al. (2023)), showcasing the mitigation potential for DAC of 5-40 $GtCO_2$ yr^{-1}.[1] Moreover, for carbon storage and utilization by mineralization, we would like to bring a study from Ostovari et al. (2020) to your attention that assessed seven pathways of carbon removals by mineralization. The study concluded that reductions would range from 0.44 to 1.17 ton CO_{2e} per ton CO_2 stored. Once suitable products are identified and developed, "*carbon capture and utilization by mineralization could provide a promising route for climate change mitigation*".[2] As mentioned above, engineering-based removal activities have a lot of potential for climate benefits.

Moreover, we would like to emphasise that work is ongoing to quantify the emission reduction potential of industrial carbon removals, e.g., the European Commission assembled an expert group to develop such methodology, establishing which level of carbon removals has to be reached to qualify for their carbon removals schemes.

Including engineered-based removal activities under this mechanism will boost research for these technologies and enable its upscaling.

In conclusion, even though the technical readiness of all engineering-based removal activities may not be have been "proven", the potential shown by existing and ongoing research, and regulatory and industry activities, the ability to link these engineering-based removal activities with other climate objectives, and the necessity of these activities to reach climate neutrality and net negative emissions, **demonstrates that it would be premature and obstructive to disincentivize innovation and investments in this field by not recognizing its potential in the mechanism for removal activities.**

[1] Panel on Climate Change (IPCC). (2022). *Climate change 2022: mitigation of climate change* (ISBN 978-92-9169-160-9). https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf; Geden, S. M., et al. (2023). *The State of Carbon Dioxide Removal - 1st Edition*. doi:10.17605/OSF.IO/W3B4Z.

[2] Ostovari, H., et al. (2020). Rock 'n' use of CO2: carbon footprint of carbon capture and utilization by mineralization. *Sustainable Energy & Fuels*, 4, 4482–4496. DOI: 10.1039/d0se00190b.