Carbon Dioxide Removal Technologies and Carbon Capture, Utilization and Storage

Background and objectives

IPCC expert Meeting

Vienna, Austria, 1-3 July 2024

IPCC TFI TSU

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IPCC Plenary decision

- The TFI will hold an Expert Meeting on *Carbon Dioxide Removal Technologies, Carbon Capture Utilization and Storage* and provide a Methodology Report on these by the end of 2027.

IPCC 60, decision 9 para 7 January 2024

What is an IPCC TFI Methodology Report?

- The IPCC Task Force on Inventories (TFI)
  - *2006 IPCC Guidelines for national greenhouse gas inventories*
  - *2019 Refinement to the 2006 IPCC Guidelines*
  - *2013 Wetlands supplement*
    - IPCC - Task Force on National Greenhouse Gas Inventories (iges.or.jp)

- Used by parties to the Paris Agreement (UNFCCC) in estimation of emissions and sinks for national inventories
  - They also provide the basis for the rules agreed by Paris Agreement parties for national reporting
    - by decision of the parties to those agreements

2027 IPCC TFI Methodology Report processes

- Scoping Meeting (October)
  - Make recommendations to the Plenary on the scope of the Methodology Report
- IPCC Plenary (Feb 2025) makes final determination of the scope of the Methodology Report
- Report writing by authors nominated by governments and selected by the IPCC TFI Task Force Bureau:
  - 4 Lead Author Meetings
- Methodology Report submitted for acceptance by the IPCC Plenary in late 2027

This IPCC TFI expert meeting

- Identify gaps or need for update in the GLs
- Collect evidence and literature
- Consider pros and cons of options
  - does not need to come up with a consensus
- The Co-Chairs will assemble a Meeting Report based on materials collected
  - will be published
  - will be made available to the Scoping Meeting

Meeting format

- Day 1: Presentations and panel discussions by experts
- Day 2: Break Out Group [3] discussions
- Day 3: Further discussions. Reporting back to Plenary by rapporteurs; discussion and wrap up

Some possible tasks for you to consider

- **Identification** of range of CDR technology types
- Consider **criteria** for assessing CDR technologies and CCUS activities for inclusion in the future scope of work
- Consider and review the current IPCC **classification system**
- Consider **feasibility** of developing methods for **new** sources and sinks
  - Preliminary assessments
  - Lists
- Consider **desirability** of **updating** methods for **existing** sources and sinks
- Consider **empirical data** available to parameterise methods
- Consider other elements such as **verification** regimes

Identification of some possible CDR technology types for consideration

Group	The IPCC WGIII AR6 Report examples of CDR methods
Engineered carbon capture with geological storage in the lithosphere	• Direct air carbon capture and storage • Bioenergy with carbon capture and storage
Carbon capture in products	• Concrete carbonation*
Anthropogenic mineral processes with storage of inorganic carbon in minerals or as bicarbonate ions	• Enhanced weathering • Ocean alkalinity enhancement
Anthropogenic biological processes (photosynthesis) – biomass	• Afforestation/Reforestation • Agroforestry • Improved Forest Management • "Blue carbon management" in coastal wetlands
Anthropogenic biological processes (photosynthesis) – soils and waterways	• Soil carbon sequestration in croplands and grasslands • Peatland and coastal wetland restoration • Biochar

Table 1: Grouping of CDR pathways by type of technology
Source: Derived from IPCC 2022 – IPCC WGIII Mitigation of Climate Change, Technical Summary. *Additional.

Identification of possible criteria against which to assess CDR technologies and CCUS activities

1. the **identification of gaps** in the existing IPCC Guidelines for specific anthropogenic sinks or sources; or the identification of relevant existing sources and sinks where an elaboration of the Guidelines is considered desirable;
2. the **delineation** of the anthropogenic sink or source to be estimated;
3. the current and **expected significance** of the anthropogenic activity;
4. the knowledge available to generalize an IPCC Tier 1 methodology applicable under any national circumstances:
    a. availability of necessary **activity data** to implement the methods (readily available national or international statistics); and
    b. the ability to specify **tier 1 default values**:
5. the feasibility of being able to specify **higher tier methods** for use by inventory compilers
6. guidance for inventory compilers as to how they may be able to devise appropriate **verification** activities.

IPCC Guidelines

- IPCC classification system of sources and sinks
- For each source and sink:
  - Tier 1 estimation method
  - Higher tier estimation methods
  - Quality Assurance/Quality Control [verification]
  - Uncertainty
  - Reporting for transparency
    - Not life cycle

Some basic definitions to underpin discussion

- **Sink** - means **any** process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere (*UNFCCC*).
  - Examples of sink activities include Direct Air Capture technologies and photosynthesis.
- **Source** - means any process or activity which releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas **into the atmosphere** (*UNFCCC*).
- **Emissions** - means the release of greenhouse gases and/or their precursors **into the atmosphere** over a specified area and period of time (*UNFCCC*).
- TSU Note: **Removals** - are the consequence of sink activities. One removal corresponds to 1 tonne of carbon dioxide removed from the atmosphere and, if by human activities, is counted as a negative contribution to the national total net carbon dioxide emissions in a national inventory

Completeness of inventories

- The IPCC Guidelines are complete

  - the latest IPCC Guidelines for National Greenhouse Gas Inventories do not include an accounting methodology for DAC, meaning that CDR associated with DAC cannot be counted towards meeting international mitigation targets under the United Nations Framework Convention on Climate Change.

    - Executive summary – Direct Air Capture 2022 – Analysis - IEA

- The IEA is not correct
- ‘Other’ categories have always been able to be used by reporters using nationally-derived methods.
  - However: should the existing IPCC classification system be elaborated?
- Another note: IPCC does ‘estimation’ and ‘reporting’ and not ‘accounting’ which is the domain of parties to the UNFCCC/Paris Agreement.

National methods

- For use by national inventory compilers in estimation of national greenhouse gas emissions
- Not project-based methods
- **Territorial -** National inventories should include anthropogenic greenhouse gas emissions and removals taking place within national territory and offshore areas over which the country has jurisdiction
  - (*2019 Refinement to the 2006 IPCC Guidelines, Vol 1.1.1 page 1.6*).

Estimators for anthropogenic removals

- What is an anthropogenic removal?
  - means that greenhouse gas emissions and removals included in national inventories are a result of human activities (*2019 Refinement to the 20006 IPCC Guidelines Vol 1.1.1 page 1.5*).

- What is the estimator for anthropogenic removals?
  - An issue for enhancement of natural processes…..

- Is it possible to disentangle anthropogenic from natural influences in the observed data?
  - Consider, for terrestrial vegetation….Managed Land Proxy…
    - which says, if this may not be possible, all emissions and sinks on the land may be estimated and attributed to anthropogenic…

Comparability

- Methods should not be considered in isolation
- Should consider comparability of approaches across various CDR technologies
- Should compare new proposals with existing methods/verification requirements for existing sources and sinks
  - For example, consistency of approaches to assessments of permanence/leakage across various carbon storage types
  - Existing examples include:
    - Forests and other vegetation
    - soils

Thank you

https://www.ipcc-nggip.iges.or.jp/index.html

https://www.ipcc-nggip.iges.or.jp/meeting/meeting.html

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