SEMARNAT

SECRETARÍA DE MEDIO AMBIENTE Y RECURSOS NATURALES

Understanding
Blue Carbon

The ecosystems that capture and store blue carbon cover less than 0.5% of the world's marine surface, but the quantity of carbon they sequester in a year equals almost half of that produced globally in transportation emissions.

Blue carbon: *Organic carbon captured and stored by coastal mangroves, seagrasses and marsh ecosystems*

Introduction

Coastal ecosystems provide important environmental services, including coastline protection, water purification, support of fisheries, the conservation of biodiversity, and carbon sequestration. In recent years, scientific knowledge has been strengthened regarding the enormous capacity of mangroves, seagrasses, and marsh ecosystems to capture and store carbon dioxide in the form of organic carbon. This carbon is known as "blue carbon."

Despite the multiple benefits of mangroves, seagrasses and marsh ecosystems, their rates of degradation and loss continue to rise, causing serious impacts: it not only diminishes their capacity to capture carbon, but also produces emissions of already stored carbon into the atmosphere, and contributes to the acidification of coastal waters, directly affecting biodiversity and the human population [1].

Where is blue carbon found?

Salt marshes, mangroves and seagrasses are the coastal ecosystems that capture blue carbon, and they do so to a much greater extent than terrestrial ecosystems. Unlike tropical forests, the storage of organic carbon in these coastal ecosystems occurs primarily in the soil itself, and less so in the plant material found above ground.

Mexico is among the countries with the largest area of ecosystems that capture and store blue carbon. Several actors—academia, civil society and government—have endeavored to increase scientific knowledge with respect to these coastal ecosystems. Thanks to the work of the Commission for Environmental Cooperation (CEC), Canada, Mexico, and the United States have taken firm steps in advancing the science around blue carbon: mapping many of these ecosystems in North America, standardizing methodologies to quantify carbon pools, and determining the extent of some carbon sinks. This basic knowledge enables the design of strategies aimed at reducing carbon emissions from these ecosystems and protecting both the current levels of carbon capture and storage and also the biodiversity in them.

Figure 1. **Ecosystems that capture and store blue carbon**

Jaime Rojo

Salt marsh: Seawater seasonally floods these areas where vegetation can grow

Mangrove: Woodlands and scrub growing in intertidal areas in tropical and subtropical coastal regions

Margarita Gallegos

Seagrasses: Underwater plants that take root in estuary sediment; their growth depends on the light that penetrates the water column

Why is blue carbon important?

Biodiversity. Maintaining the proper functioning of coastal ecosystems benefits the conservation of biodiversity and the environmental services they offer [2, 4]:

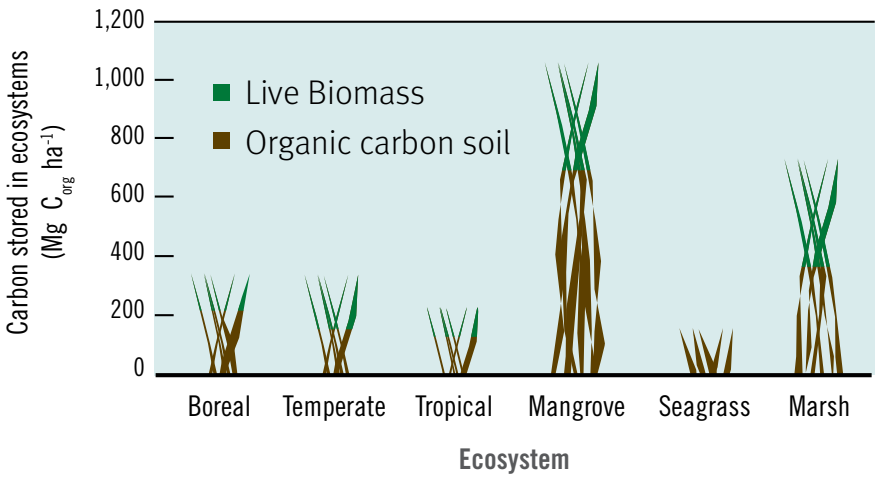
a) Marshes provide food and act as a habitat for fish and bird populations; they are pollutant sinks and act as natural barriers that protect continental lands from storms.

b) Seagrasses filter water and increase its clarity; they are temporary and permanent habitats for numerous species (such as shrimp and starfish, respectively) and are the foundation of food chains in other estuary and coastal environments, which in turn support a large and diverse number of species. They prevent beach erosion, holding sediment within their root systems.

c) Mangroves play an important role in attenuating waves and acting as storm buffer zones; they are a critical habitat (reproduction, nesting and brooding sites) for birds, fish, crustaceans, and mollusks, and species of economic importance.

Climate change mitigation and adaptation. Blue carbon ecosystems (Figure 1) cover less than 0.5% of the global marine surface [3], but capture carbon at an annual rate two to four times higher than mature tropical forests, storing from three to five times more carbon by area (Figure 2) [1]. They also represent more than 50% of the total carbon contained in ocean sediments, and in one year sequester a quantity of carbon equal to almost half the emissions generated globally by transportation [3]. The plant cover of these ecosystems dissipates the energy of waves, controls erosion, and buffers the impacts of increased sea levels. The conservation of these ecosystems is an ecosystem-based climate change adaptation measure.

Figure 2. **Quantity of carbon stored in terrestrial and coastal ecosystems**



A handful of blue carbon

What lies ahead

Due to their location on boundaries between land and sea, mangroves, seagrasses and marshes are highly sensitive and vulnerable ecosystems. Their loss and degradation are caused primarily by coastal urbanization, water pollution, changes in land cover and use associated with aquaculture, stockbreeding and agriculture, the lack of suspended sediments, excess nutrients, the coastal bottlenecks, the construction of port infrastructure, tourism, increased sea levels, and extreme climate events (hurricanes) [4].

The problem is worsened because once these ecosystems are degraded or destroyed, the carbon that they have been storing for years is released, increasing concentrations of carbon dioxide in the atmosphere.

Several alternatives can be implemented to protect coastal ecosystems that capture and store carbon, such as:

SCIENCE	POLICY	MANAGEMENT
■ Increase and improve scientific work, with adequate methodologies, aimed at achieving a detailed and specific comparative basis for the national coverage of blue carbon ecosystems. ■ Broaden the approach and scope of research to cover not only carbon stores or deposits but also flows of carbon in these ecosystems, and include other gases such as methane and nitrous oxide in the assessments. ■ Foster the quantification of blue carbon deposits at the national scale. ■ Study the spatial and temporal variability of carbon deposits to define patterns regarding various physicochemical aspects [3].	■ Foster the drafting of blue carbon laws and regulations that include: • the assessment of emissions due to coastal degradation; • promotion of mechanisms for the regulated trade of carbon credits. ■ Propose innovative options for nationally appropriate mitigation actions (NAMA). ■ Foster education and awareness of the sociocultural and environmental value of ecosystems that capture and store blue carbon, as a transversal strategy to achieve domestic and international goals and commitments [5].	■ Define actions and strict conditions for the conservation of territories with different land-tenure regimes. ■ Promote better practices for the participative restoration and conservation of these ecosystems. ■ Foster measures to effectively manage protected natural areas in marine and marine-terrestrial environments. ■ Include the private sector in protection and restoration actions, catalyzing and directing investments and including the socioenvironmental benefit as part of returns on investment [5].

Despite the huge importance of blue carbon, until recently very little attention was paid to the conservation of ecosystems that capture and store it. Today, more and more initiatives and organizations are joining the effort, but a long road still lies ahead.

Margarita Gallegos

Taking a core sample to measure blue carbon

We can all contribute to the protection of blue carbon ecosystems!

Get involved!

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References:

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2. The Blue Carbon Initiative, "Mitigating climate change through coastal ecosystem management", at: <www.thebluecarboninitiave.org>.
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5. CEC (in prep.), Analysis of opportunities for integrating the concept of blue carbon in Mexican public policy (*Análisis de las oportunidades para la integración del concepto de carbono azul en la política pública mexicana*), Commission for Environmental Cooperation, Montreal, 113 pp.