

# THE *Current*

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## **UCSB professor to lead IPCC methodology report on carbon capture, storage and utilization**

When it comes to climate change, preventing greenhouse gas emissions is the name of the game. But what if instead of preventing emissions, we started sucking carbon directly out of the atmosphere?

These efforts are part of the burgeoning sector of carbon capture and storage, which is expanding our options for mitigating climate change. They're also making it trickier to measure net carbon emissions.

Fortunately, the guidelines for estimating and tracking greenhouse gasses are receiving an overhaul. UC Santa Barbara's [Iris Holzer](#) will serve as a lead author on the next international report characterizing carbon capture and sequestration for the Intergovernmental Panel on Climate Change (IPCC). This iteration will update the group's guidelines on how to inventory greenhouse gas emissions, especially the sections on carbon capture, storage and utilization.

### **What's in a name**

The IPCC is a body of the United Nations that summarizes the best science on the causes and impacts of climate change, as well as possible responses. The panel

published its first report in 1990, and updates it roughly every five to seven years. The IPCC also provides guidance on how member nations should account for carbon emissions and removals — the National Greenhouse Gas Inventories — a section that Holzer has been tapped to help revise. The results will comprise the Methodology Report on Carbon Dioxide Removal Technologies, Carbon Capture, Utilization, and Storage.

Holzer helps break down this formidable title. “Carbon dioxide removal is taking CO<sub>2</sub> out of the atmosphere and putting it somewhere else,” she explained. Sometimes this occurs naturally — it can be taken up by trees or dissolve into seawater. But there are also increasing efforts to accomplish this artificially.

Once you capture the carbon, you have to do something with it. Hence the “utilization and storage” aspect of the title. In natural processes, the carbon is often incorporated into biomass like wood. Popular ideas for artificially captured carbon are injecting it underground or sequestering it in the deep sea. But it can also be put to beneficial uses. “You could make any kind of carbon-derivative product, from cling wrap to bulking pellets for concrete,” said Holzer, an assistant teaching professor in the Environmental Studies Program.

Unfortunately, carbon capture technologies tend to be rather energy intensive. So not only does the process require clean energy or green chemical catalysts to be effective, but the captured carbon needs to be locked away for a long time.

## **Counting carbon**

The National Greenhouse Gas Inventories provide countries with guidance on how to count their emissions. It offers different levels of granularity based on a country’s resources, the kind of activity and the available data. The report includes coarse, sector-level estimates all the way to refined calculations for specific activities and regions.

For instance, when the United States was still doing a national inventory, the country used sophisticated models to account for organic carbon stored in the soil. These estimates incorporated soil characteristics, land-use and weather data, and direct observations. “A country with less of their own data available might use ‘default values’ that are provided in the methodology report,” Holzer said.

The role of carbon capture in this accounting has become increasingly important. “Both nature-based and technological approaches to removing CO<sub>2</sub> from the atmosphere are evolving super rapidly,” Holzer said, which means the current guidelines aren’t up to date with the science or implementation. “So the member countries asked for an updated report.”

It’s a challenging enterprise to produce fine-grained estimates in sectors where data is just emerging, such as bio-char, wetland carbon storage and carbon mineralization. That’s scary for scientists, Holzer explained, who often want to acknowledge as much nuance and uncertainty as possible. But the task is critical. “The IPCC guidance creates the starting point for a lot of other conversations about carbon accounting and national research priorities around carbon sources and sinks,” she said.

## **The changing landscape of climate science**

Holzer, who joined UCSB in 2024, is looking forward to leading a younger, more diverse team to accept the baton from her colleagues who came before. “There’s quite a few people who’ve been on these reports since the beginning,” she said. “And I think they want to cultivate a new generation of authors.” A lot of work on these emerging carbon capture approaches is also coming from early-career researchers, she added.

For instance, Holzer’s specialty is carbon storage in soils, and her work will help improve the guidance for estimating carbon deeper underground. She also studies enhanced rock weathering, a technique that speeds up the geochemical processes that naturally remove carbon from the atmosphere. This is emerging as a promising approach to large-scale carbon capture.

The report will focus on terrestrial sources, sinks and uses. The ocean is subject to different international treaties and protocols than the land and air, Holzer explained. Still, it will be an important part of accounting for humanity’s carbon budget given its role in the geologic carbon cycle, which plays out over hundreds of millions of years.

Holzer and other American authors are supported by a consortium hosted by the American Geophysical Union, as the U.S. has withdrawn from the IPCC. “It’s a really

strange position because there's a lot of scientific expertise in the United States," she said, "but our country as a whole has taken a backseat in this conversation and this process."

"Participating is a way to say that, even if the country has stepped back from this, we can still contribute to this on an international scale, among the 194 other countries that have placed a priority on understanding their contributions to global climate change," she added. The United Nations as a whole contains 195 members plus observer states in total.

Still, Holzer acknowledged a tough truth for many scientists: "Data alone are not going to change anything," she said. "We have to figure out how to go from knowledge to some kind of actionable change."

Tags

[Climate Change](#)

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