

Session: Ocean and Science

Blue Carbon Ecosystems

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Blue Carbon refers to the carbon stored and sequestered in vegetated coastal ecosystems or coastal wetlands, mainly mangrove forest, salt marshes and seagrass meadows. Occupying less than one percent of the ocean floor, blue carbon systems have disproportional sequestration rates, contributing up to 50% of carbon buried into marine sediments. Therefore, the coastal vegetation play a central role in how oceans can mitigate climate change.

Those systems are also essential in climate adaptation: they buffer the wave energy, protecting the shoreline against storms, cyclones and erosion. By growing and trapping the sediments, they increase the ocean and coastal floor, mitigating sea level rise.

All coastal and marine ecosystems (mangroves, seagrass meadows, salt marshes, coral reefs, rock reefs, kelp beds, rodolith beds etc.) are important in providing valuable services to coastal populations. But mangroves, salt marshes and seagrasses have the potential for large and longer term carbon stores, most buried into tens of meters of sediment. They capture and stores huge amounts of carbon (400 Tg C y⁻¹), equivalent to half of the global transport emissions

Although providing billions of dollars in ecosystem services annually and playing an essential role in the livelihoods and well being of billions of people, coastal areas are among the most threatened natural ecosystems on Earth. Between 30-50% of mangroves and salt marshes disappeared in the last half century and about 30% of the world's seagrasses are gone. That loss is continuing and in many places accelerating, with 2% of those important coastal systems being lost each year.

After almost 10 years of fast increase o the Blue Carbon knowledge and several initiatives, with lots of studies and tens or more than 100 published studies papers, the inclusion of these systems in current policies, carbon markets and incentives are still very limited.

Countries with long coastal lines and rich in Blue Carbon are missing this important component of climate change adaptation and mitigation.

My country, Brazil, holds 1,5 million hectares of mangrove forests, more than 100 hectares of seagrass meadows and extensive salt marsh areas. All these systems are under pressure by the intensive coastal occupation and development, habitat degradation, eutrophication, shrimp aquaculture and substantial changes in the drainage basins. Per unit area, Brazilian

mangrove soil can have 3 to 4 times more carbon than Amazonian soil. Taking into account the average values of carbon at different mangrove sites and regions, Brazilian mangroves stores from 100 to 220 billions of tons of Carbon in their soil. When disturbed or destroyed, this huge sink turns into source. If we take the lower and upper range of coastal degradation rates (0,7% and 2% per year), the emissions of Brazilian mangroves may reach up to 400 hundred thousand tons of CO₂ per year.

Climate Change mitigation framework developed for terrestrial ecosystems can be extended to include coastal wetlands. In their Supplement of 2014, the IPCC provides the guidelines to include Blue Carbon systems in the national emission inventories.

Through restauration and conservation of existing coastal and marine ecosystems, and applying integrated coastal management, Blue Carbon incentives may substantially contribute for the global reduction of green house gases in next decades.

A recent analysis from Blue Carbon Scientific Working Group (still in review) concludes that a global effort to restore Blue Carbon systems could reduce annual emissions by up to 0,1 Pg (1 Pg = 10¹⁵) of CO₂ per year, contributing to CO₂ mitigation as much as reforestation of terrestrial ecosystems. Due to other services these systems provides, the restauration always will exceed the value of the Green House Gases mitigation.

Sources and information:

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Hejnowicz et al. 2015. Harnessing the climate mitigation, conservation and poverty alleviation potential of seagrasses: prospects for developing blue carbon initiatives and payment for ecosystem service programmes. *Frontiers in Marine Sciences*.

Web site: *The Blue Carbon Initiative*. www.thebluecarboninitiative.org.br

Short Biography

Assistant Professor, Instituto de Oceanografia, Universidade Federal do Rio Grande, Brazil.
PhD in Marine Ecology, with great interest in interdisciplinary approaches to understand the impacts of Climate Change on coastal and marine ecosystems and the implications for ecological services society. Member of *The Blue Carbon Scientific Working Group* and from the following research groups and networks:

Rede de Monitoramento dos Habitats Bentônicos Costeiros – ReBentos. www.rebentos.org.com
Coastal Zone Node (Coordinator) from Brazilian Network for Climate Changes Studies (Rede CLIMA).

<http://redeclima.ccst.inpe.br/>

Brazilian Long Term Ecological Research. <http://www.peld.furg.br/>