

EMB POLICY BRIEF

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Blue Carbon

Challenges and opportunities to mitigate
the climate and biodiversity crises

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Challenges and opportunities to mitigate the climate and biodiversity crises

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What is Blue Carbon?

- **Traditional definition:** Mangroves, tidal marshes and seagrasses (coastal vegetated ecosystems with rooted vegetation)
- **Expanded definition:** also coastal, shelf and offshore marine sediments, where carbon is buried and stored
- **Other components of the biological carbon cycle:**
 - The deep Ocean, whales, fish stocks
 - Kelp and macroalgae (absorb CO₂ but do not bury it)
 - Calcifying organisms (e.g. maerl and shellfish) – emit CO₂ as they calcify

In this policy brief:

Coastal vegetated ecosystems with rooted vegetation & marine coastal, continental shelf and offshore sediments

The most important issue is the long-term storage of carbon



Mangrove forest in Guadeloupe, France

The benefits of Blue Carbon ecosystems

Protection and restoration of Blue Carbon ecosystems as a Nature-based Solution

- Climate change mitigation (in the long-term)
- Co-benefits include marine biodiversity (habitat / food provision)
- Stabilises livelihoods, protect coasts (e.g. storms and floods) and support other societal needs such as food security from the Ocean

Limitations

- Effectiveness limited by available space
 - Maximum mitigation ~ 2% of our current global emissions
 - Climate change can reduce effectiveness (e.g. loss of space, negative impacts of warming, drought)
- Essential to also drastically reduce greenhouse gas emissions
- Keep global warming close to 1.5°C above pre-industrial



Saltmarshes in an estuary in UK



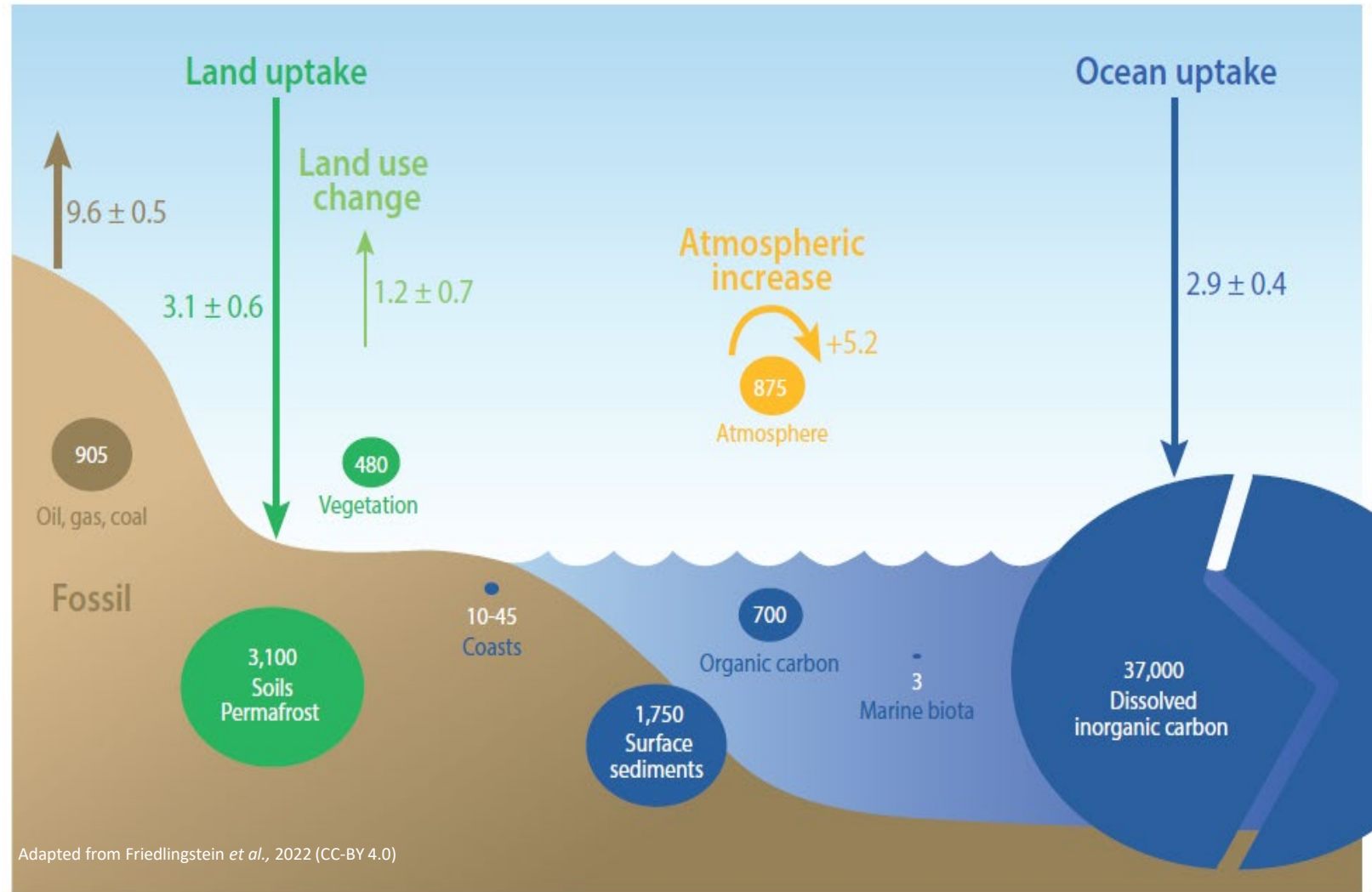
Oystercatcher in coastal sediments in Ireland

The role of the Ocean in the carbon cycle

The global carbon cycle

The Ocean currently takes up ~25% of all CO₂ emissions each year

- This uptake will diminish in the future with more greenhouse gas emissions
- CO₂ in seawater can be released back into the atmosphere (timescale correlates with depth)



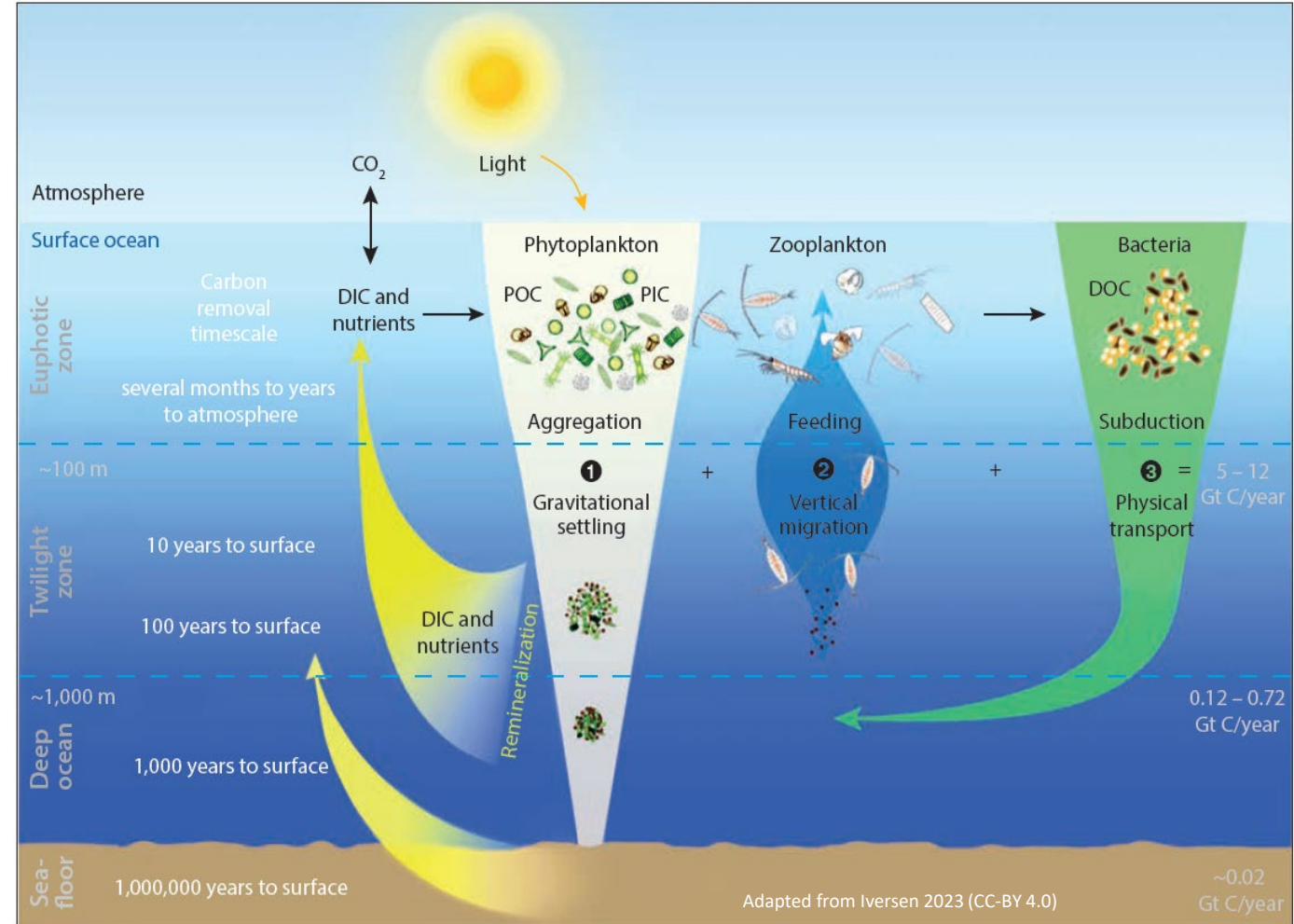
The role of the Ocean in the carbon cycle

The Biological Carbon Pump (BCP)

Transport of organic carbon from surface to deep Ocean

- Includes all living organisms that move carbon around the Ocean
- Small proportion of this carbon is stored in sediments for hundreds to millions of years

→ Helps in building Blue Carbon



Uncertainties and questions on Blue Carbon ecosystem conservation and restoration as a climate change solution

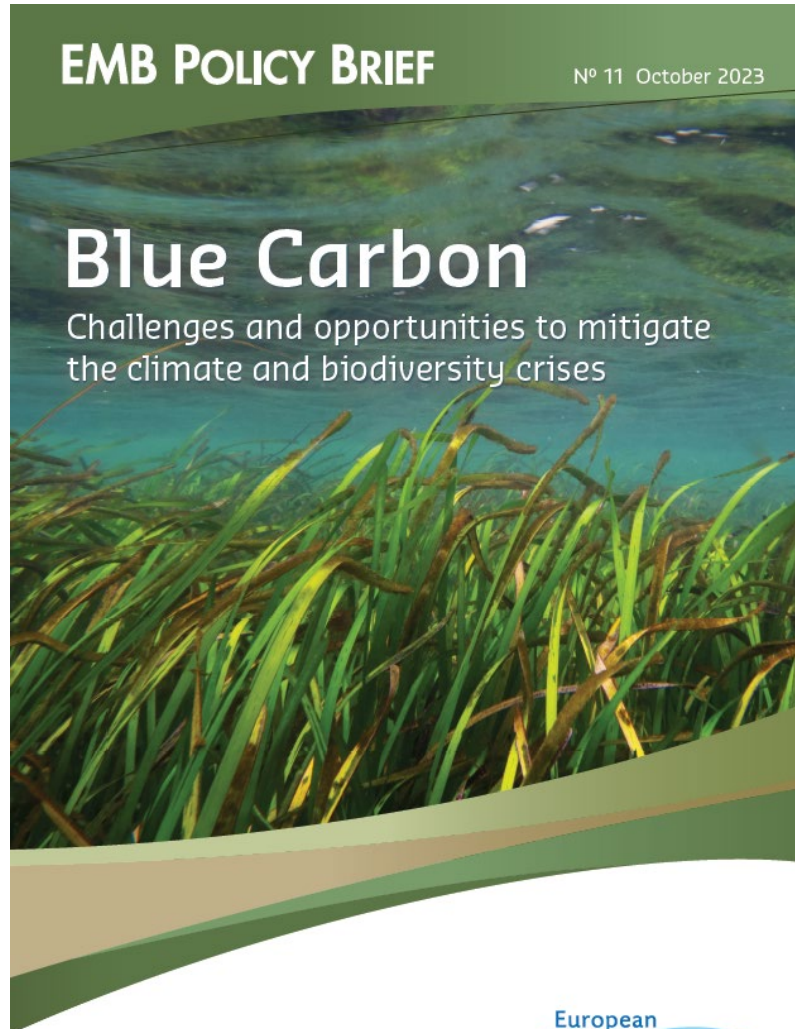
- Limited area available in coastal environments
- High uncertainty in carbon accounting, carbon stocks and flows
- Possible emission of greenhouse gases methane and nitrous oxide (coastal ecosystems)
- Human activities might impact offshore carbon stocks (trade offs on priorities)



Seagrass meadow with exposed root system and sediment, where carbon is buried and stored

Summary and Recommendations

- Funding for further research to:
 - **Reduce uncertainties about the amount of carbon removed and stored by Blue Carbon ecosystems**
 - **Quantify the possible production of methane and nitrous oxide that might arise from coastal restoration efforts over the long term, and impact on greenhouse gas emissions**
 - **Understand the dynamics of offshore carbon stocks and sequestration, and the possible impact of human activities, such as trawling and deep-sea mining**
- Tailored monitoring and observations of carbon (stocks, fluxes, process rates temporal and spatial scales) to **improve our understanding of the global Ocean carbon budget, the biological carbon pumps (BCP, CCP) and sedimentary carbon storage**
- Support sustained observations to **better parameterize processes (e.g. remineralisation, fragmentation, sinking) in carbon cycle models**
- **Promote collaboration between environmental scientists, social scientists and engineers to ensure the integration of Blue Carbon solutions (multi-disciplinary approach)**



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