

Leaking underground CO₂ storage could contaminate drinking water

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Leaks from carbon dioxide injected deep underground to help fight climate change could bubble up into drinking water aquifers near the surface, driving up levels of contaminants in the water tenfold or more in some places, according to a study by Duke University scientists.

Based on a year-long analysis of core samples from four [drinking water](#) aquifers, "We found the potential for contamination is real, but there are ways to avoid or reduce the risk," says Robert B. Jackson, Nicholas Professor of Global Environmental Change and professor of biology at Duke.

"Geologic criteria that we identified in the study can help identify locations around the country that should be monitored or avoided," he says. "By no means would all sites be susceptible to problems of water quality."

The study appears in the online edition of the journal *Environmental Science & Technology*.

Storing carbon dioxide deep below Earth's surface, a process known as geosequestration, is part of a suite of new carbon capture and storage (CCS) technologies being developed by governments and industries worldwide to reduce the amount of greenhouse gas emissions entering Earth's atmosphere. The still-evolving technologies are designed to capture and compress CO₂, emissions at their source – typically power plants and other industrial facilities – and transport the CO₂ to locations

where it can be injected far below the Earth's surface for long-term storage. The U.S. Department of Energy, working with industry and academia, has begun the planning for at least seven regional CCS projects.

"The fear of drinking water contamination from CO₂ leaks is one of several sticking points about CCS and has contributed to local opposition to it," says Jackson, who directs Duke's Center on Global Change. "We examined the idea that if CO₂ leaked out slowly from deep formations, where might it negatively impact freshwater aquifers near the surface, and why."

Jackson and his postdoctoral fellow Mark G. Little collected core samples from four freshwater aquifers around the nation that overlie potential CCS sites and incubated the samples in their lab at Duke for a year, with CO₂ bubbling through them.

After a year's exposure to the CO₂, analysis of the samples showed that "there are a number of potential sites where CO₂ leaks drive [contaminants](#) up tenfold or more, in some cases to levels above the maximum contaminant loads set by the EPA for potable water," Jackson says. Three key factors – solid-phase metal mobility, carbonate buffering capacity and electron exchanges in the overlying freshwater aquifer – were found to influence the risk of drinking water contamination from underground carbon leaks.

The study also identified four markers that scientists can use to test for early warnings of potential [carbon dioxide](#) leaks. "Along with changes in carbonate concentration and acidity of the water, concentrations of manganese, iron and calcium could all be used as geochemical markers of a leak, as their concentration increase within two weeks of exposure to CO₂," Jackson says.

More information: <http://pubs.acs.org/doi/abs/10.1021/es102235w>

Provided by Duke University

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