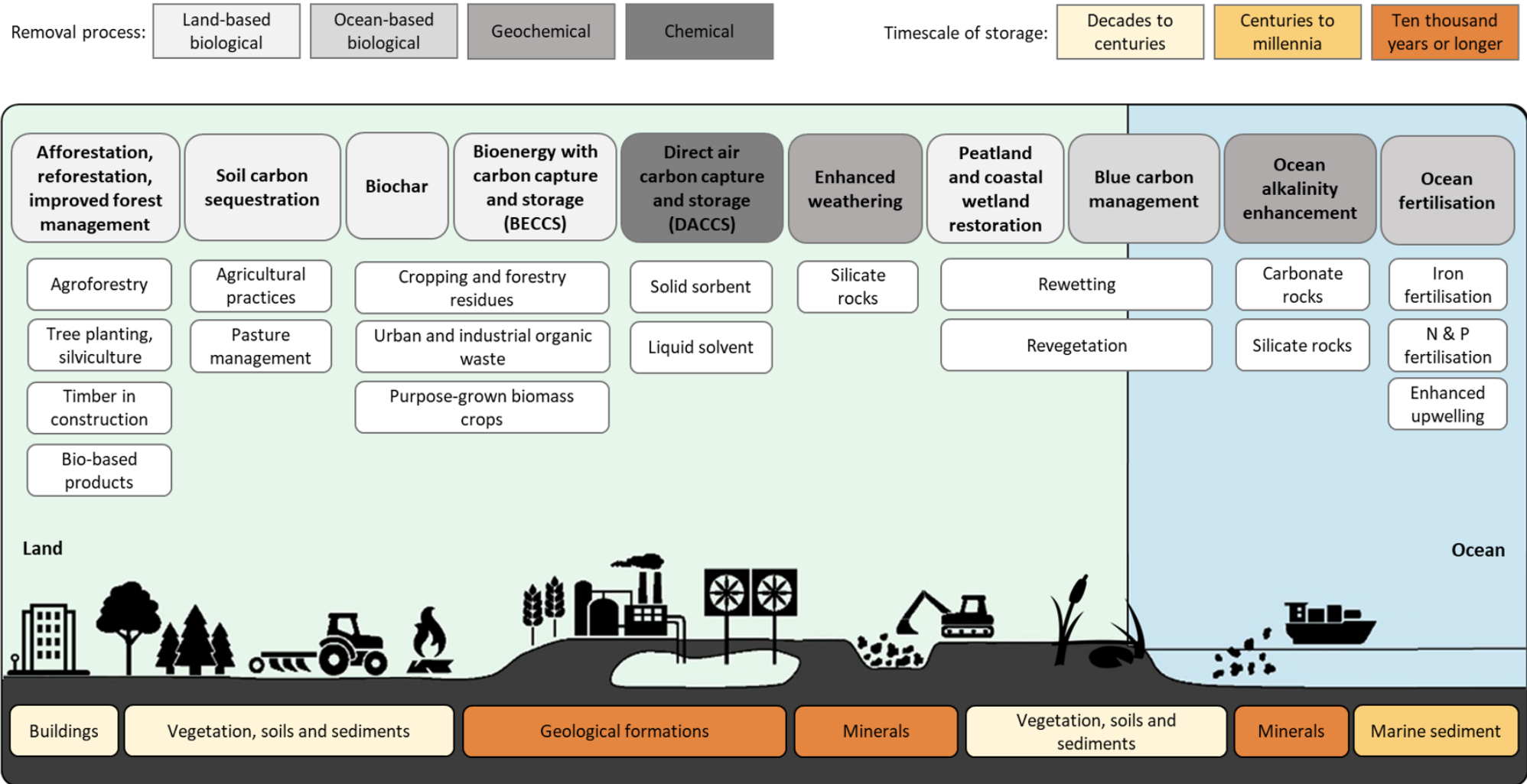


# **Carbon Dioxide Removal and Carbon Capture Utilisation and Storage in AR6 WGIII**

## Carbon Dioxide Removal {WGIII SPM C.11.1}

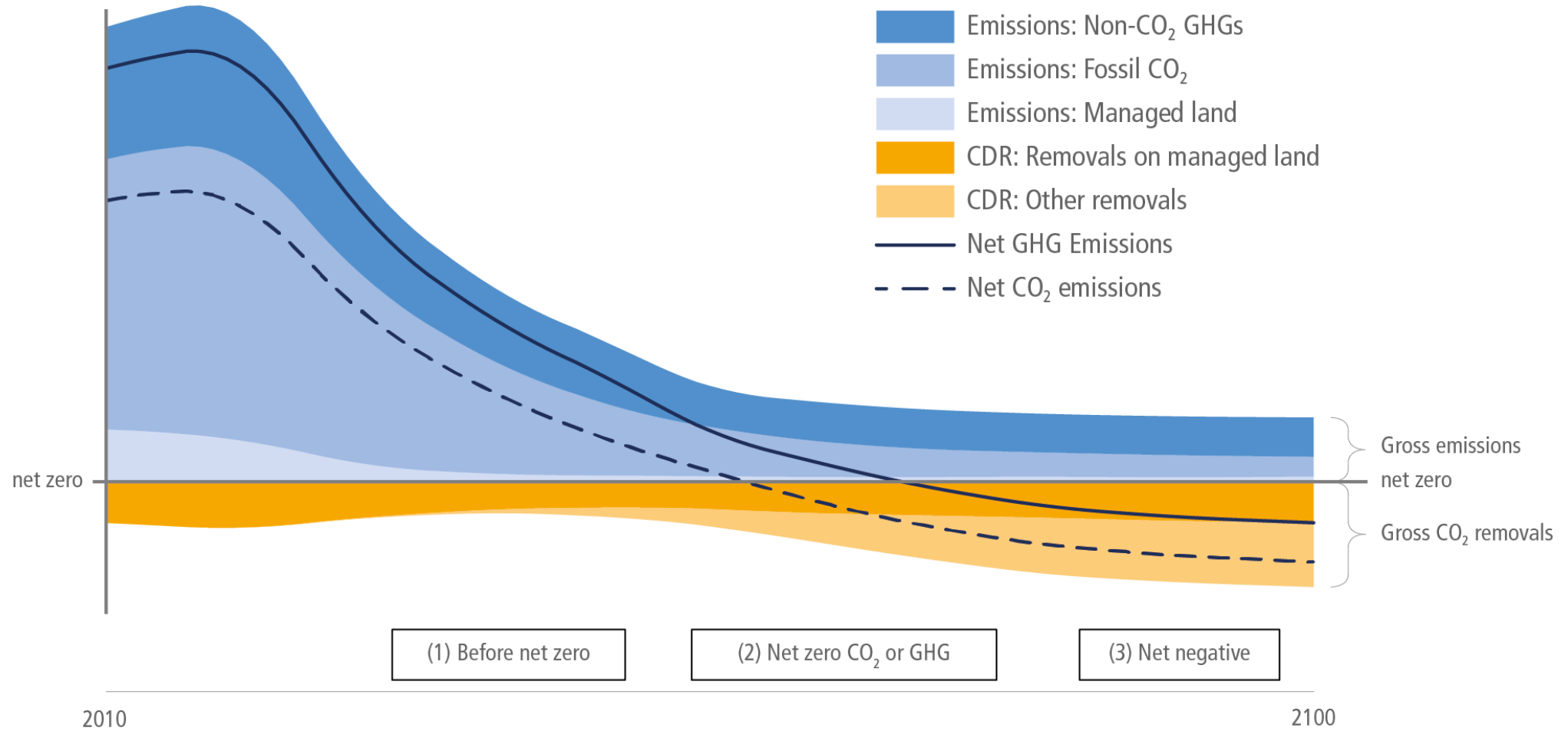
- CDR refers to anthropogenic activities that remove CO<sub>2</sub> from the atmosphere and store it durably in geological, terrestrial, or ocean reservoirs, or in products.
- CDR methods vary in terms of their maturity, removal process, time scale of carbon storage, storage medium, mitigation potential, cost, co-benefits, impacts and risks, and governance requirements (*high confidence*). Specifically, maturity ranges from lower maturity (e.g., ocean alkalisation) to higher maturity (e.g., reforestation); removal and storage potential ranges from lower potential (<1 GtCO<sub>2</sub> yr<sup>-1</sup>, e.g., blue carbon management) to higher potential (>3 GtCO<sub>2</sub> yr<sup>-1</sup>, e.g., agroforestry); costs range from lower cost (e.g., USD-45–100 per tCO<sub>2</sub> for soil carbon sequestration) to higher cost (e.g., USD100–300 per tCO<sub>2</sub> for DACCS) (*medium confidence*). Estimated storage time scales vary from decades to centuries for methods that store carbon in vegetation and through soil carbon management, to 10,000 years or more for methods that store carbon in geological formations (*high confidence*).
- The processes by which CO<sub>2</sub> is removed from the atmosphere are categorised as biological, geochemical or chemical.
- Afforestation, reforestation, improved forest management, agroforestry and soil carbon sequestration are currently the only widely practiced CDR methods (*high confidence*).

# Carbon Dioxide Removal Taxonomy



# Roles of CDR in global or national mitigation strategies

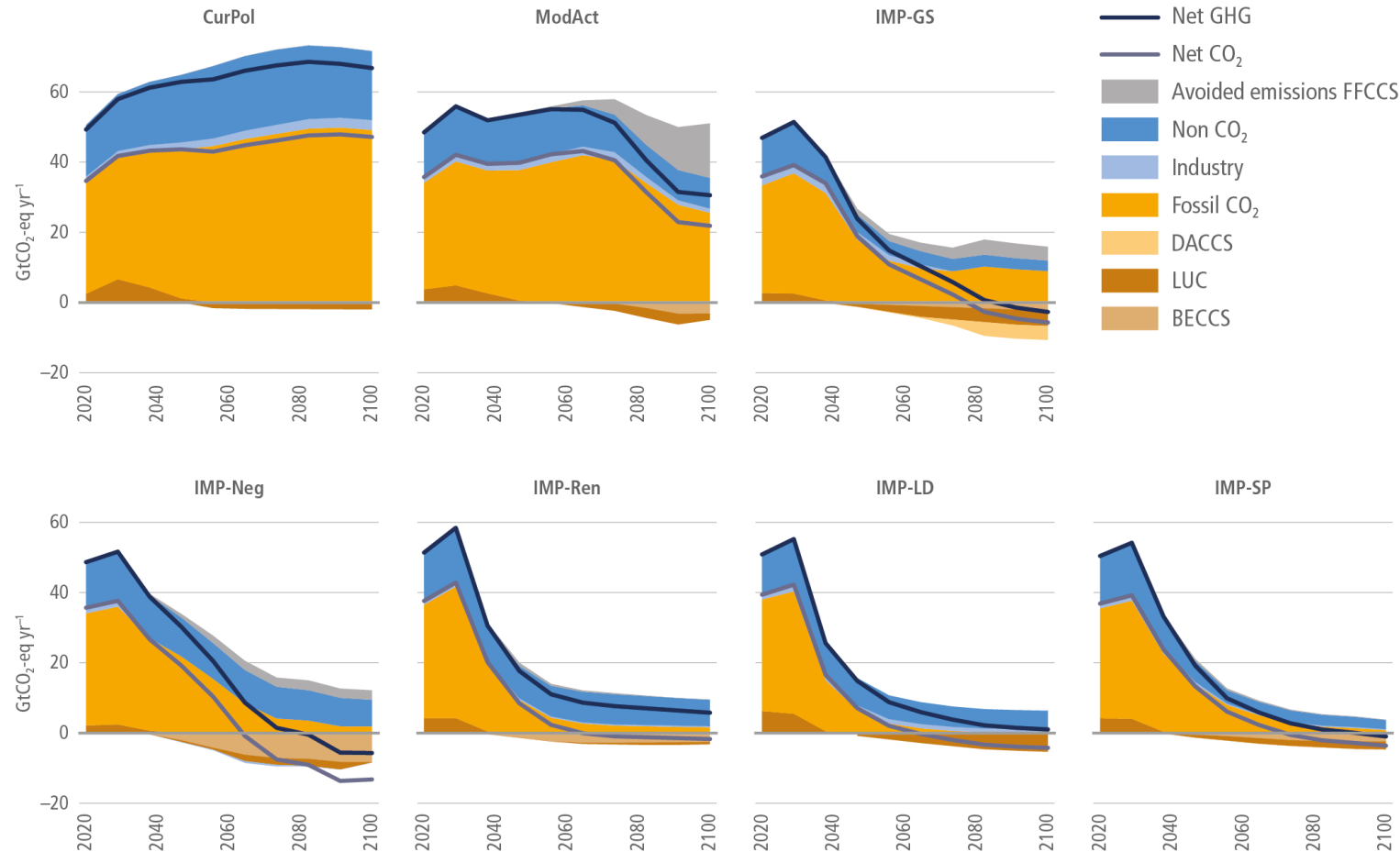
Greenhouse gas emissions (stylised pathway)



## Carbon Capture and Storage {WGIII SPM C.4.6, SYR Footnote 47}

- CCS is an option to reduce emissions from large-scale fossil-based energy and industry sources, provided geological storage is available. When CO<sub>2</sub> is captured directly from the atmosphere (DACCS), or from biomass (BECCS), CCS provides the storage component of these CDR methods.
- CO<sub>2</sub> capture and subsurface injection is a mature technology for gas processing and enhanced oil recovery. In contrast to the oil and gas sector, CCS is less mature in the power sector, as well as in cement and chemicals production, where it is a critical mitigation option.
- The technical geological CO<sub>2</sub> storage capacity is estimated to be on the order of 1000 GtCO<sub>2</sub>, which is more than the CO<sub>2</sub> storage requirements through 2100 to limit global warming to 1.5°C, although the regional availability of geological storage could be a limiting factor.
- If the geological storage site is appropriately selected and managed, it is estimated that the CO<sub>2</sub> can be permanently isolated from the atmosphere.
- Implementation of CCS currently faces technological, economic, institutional, ecological-environmental and socio-cultural barriers. Currently, global rates of CCS deployment are far below those in modelled pathways limiting global warming to 1.5°C or 2°C. Enabling conditions such as policy instruments, greater public support and technological innovation could reduce these barriers. (*high confidence*)

# The residual fossil fuel and industry emissions, carbon dioxide removal (CDR) {LUC, DACCS, BECCS}, and non-CO<sub>2</sub> emissions (using AR6 GWP-100) for each of the seven illustrative pathways (IPs)



# Methodology Report on CDR technologies, Carbon Capture Utilization and Storage

## **Mandate to produce Methodology Report on CDR technologies, Carbon Capture Utilization and Storage**

- IPCC 60 (2023) decided that the TFI will produce two Methodology Reports during the AR7 cycle
  - Short-lived Climate Forcers (SLCFs)
  - Carbon Dioxide Removal Technologies, Carbon Capture Utilization and Storage.
- The two processes will overlap, and both Reports will be completed together by the end of 2027.



## Expert Meeting on CDR/CCUS

- An Expert Meeting will be held July 2024
- This Expert Meeting will aim to collect evidence and information about
  - gaps in the existing guidance or where existing guidance might be updated and elaborated
  - capacity to rigorously specify IPCC methodologies.
  - knowledge gaps and any specific areas or issues to be prioritized in the development of methodologies.
- The discussions in the Expert Meeting will feed into the Scoping Meeting, to be held later in 2024.

## Some points for consideration at the Expert Meeting

1. Identification of gaps in the existing IPCC Guidelines; or the identification of sources and sinks where elaboration of the Guidelines is desirable;
2. Delineation of the anthropogenic sink or source to be estimated and current and expected significance of the activity;
3. Knowledge available to develop an IPCC Tier 1 methodology applicable under any national circumstances:
4. feasibility of being able to specify higher tier methods; and
5. guidance on how to devise appropriate verification activities.

# Report Process | Ten Steps

## 1 Scoping

The outline is drafted and developed by experts nominated by governments and observer organizations.

## 2 Approval of Outline

The Panel approves the outline.

## 3 Nomination of Authors

Governments and observer organizations nominate experts as authors.

## 4 Selection of Authors

The Bureau selects authors.

## 5 Expert Review First Order Draft (FOD)

Authors prepare a first draft which is reviewed by experts.

## 6 Government and Expert Review Second Order Draft (SOD)

The second draft of the report and first draft of the Summary for Policymakers (SPM) are reviewed by governments and experts.

## 7 Final Draft Report and SPM

Authors prepare final draft of the report and SPM which are sent to governments.

## 8 Government Review of Final Draft SPM

Governments review the final draft in preparation for its approval.

## 9 Approval & Acceptance of Report

Working Group/Panel approves SPM and accepts reports.

## 10 Publication of Report

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