

WETLANDS:

Destroyed coastal ecosystems emit a massive amount of carbon

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Disturbed soils under tidal marshes, mangroves and sea grasses emit about 450 million metric tons of carbon dioxide per year -- about the same level of annual carbon emissions in the United Kingdom, according to a midrange estimate in a [study](#) published in *PLoS ONE*.

Coastal ecosystems are losing carbon in their soils at an aggressive rate. But conserving them could curb emissions, slow climate change and provide economic and carbon market opportunities for communities around the world, the study's authors conclude.

The study on "blue" carbon, CO₂ sequestered in coastal ecosystems, is the first attempt to calculate how much carbon is being emitted by the soils that lie underneath coastal marshes, said Linwood Pendleton, ocean and coastal policy program director at Duke University's Nicholas Institute for Environmental Policy Solutions.

"All of this carbon is in the soil under existing habitat," said Pendleton, the lead author of the report. "You can't get this volume of carbon from creating new habitat."

This study supports conservation of existing marshes over creating new ones, said Pendleton. Replanting a new salt marsh sequesters about 10 metric tons of carbon per hectare. But an old salt marsh sits atop 500 tons or more of soil carbon per hectare. (A hectare equals 2.47 acres.)

Destruction of coastal wetlands, often as a result of urban development, aquaculture or farming, releases between 150 million and 1.2 billion metric tons of carbon per year with a central value of 450 million tons -- 10 times higher than previous reports.

'Competing benefits'

Based on this, the researchers estimated the cost of destroying coastal ecosystems to lie between \$6 billion and \$42 billion annually.

"These types of soil are very rich agricultural land," said Steve Crooks, climate change director of environmental services firm ESA PWA and a co-author of the report. "There's competing benefits for what to do with this land."

Crooks studies the Sacramento Bay Delta region, located in California's bread basket. By the 1960s, he said, farmers had destroyed 95 percent of the native wetlands.

Although research on blue carbon is growing, the understanding of coastal carbon sequestration is nascent compared to the information available on forest carbon, agriculture and energy emissions. Blue carbon has yet to make its way into the official literature of the Intergovernmental Panel on Climate Change, the U.N. body that assesses the science of climate change.

Environmental group Conservation International and the International Union for Conservation of Nature have developed the Blue Carbon Policy Framework with the objective to weave blue carbon into the policy and financial work of the U.N. Framework Convention on Climate Change, which directs global efforts to reduce greenhouse gas emissions. The World Bank is also looking to thicken its carbon finance portfolio with coastal wetland projects.

Fertile areas for carbon offsets?

"One of the critical missing pieces for blue carbon was having a peer-reviewed paper," Pendleton said. This study, he hopes, will pass muster for inclusion in the IPCC's fifth assessment report to be released next year and in 2014.

In addition to helping curb climate change, preserve habitat biodiversity and save natural resources like species and water quality, protecting the ecosystems could create a carbon market for coastal wetlands. A rural fishing village in Vietnam, for example, could receive dividends from carbon market investors if blue carbon could qualify along with renewable energy or forest projects.

The prevalence of coastal wetlands around the world could bring carbon offsets closer to home, said Pendleton. For the Northeastern states in the Regional Greenhouse Gas Initiative, a regional carbon cap-and-trade program, for instance, "you could get offsets from providing protection for salt marshes in New England," he said, a nearer option than carbon credits from tropical forests halfway around the world.

Uncertainty still shrouds measures of blue carbon, said Pendleton. In many habitats, like the coasts of some African countries, the area is poorly mapped, and data on the rate of loss from development are scant.

In addition, said Crooks, there is little information on the locations of the "hot spots" of degradation, areas that are already emitting consistently high levels of CO₂, as well as areas that have not been affected but risk damage due to economic incentives and high soil carbon content.

"What we keep learning is we [have to] keep revising estimates up," Pendleton said.