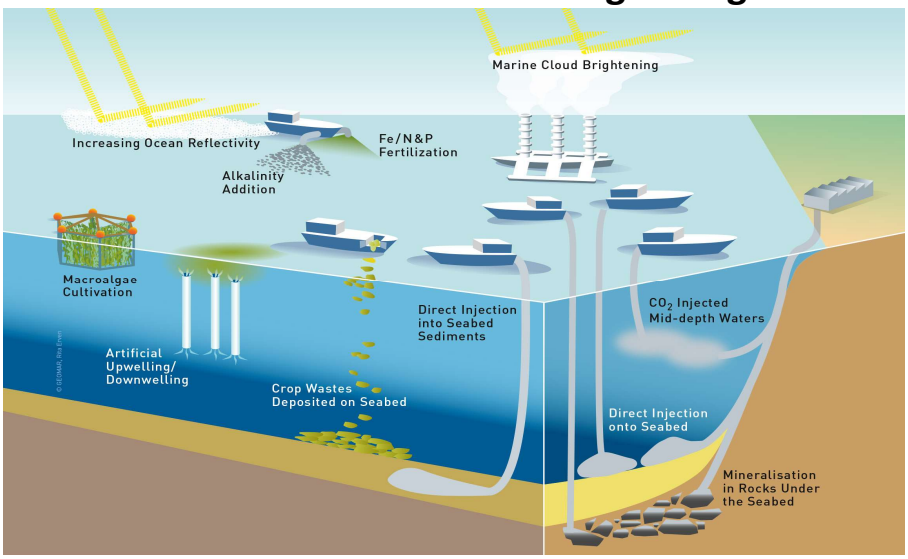
Progress made by GESAMP Working Group 41 on 'Ocean interventions for climate change mitigation'



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GESAMP Working Group 41 on 'Ocean Interventions for Climate Change Mitigation' (formerly the Working Group on Marine Geoengineering)

WG 41 objectives:

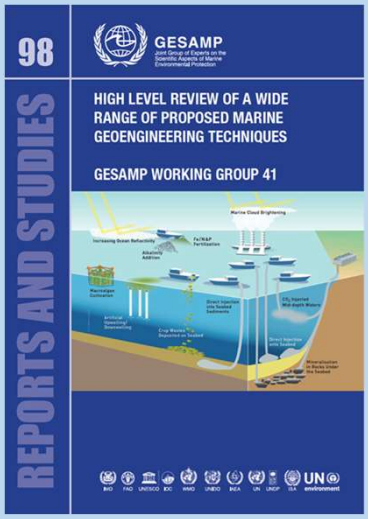
1. Better understand the potential environmental and socio-economic impacts of different marine climate intervention approaches: and
2. To provide advice to the London Protocol Parties to assist them in identifying those marine climate intervention techniques that it might be sensible to consider for listing in the new annex 4 of the Protocol

LC&P LONDON CONVENTION AND PROTOCOL

WG 41 first phase:

Carried out a '***High level review of a wide range of proposed marine geoengineering techniques***', published in March 2019.

This is the first study to comprehensively examine the many proposed ways in the marine environment to remove CO_2 from the atmosphere or boost the reflection of incoming solar radiation to space (termed "albedo modification") - or, in some cases, both.



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1. GESAMP Working Group 41 Overall Objectives for the Second Phase of Work*:

1. to better understand the potential environmental and societal impacts of different ocean interventions for climate change mitigation on the ocean;
2. to develop a framework to integrate inputs from natural sciences and societal disciplines into a holistic assessment of ocean interventions for climate change mitigation or other purposes; and
3. to provide advice to the London Protocol Parties to assist them in identifying those ocean interventions for climate change mitigation, or other purposes, consistent with the London Protocol's definition of marine geoengineering, that it might be prudent to consider for listing in the new Annex 4 of the Protocol.

* http://www.gesamp.org/site/assets/files/1723/new_tor_wg41_as_approved.pdf

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2. GESAMP Working Group 41 – Key Terms of Reference* - Part 1

1. Provide advice to the London Protocol Parties:

a) identifying promising ocean interventions for climate change mitigation or other purposes …that might be worthwhile to consider for listing in the new annex 4 of the Protocol, including techniques having the potential to move to field testing;

b) developing an outline of the specific issues to be addressed in an assessment framework for each of a subset of techniques identified above, using the OFAF as a template;

c) providing an initial assessment of monitoring and verification approaches; and

d) identifying significant gaps in knowledge and uncertainties.

* http://www.gesamp.org/site/assets/files/1723/new_tor_wg41_as_approved.pdf

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2. GESAMP Working Group 41 – Key Terms of Reference* - Part 2

2. Develop a framework to integrate inputs from natural sciences and societal disciplines into a holistic assessment of ocean interventions for climate change mitigation or other purposes consistent with the London Protocol's definition of marine geoengineering;

3. Develop a flow chart and questionnaire with associated guidance to elicit information from proposers of ocean interventions for climate change mitigation or other purposes consistent with the London Protocol's definition of marine geoengineering, to enable a preliminary assessment (including constructive feedback) of their techniques by regulators, policy makers, funders or anyone considering or permitting proposals.

* http://www.gesamp.org/site/assets/files/1723/new_tor_wg41_as_approved.pdf

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3. Integrated Assessment Framework - 1

Progress is being made with the framework. Points to note:

1. All discussions to date have been online;
2. A systems approach has been adopted as recommended by March 2019 workshop – see next slides;
3. Integrating natural and social sciences has been challenging and required a number of meetings to reach a common understanding e.g., issues of language;

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3. Integrated Assessment Framework - 2

The systems approach has been based on:

1. The DPSIR (Driver, Pressure, State, Impact and Response) approach that has been developed into the DAPSI(W)R(M) approach (Drivers, Activities, Pressures, State or State Changes, Impact (on Human Welfare), Response (as Management Measures) – Elliott et al. (2017).
2. The 10-tenets of adaptive management and sustainability – Barnard and Elliott (2015);
3. A German framework for assessing the feasibility of CO2 options - Forster et al. (2022)

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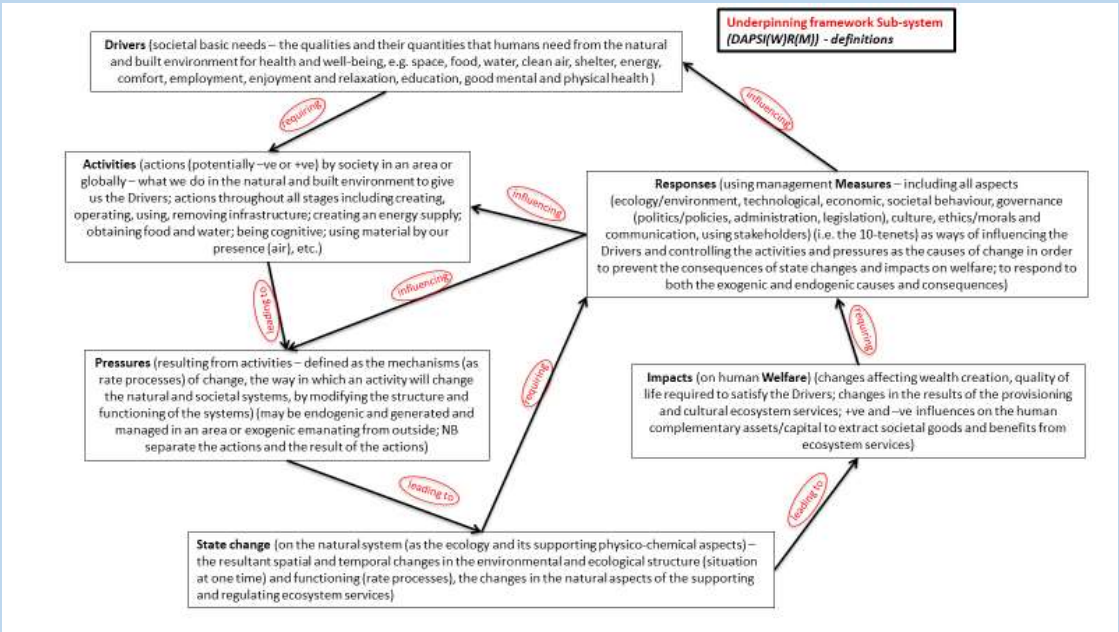
3. Integrated Assessment Framework - DAPSI(W)R(M) approach



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3. Integrated Assessment Framework – The 10 Tenets

The 10 tenets:

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To be successful, management measures or responses to changes resulting from human activities should be:

- Ecologically sustainable
- Technologically feasible
- Economically viable
- Socially desirable/tolerable
- Legally permissible
- Administratively achievable
- Politically expedient
- Ethically defensible (morally correct)
- Culturally inclusive
- Effectively communicable

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3. Integrated Assessment Framework – German framework

frontiers | Frontiers in Climate

ORIGINAL RESEARCH
published: 02 May 2022
doi: 10.3389/fclim.2022.758628

Framework for Assessing the Feasibility of Carbon Dioxide Removal Options Within the National Context of Germany

Johannes Förster[1*], Silke Beck[1], Malgorzata Borchers[2], Erik Gawel[3], Klaas Korte[3], Till Markus[4], Nadine Mengis[5], Andreas Oschlies[5], Romina Schaller[4], Angela Stevenson[6], Terese Thoni[1] and Daniela Thrän[2,7]

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3. Integrated Assessment Framework – draft assessment skeleton

Meta level assessment principles *Research and innovation of ocean interventions should be guided by:*	**Macro level assessment tenets** *Ocean intervention measures should be:*	**Meso level assessment criteria**	**Micro level assessment indicators**	**Traffic light / assessment outcomes**

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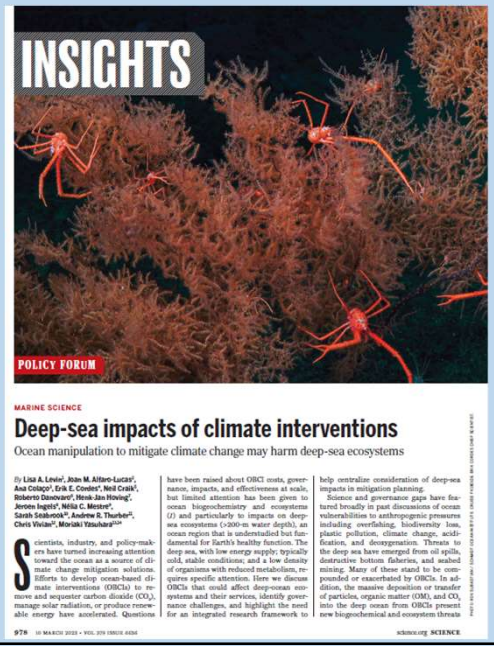
4. Blue Carbon sub-group

- Mangroves, salt marshes and seagrass beds are often referred to as coastal blue carbon ecosystems and coastal seaweed beds can also be included in this definition.
- Marine sediments, in particular fine-gained ones, have been included within the definition of blue carbon by some authors. However, their significance for long-term sequestration is unclear.
- The sub-group agreed:
  - ➢That there was no need to address restoration of coastal blue carbon ecosystems since there was much activity on this globally;
  - ➢The sub-group agreed to focus its work on those ecosystems where it may be possible to increase natural sequestration rates, i.e., saltmarshes and mangroves e.g., placement of dredged material – Baptist et al. (2019). Suedel et al. (2021), CDR Academy (2023);
  - ➢The other blue carbon ecosystems i.e., seagrasses and seaweed beds are those where we should encourage interventions associated with habitat protection, restoration and creation.
- However, note Williamson and Gattuso (2022) paper suggesting that carbon removal using coastal blue carbon ecosystems is uncertain and unreliable, with questionable climatic cost-effectiveness

Recent Paper



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Barnard, S. and Elliott, M. (2015) The 10-tenets of adaptive management and sustainability: A holistic framework for understanding and managing the socio-ecological system. Environmental Science and Policy 51: 181-191. https://www.sciencedirect.com/science/article/abs/pii/S1462901115000817?via%3Dihub

Baptist et al. (2019) Beneficial use of dredged sediment to enhance salt marsh development by applying a 'Mud Motor'. Ecological Engineering 127, 312-323. https://www.sciencedirect.com/science/article/pii/S0925857418304361

CDR Academy: 'Forests and tidal wetlands recording' - The tidal wetlands presentation starts at 31:35 minutes. In the 3rd part of that presentation starting at 54:00 minutes it deals with 'Enhanced blue carbon: Alkaline sand amendment to salt marsh soil as a approach to increase carbon sequestration' where they are using olivine sand - https://www.nacarbon.org/nacp/assets/CDR_Videos/CDR%20Academy_Forests%20and%20tidal%20wetlands.mp4

Elliott, M., (2015) "And DPSIR begat DAPSI(W)R(M)!" - A unifying framework for marine environmental management. Marine Pollution Bulletin 118: 27–40. https://www.sciencedirect.com/science/article/pii/S0025326X17302692?via%3Dihub

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