Breakout Group 3

Biogenic processes and storage

Vienna, Austria – 2 & 3 July 2024

Andrew Lenton
Bamikole Jacques Kouazounde
Bong-Oh Kwon
Claudia Kammann
Dominic Woolf
Jan Fuglestvedt
Giacomo Grassi
Maheswar Rupakheti
Maria Jose Sanz Sanchez
Marta Camps Arbestain
Martial Bernoux
Rizaldi Boer
Stephen Ogle

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Breakout Group main objectives

1. Discuss and refine the **evaluation criteria**.

2. Learn about new **CDR** based on biological processes and develop methods for estimating CO_2 capture and long-term storage.

3. Identify and highlight potential important **issues for future meetings and authors** of the methodological guide.

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Guiding Questions:

Appendix

Framing issue

- “Technology” issue:
  - In the absence of clear definition we assume all what was considered is “technology”;
  - depending the definition that will be adopted this can have impact/consequences on the “anthropogenic” approach for the AFOLU which is based on manage land proxy.

- We discuss both completely new methods as well as refining methods
- Geographical scope: our discussion went beyond land into territorial waters

CDR pathways

Original table for BOG3

Group	The IPCC WGIII AR6 Report examples of CDR methods
Anthropogenic biological (photosynthesis) – biomass	• Afforestation/Reforestation • Agroforestry • Improved Forest Management • “Blue carbon management” in coastal wetlands
Anthropogenic biological (photosynthesis) – soils and waterways	• Soil carbon sequestration in croplands and grasslands • Peatland and coastal wetland restoration • Biochar

Source: Derived from IPCC 2022 – IPCC WGIII Mitigation of Climate Change, Technical Summary.

*Additional – not included in the source data

CDR pathways

Group	The IPCC WGIII AR6 Report examples of CDR methods	Q3-Taxonomy	Q4—Methodology
Anthropogenic biological (photosynthesis) – **biomass**	• Afforestation/Reforestation	• No	• No need for improvement at Tier 1; No need for improvement > Tiers.
	• Agroforestry	• No	• May be (update EF1 – Cstock **or** EFDB update)
	• ~~Improved~~ Forest Management	• No	• No need for improvement at Tier 1; No need for improvement > Tiers.
	• "Blue carbon management" in coastal wetlands (seagrass meadow, macro algae)	• Yes	• Develop Tier 1 EF (not covered in Wetlands Supplement - Chapter Coastal Wetlands) for seagrass, tidal marshes; develop Tier 1 EF for macro algae#. Develop Tier 2 (but see "Guidance for authors on taxonomy"); Lateral transfer of biomass
	• Ocean fertilization	• No*	• No

*In view of international agreements allowing or prohibiting certain activities, e.g. according to the **London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter**); no clear evidence of C sequestration from experiments (satellite monitoring); issue of national boundaries (less nutrient limitation in territorial waters: probably more affected in open ocean – international waters - that in territorial waters)

Most probably not enough information to develop Tier 1 EF

VERIFICATION: Blue Carbon: might be challenging due to lateral transfer (floating biomass) in the tidal zone

CDR pathways

Group	The IPCC WGIII AR6 Report examples of CDR methods	Q3-Taxonomy	Q4—Methodology (Tier1)
Anthropogenic biological (photosynthesis) – **soils and waterways**	• Soil carbon sequestration in croplands and grasslands	No	• Tier 1 - May be: SOCref possible to develop for deeper depths; inputs/LU factors might be updated and extended to a deeper depth); Could consider develop an alternative Tier 1 approach taking into account changes before and after 20 years for LUC, or at least elaboration on the impact (box) • > Tiers: additional guidance to consider DEM at Tier 3 level)
	• Organic Soils and Peatland ~~and coastal wetlands~~ restoration	Yes*	• Tier 1: Not sure (no expert in the BOG). Default EF1 factors in the 2013 Wetland Supplement - Chapter 3: Rewetted Organic Soil, might be updated; Update the DOC EF; Develop lateral transfer (DIC, POC); Revisit EF Tier 1 for CH4 and N2O. Consider stratify EF based on water table depth • > Tiers: Lateral transfer (DIC, POC); Probably enough new science to consider the impact of the water table level at higher Tiers.
	• "Blue carbon management" in coastal wetlands (mud flats,seagrass bed, subtidal sediments)	Yes	• Tier1: might expand (sea grass) or develop (mud flats and subtidals), considering DIC, DOC, POC; • > Tiers: Need to considered lateral transfer of sediment;

VERIFICATION: Soil C (Possible and guidance available as needed); Blue Carbon: might be challenging for the sediments, due to lateral transfer in the tidal zone

CDR pathways

Group	The IPCC WGIII AR6 Report examples of CDR methods	Q3-Taxonomy	Q4—Methodology (Tier1)
Anthropogenic biological (photosynthesis) – **soils and waterways**	• Biochar	Yes	• No Tier 1 for soil, (Basis for future methodological development of a Tier1 method in Appendix, but only for cropland/grassland); Need to consider the effect on the direct N_2O emissions. • Develop/update information on derivation of FC_p and $Fperm_p$ values need to be considered (including evaluate the feasibility of develop alternative methods based on pyrolysis temperature or ratios, e.g. H/OC). • Consider expands at Tier1 to other land use (settlement, wetlands, forest) and other sectors (e.g. construction material) • Develop production level (sub)category for Biochar and **consider the trade issue in the methodology** to avoid double counting, based on where the biochar is applied. • Production of syngas and oil in the Energy Sector and potential for storage in geological reservoir. • > Tiers: Some guidance already available. Impacts of different soil types / Impact of climate zones on EFs (for biochar with H/OC between 0.4 and 0.7) where it is applied; Considered eventual priming effect for verification.

VERIFICATION: Biochar consider using available registry on biochar/CDR at country level; Verification at production phase seems not an issue, might be more complex at application side

CDR pathways

Issues for cross bog discussion

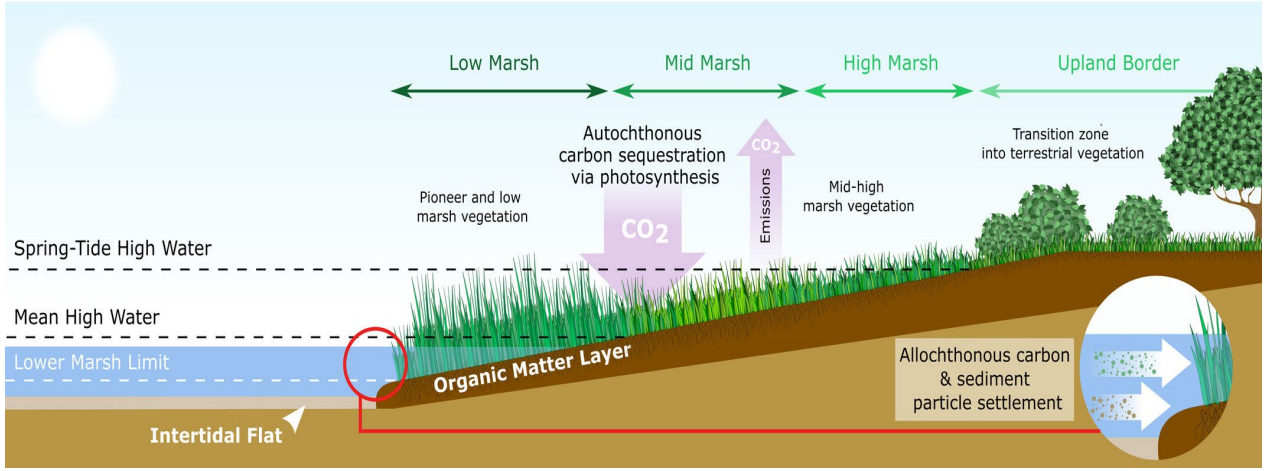
Group	The IPCC WGIII AR6 Report examples of CDR methods	Q3-Taxonomy	Q4—Methodology
Anthropogenic biological (photosynthesis) – **Soils? <u>Oceans? Or geological reservoirs</u>**	• Biomass burial, Slurry and Oil*	• May be (new category [on top of] HWP or waste)	• May be not enough information for EF Tiers; Need a taxonomy (type of burial, type of material: raw, dried, processed, etc); need to consider all GHGs (likely not enough science/information); • > Tiers: no further consideration

* Risk of leakage on mid to long-term to be evaluated (risk of pollution from the “products” and/or “additives” and/or “packaging”); Loss of carbon and/or nutrients for the terrestrial or ocean agro-ecosystems; Changing oxygen levels in oceans; Impact on the waste sectors; National regulations/laws on waste/biomass deposition; Ensure the loss of biomass and the GHG associated with the production, is counted in the productive system(s); international trade and potential issues with double counting (similar to HWP); Verification: not feasible if ocean, should be possible in terrestrial.

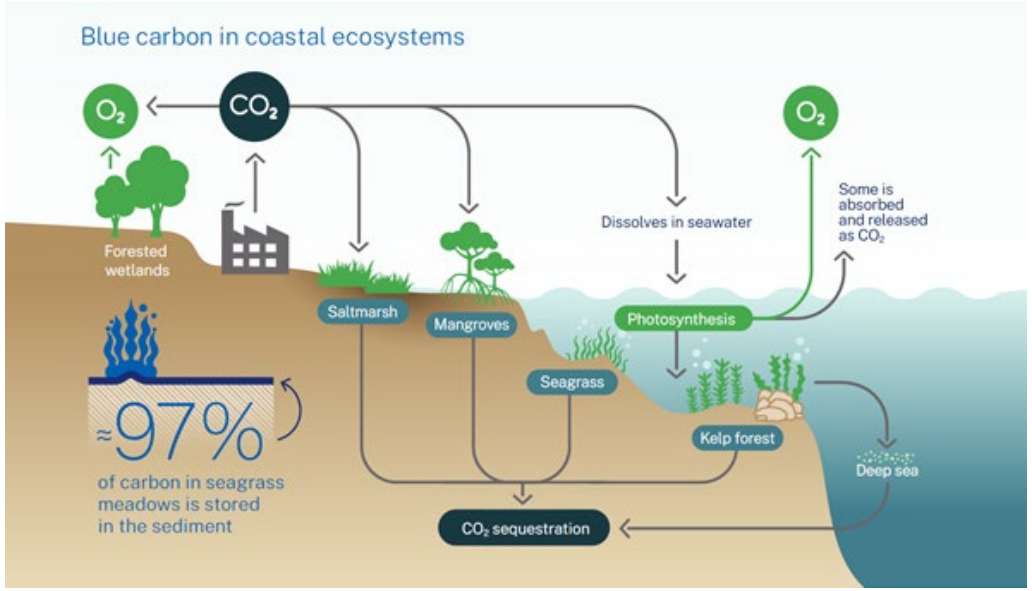
Further guidance for authors for “blue carbone”

- **Consider developing a clear taxonomy for “Blue carbon management” in coastal wetlands**
- **Consider different species for each ‘subcategory’**
- **Potential lateral transfer (potential double counting in sediments)**

https://cdn.naturalresources.wales/media/692035/nrw-evidence-report-428_blue-carbon_v11-002.pdf



https://onlinelibrary.wiley.com/doi/10.1111/gcb.16943



https://www.environment.nsw.gov.au/topics/water/coasts/blue-carbon-strategy

Thank you all!

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