

By BRYAN WALSH Friday, Nov. 20, 2009

Like the vast forests of the world, which continually suck carbon dioxide from the atmosphere and release oxygen, the planet's oceans serve as vital carbon sinks. Last year the oceans absorbed as much as 2.3 billion tons of carbon, or about one-fourth of all man-made carbon emissions. Without the action of the oceans, the CO<sub>2</sub> we emit into the atmosphere would have flame-broiled the planet by now.

But a new paper published in the Nov. 19 issue of *Nature* demonstrates that the oceans' ability to absorb man-made carbon may be dwindling and that has worrying ramifications for future climate change. While the ocean is now absorbing more carbon in total than ever before, the waters are sucking up a smaller percentage of the CO<sub>2</sub> emitted by humans. That could mean that there's a limit to the ocean's capacity and that we might be hitting it.

Led by Samar Khatiwala, an oceanographer at Columbia University's Lamont-Doherty Earth Observatory, a team of researchers reconstructed the amount of carbon that has been annually absorbed by the oceans since 1765 around the time when people began putting large amounts of CO<sub>2</sub> into the atmosphere. "Over time, it seems, the oceans are becoming less efficient at taking up man-made carbon," says Khatiwala. "That's concerning over the long term."

Scientists have long known that the ocean is a major carbon sink, but it's been difficult to tease out how much of that carbon comes from man-made processes. Khatiwala and his colleagues solved that problem by mathematically charting seawater temperature, salinity and other attributes and then working backward to infer how much man-made carbon was being circulated from the surface and through the deeper waters. They estimated that there are currently 150 billion tons of carbon from man-made sources currently sequestered in the ocean so much that if all that gas were to be released back into the atmosphere, it would raise carbon concentration levels to 460 parts per million, higher than what many scientists believe is the upper safe limit. "What we show is that the ocean sink is enormous," says Khatiwala.

Enormous, but not limitless. Carbon emissions from fossil fuels have skyrocketed in recent years. A new study by the University of East Anglia and the British Antarctic Survey estimated that emissions have jumped 29% since 2000. The *Nature* study found that over the same period, the proportion of fossil-fuel emissions absorbed by the oceans has fallen by as much as 10%. Though it's not clear why, the fact seems to be that the oceans' absorption ability can't keep up with the rate at which we're burning fossil fuels. That's troubling because even under the most optimistic projections, man-made carbon emissions aren't likely to decline for years. "There's a physical limit to how rapidly the oceans can absorb CO<sub>2</sub>," says Khatiwala. "The ocean becomes a less efficient sink."

The consequences are many. As the ocean absorbs more and more carbon, it acidifies think of the acidic fizz in a carbonated beverage. That injures ocean life especially the vulnerable coral reefs that are home to wildly diverse marine species. And as the ocean warms because of climate change, it will be less able to absorb carbon too cold water is more absorptive than warm water. But, ultimately, what the *Nature* study shows is that the climate system is dynamic, capable of responding in ways we can't predict. If the oceans won't take the carbon we're spewing into the atmosphere, it will put that much more pressure on us to cut back our emissions lest the cycle truly spin out of control. "We have enough reasons to cut carbon," says Khatiwala. "This is just one more."

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