EMB Policy Brief N°11: Blue Carbon

Blue Carbon

Challenges and opportunities to mitigate the climate and biodiversity crises

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What is Blue Carbon?

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- **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 CO_2 but do not bury it)
  - Calcifying organisms (e.g. maerl and shellfish) – emit CO_2 as they calcify

In this policy brief:

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

Mangrove forest in Guadeloupe, France

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

The benefits of Blue Carbon ecosystems

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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

Saltmarshes in an estuary in UK

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

Oystercatcher in coastal sediments in Ireland

The role of the Ocean in the carbon cycle

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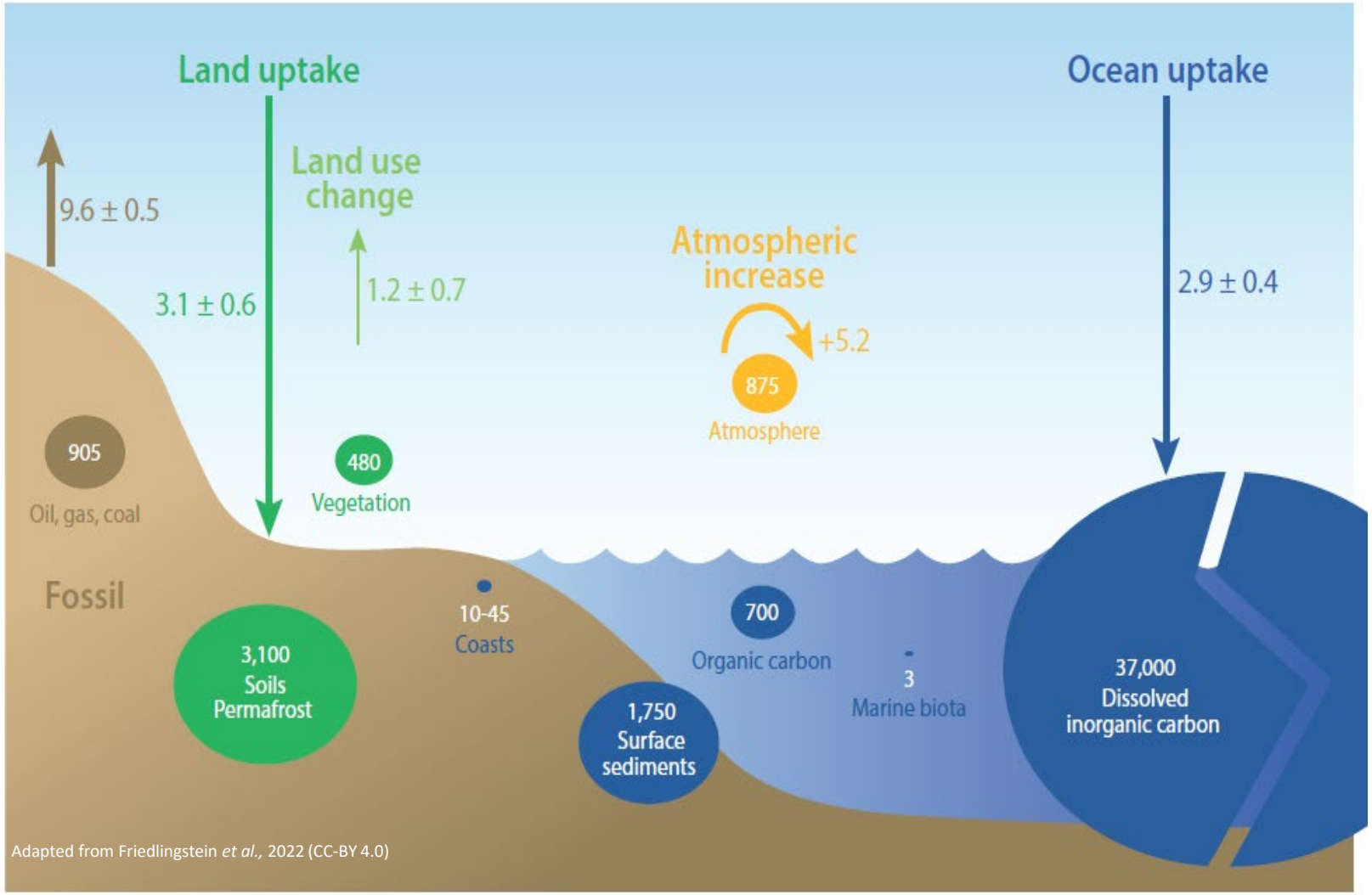
The global carbon cycle

The Ocean currently takes up ~25% of all CO_2 emissions each year

- This uptake will diminish in the future with more greenhouse gas emissions
- CO_2 in seawater can be released back into the atmosphere (timescale correlates with depth)



The role of the Ocean in the carbon cycle

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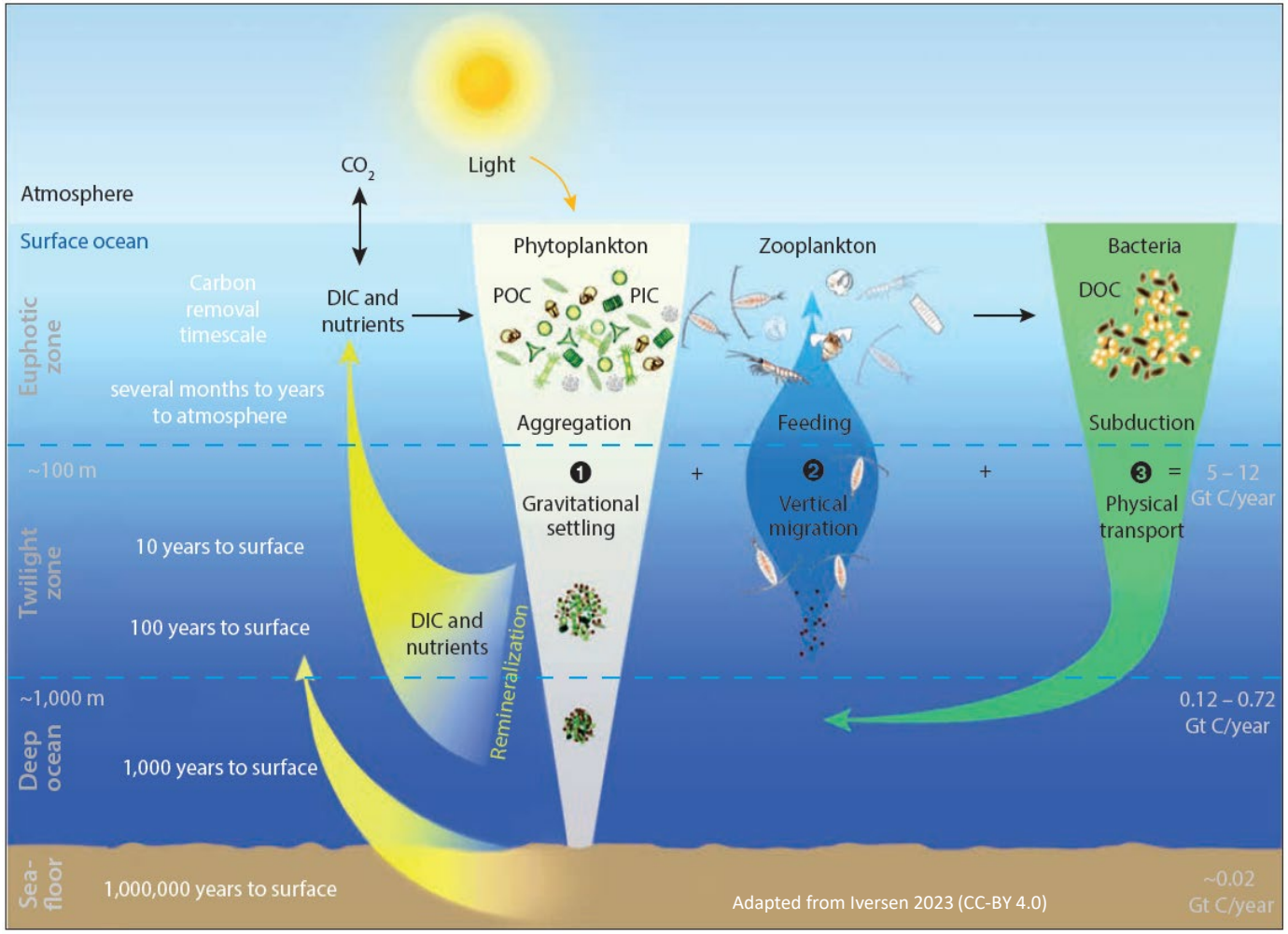
The Biological Carbon Pump (BCP)

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

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- 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

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- 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) 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**)

Download from the EMB website:

https://marineboard.eu/publications/blue-carbon