THE INTEGRITY COUNCIL
FOR THE VOLUNTARY CARBON MARKET

OBSERVATIONS IN RELATION TO CATEGORY ASSESSMENT
CARBON DIOXIDE REMOVALS – PART II
SEPTEMBER 2025

1. Purpose of these observations

The Governing Board (the Board) of the Integrity Council for the Voluntary Carbon Market (ICVCM), when considering the assessment of methodologies related to carbon dioxide removals identified that it would be beneficial to make available the ICVCM's observations for the purpose of supporting the future development of methodologies in this Category. These observations are non-binding and do not impact or form any part of the Assessment Framework, Assessment Procedure, or any Decision (as defined under the Assessment Framework) and are published by the ICVCM for the purpose of information only.

The ICVCM may, from time to time, publish other observations for other Categories where it considers this may be useful for CCP-Eligible Programs and other stakeholders, and may update and revise its observations from time to time based on further assessment processes or information. Observations are not an exhaustive set of views of the ICVCM, and not all aspects addressed in assessment processes are included. No reliance may be placed on observations, as they are for the purpose of information only, and observations published are without prejudice to other ongoing assessments.

The Governing Board would like to express its gratitude to the experts and other stakeholders engaged in the assessment process who provided input to the ICVCM regarding this Category.

2. Category Details

The Carbon Dioxide Removals (CDR) Category covers all engineered removals technologies that capture carbon dioxide from a source (e.g., a power plant, or directly from the air) and then store the carbon dioxide in a stable form (e.g., an underground reservoir, or in a product). Methodologies covering these technologies tend to provide several different monitoring and calculation approaches reflecting different types of sources and stores and thus cannot be categorised by a single mitigation activity type. Methodologies that cover a discrete mitigation activity type, for example Biochar, Enhanced Rock Weathering and Ocean Alkalinity Enhancement are categorised separately accordingly,.

Engineered carbon dioxide removals are distinct from natural removal mitigation activities, like Afforestation or Reforestation, for example, because the technology, or process is man-made and goes beyond natural processes. Engineered carbon dioxide

removals technologies have typically yet to reach significant maturity and scale and will require significant investment and support if they are to do so. These technologies are widely considered essential to decarbonise hard to abate sectors, like cement and steel production[1], that have requirements for high energy intensity as well as inherent process emissions (emissions released during industrial processes unrelated to energy consumption).

3. Observations relating to CDR methodologies

The Governing Board's observations regarding the assessment of CDR methodologies against the ICVCM Assessment Framework and its Core Carbon Principles generally relate to permanence and robust quantification.

The six methodologies within this Category to which these observations relate are:

- Carbon Sequestration Through Accelerated Carbonation of Concrete Aggregate (v1.0) applied under Gold Standard
- Biomass Geological Storage (v1.0-1.1) applied under CAR.
- Bio-oil Geological Storage (v1.0-1.1) applied under Isometric.
- Subsurface Biomass Carbon Removal and Storage (v1.0) applied under Isometric.
- Biogenic Carbon Capture and Storage (v1.1) applied under Isometric.
- Direct Air Capture (v1.1) applied under Isometric.

There are several methodologies in this Category applied under Isometric, Gold Standard and VCS that remain under assessment by the ICVCM.

4. Permanence

Mitigation activity types with a material risk of reversal are listed in the Assessment Framework and must comply with a clearly defined set of monitoring and compensation requirements to address potential reversals[2]. CDR mitigation activities are required to address any identified risks using measures appropriate to that risk, rather than solely rely on use of monitoring and compensation.

During assessment, it was noted that the risk of reversal differs according to the type of storage employed by the CDR mitigation activity in the methodology. Activities relying on geochemical storage or mineralisation generally have a very low permanence risk. For example, carbonation of carbon dioxide in concrete forms a strong chemical bond with calcium ions in cement to form calcium carbonate (CaCO3) – akin to the natural process observed during the weathering of concrete (see section 5). Very high temperatures (at least 825°c) would be required release the carbon dioxide from this

[1] IPCC, AR6 WGIII Factsheet
[2]Please refer to ICVCM Assessment Framework 9.1 (b)

stable mineral (as is the case in cement kilns), therefore the permanence risk is negligible and does not require measures to address it.

Activities relying on storage in underground reservoirs, aquifers or similar, as is the case with the five methodologies applied under Isometric, have measures relating to proving the integrity of the storage approach, ongoing monitoring of the storage and contributions to a buffer pool in the event that a reversal occurs. These measures were assessed as being appropriate to the level of risk and, therefore, in line with the relevant requirements in the assessment framework.

The Governing Board notes that CDR is a novel technology and that some countries may not yet have national regulations governing subsurface CO_2 storage and the regulatory landscape for this technology type is likely to evolve. The Assessment Framework requires CCP Eligible programs to require mitigation activity proponents to comply with national and local laws[3]. Given the fast pace of development in this sector, it is possible national/local regulation may not keep pace with emerging technologies and practices. The ICVCM, therefore, expects CCP-Eligible Programs to remain attentive to this issue and consider requiring the best available practices in subsurface storage where regulations are not in place or not designed to support CDR technologies.

5. Robust Quantification

A crucial consideration in strengthening the integrity of the voluntary carbon market is ensuring that GHG emission reductions or removals are robustly quantified, which means based on conservative and complete approaches and using sound scientific methods. The Governing Board considered the following issues when taking the Decisions for the methodologies in the CDR Category.

The source of the biomass that is processed in an engineered carbon removal technology is referred to as the feedstock. The assessment process revealed that leakage and project emissions associated with biomass feedstocks in CDR methodologies are complex and can be significant and present risks. For example, if feedstocks are sourced from areas with an associated change in land use, these emissions could outweigh any removals achieved by the project. Methodologies in this category typically address a range of leakage and project emissions related to biomass feedstock by using a layered approach to address risks. This includes eligibility criteria which exclude highest-risk biomass (often limiting applicability to biomass residues, or other sustainable sources), eligibility criteria that eliminate the possibility of leakage, as well as requirements to quantify any risks that cannot be minimised.

For carbonation-based methodologies, the assessment process found that accurate accounting for natural carbonation in the baseline was an important factor in achieving

[3] Please refer to ICVCM Assessment Framework 7.1 (a). 1

robust quantification. As noted above, carbonation of concrete mimics a natural process by which concrete slowly and steadily absorbs atmospheric carbon dioxide. The Governing Board decided to approve Carbon Sequestration Through Accelerated Carbonation of Concrete Aggregate applied under Gold Standard subject to the condition that a rule update concerning baseline carbonation is applied in projects.

As observed in section 4, the Governing Board notes the novel nature of the CDR category and recognises that further research and empirical testing of engineered removal technologies may identify new risks, and it will be attentive to these as part of general ICVCM ongoing assurance and oversight.