

As emissions increase, carbon 'sinks' get clogged

World's oceans, forests becoming less able to absorb CO₂

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In the race to reduce greenhouse gases in the atmosphere, scientists have been looking to forests and oceans to absorb the pollution people generate.

Relying on nature to compensate for human excesses sounds like a win-win situation -- except that these resources are under stress from the very emissions we are asking them to absorb, making them less able partners in the pact.

Consider it the latest inconvenient truth about climate change.

The benefits of these natural carbon "sinks" are many: Their diverse ecosystems soak up carbon dioxide. What's more, the international carbon enables industries to compensate for their emissions at a fraction of the price of installing cleaner technology, essentially by investing in forests; meanwhile, poorer countries that are rich in woodland profit from selling not lumber but carbon credits.

Now, a global society of conservation biologists has launched a lobbying campaign, asking key decision-makers -- from the Danish officials chairing next week's climate talks in Copenhagen to U.S. lawmakers -- to push for steeper emission cuts to ensure that humans do not exhaust forests' capacity to store carbon in the decades to come.

Earlier this year, a team of nearly 70 researchers published a paper in the journal *Science* showing that the drought-stressed Amazon rain forest emitted roughly as much carbon dioxide in 2005 as it usually stores -- about the same amount as the European Union and Japan together emit in a single year.

"This dramatic new information confirms that unsustainable human demands on the Earth's dwindling primary and old-growth forests have pushed them to the wall," said Dominick DellaSala, president-elect of the Society for Conservation Biology's North America section.

A separate article published last month in the journal *Nature* analyzed the sea's uptake of carbon between 1765 and 2008, finding that the proportion of fossil-fuel emissions absorbed by the oceans since 2000 may have declined by as much as 10 percent.

The study's lead author, Samar Khatiwala, an oceanographer at Columbia University's Lamont-Doherty Earth Observatory, said oceans are becoming more acidic as more carbon dioxide enters the atmosphere, so they are losing their ability to soak up emissions produced by people.

"What our ocean study and other recent land studies suggest is that we cannot count on these sinks operating in the future as they have in the past and keep on subsidizing our ever-growing appetite for fossil fuels," Khatiwala said.

Absorption rate slowing

According to the Global Carbon Project, which tracks emissions, land and ocean carbon sinks took up 57 percent of human-generated carbon emissions between 1958 and 2008. While the size of these sinks has expanded in the past few decades, their absorption rate is slowing as greenhouse gas emissions have risen (by 41 percent since 1990).

Ed Grumbine, an environmental studies professor at Prescott College and another member of the Society for Conservation Biology, said future drought and other factors make it difficult to determine what the exact rate of absorption will be. He noted that the Amazon has now returned to soaking up carbon rather than emitting it, but it's projected to be drier in future decades. To the north, Canada's boreal forest has suffered pine-beetle infestation on 51 million acres, an area half the size of California, which can lead to a massive carbon release as trees die off.

"It's climate change with an emphasis on 'change,'" Grumbine said, adding that the climate bills pending in Congress do not factor in these trends. "They're pretty much rear-window views on what forests can and cannot do."

Concerns for old trees

The calculations matter because countries such as Brazil, which has pledged to reduce its deforestation rate 80 percent by 2020, are planning to receive money for these reductions as part of an allowance-trading system through the carbon market.

Some environmentalists argue that the fact that forests are becoming less efficient carbon sponges should not lessen the incentive for preserving long-standing forests in developing countries. Such forests are more effective at storing carbon because the trees are bigger.

Mark Tercek, president and chief executive of the Nature Conservancy, called the issue "a distraction. . . . In a climate-changing world, does that mean the level of difficulty goes up? Yes, but that doesn't mean you stop doing what you're trying to do."

Miguel Calmon, director of forests and climate change for the Nature Conservancy's Latin America program, said environmental groups are trying to protect the integrity of natural carbon sinks. "The more biodiversity in any ecosystem, the higher the resilience," he said.

New research does point to one promising new avenue of natural carbon sequestration: coastal salt marshes, mangroves and seagrass meadows.

Emily Pidgeon, Conservation International's marine climate change director, said these habitats "are extremely efficient at burying carbon in the sediment below them, where it can stay for centuries or even millennia."

But human activity is eroding these coastal habitats.

As Grumbine observed, the future capacity of natural sinks to absorb carbon "is going to depend on human action."