

BLUE CARBON

WHAT IS BLUE CARBON?

Most of earth's terrestrial carbon stocks are held in peatlands and coastal wetlands, including mangroves, tidal marshes, seagrasses, etc. **The carbon stored in the sediments and plants in these wetlands is known as "blue carbon."** However, one-third of the world's mangrove, seagrass, and salt marsh areas have been destroyed over the past several decades. They are being degraded at devastating rates—in some instances, up to four times that of rainforests, with between 2–7% of blue carbon sinks being lost annually. Restoring and expanding these wetlands and peatlands offers a way to remove carbon dioxide (CO₂) from the atmosphere and store it in the sediments and biomass.

CO-BENEFITS AND CONCERNS

- + **Biodiversity:** coastal wetlands and peatland host biodiverse ecosystems.
- + **Water quality:** wetlands and peatland filter water, enhancing water quality.
- + **Flood control:** wetlands and peatland reduce flooding and protect coasts against storm surges.
- + **Recreation and tourism:** wetlands provide attractive settings for outdoor activities.
- **Non-CO₂ greenhouse gases:** some wetlands, especially peatland, emit potent non-CO₂ greenhouse gases, such as methane, which can offset the climate benefits of carbon removal.
- **Saturation:** wetlands and peatlands can only hold a finite amount of carbon; once they are saturated, societies will no longer be able to sequester more blue carbon.
- **Reversibility:** blue carbon can be released if coastal ecosystems are degraded again; societies would need to maintain appropriate wetland management practices indefinitely. Coastal wetlands may also be vulnerable to sea level rise.
- **Difficulty of measurement:** monitoring and verifying carbon removal via blue carbon is difficult and costly.

POTENTIAL SCALE AND COSTS

Research on the potential scale and costs of blue carbon remains sparse. A recent study of natural climate solutions suggests that up to 29 million hectares of degraded coastal wetlands could be restored, with each hectare sequestering an average of 12.1 tons of CO₂ per year; and up to 46 million hectares of degraded peatland could be restored, with uncertain carbon removal benefits. These ecosystems would saturate in roughly 20 years for peatlands and 50 years for seagrass meadows and tidal marshes, with restored mangroves continuing to sequester carbon for more than a century. Available estimates suggest that wetland restoration might be able to sequester carbon at costs **as low as \$10–100 per ton of CO₂**, far below the value of the co-benefits of restoring blue carbon ecosystems.

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TECHNOLOGICAL READINESS

Methods for restoring degraded wetlands and peatlands are in use and ready for wider adoption. Further research could help figure out how to maximize the benefits of blue carbon projects in different contexts.

GOVERNANCE CONSIDERATIONS

- **Encouraging restoration:** policies and incentives are needed to encourage restoration of degraded wetlands and peatlands and to protect restored and existing blue carbon ecosystems. These could include efforts to integrate coastal management into existing climate policy.
 - **Local land and zoning policies:** local land-use policies can have large implications for blue carbon storage by encouraging or discouraging the preservation and restoration of wetlands and peatlands.
 - **Monitoring, verification, and reporting:** processes, standards, and technologies need to be developed to reliably measure carbon sequestration via blue carbon.
 - For **cross-cutting considerations**, see the [What Is Carbon Removal? Fact sheet](#) on our website.
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FURTHER READING

Carlos M. Duarte et al., “The Role of Coastal Plant Communities for Climate Change Mitigation and Adaptation,” *Nature Climate Change* 3, no. 11 (November 1, 2013): 961–68, [doi 10.1038/nclimate1970](https://doi.org/10.1038/nclimate1970).

Bronson W. Griscom et al., “Natural Climate Solutions,” *Proceedings of the National Academy of Sciences* 114, no. 44 (October 31, 2017): 11645–50, [doi 10.1073/pnas.1710465114](https://doi.org/10.1073/pnas.1710465114).

Peter I. Macreadie et al., “Can We Manage Coastal Ecosystems to Sequester More Blue Carbon?” *Frontiers in Ecology and the Environment* 15, no. 4 (May 10, 2017): 206–13, [doi 10.1002/fee.1484](https://doi.org/10.1002/fee.1484).

For more fact sheets on carbon removal, visit <https://carbonremoval.info/factsheets>.