

Storing carbon dioxide underground: An effective tool against climate change?

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Credit: AI-generated image ([disclaimer](#))

Can carbon dioxide (CO₂) stored below the ocean floor be detected when it leaks? And what does this mean for the environment? An EU-funded study strives to answer these questions.

Scientists are developing new strategies for keeping global temperature

risers under control. Carbon capture and storage (CCS) is one of the methods used to prevent CO₂ from entering the atmosphere. With this technology, waste CO₂ from [power plants](#) and [industrial processes](#) is captured, transported and then stored several kilometres below ground in depleted oil and [gas wells](#) or deep saline aquifers. However, the question remains: Once buried, will the CO₂ stay buried? And, how safe is CCS for the environment?

These are some of the questions the EU-funded projects STEMM-CCS, ECO2 and EUROFLEETS have sought to answer. The researchers conducted a controlled CO₂ release experiment at the Sleipner CO₂ storage site in the Norwegian sector of the North Sea. Their aim was to determine how effectively a well leaking CO₂ into the sea could be detected, and what the [environmental consequences](#) of such a leak would be. Their findings were published in the "International Journal of Greenhouse Gas Control."

During the study, which simulated the leakage of CO₂ through abandoned wells, the gas was released at seabed level at a water depth of 82 m. A total of 40 kg of CO₂ was released into the water in just under 12 hours. This corresponds to an annual leakage rate of 31 t per year, which is in the upper range of methane gas fluxes seen in abandoned wells.

Effects of a CO₂ leak

The data showed that CO₂ gas bubbles were completely dissolved near the seabed. While this lowered the pH value of the surrounding seawater, making it more acidic and consequently harming organisms in the area, the scientists felt that the detrimental effects were limited. Thanks to the strong bottom currents that rapidly dispersed the dissolved CO₂, only local ecosystems in the well's immediate vicinity were affected. Leakage through wells therefore has "no detrimental large-scale effects on the

North Sea ecosystem," according to co-author Dr. Klaus Wallmann of ECO2 project coordinator GEOMAR Helmholtz Centre for Ocean Research Kiel. "Thus, we tentatively conclude that it is possible to store CO₂ safely in sub-seabed formations if the storage site is located in an area with a small number of leaky wells," stated Dr. Wallmann in a news item posted on the "ScienceDaily" website.

STEMM-CCS (Strategies for Environmental Monitoring of Marine Carbon Capture and Storage) is conducting a second release experiment in the North Sea in May. The project will be developing sensing and monitoring techniques to detect leakages and to trigger subsequent studies on their environmental impact, if any. Alleviating concerns about the effects on marine life, lead researcher Douglas Connelly of the United Kingdom's Natural Environment Research Council said that leaks are "very unlikely." "There has been no measurable impact—or leakage—from the storage of CO₂ at the Sleipner reservoir, for example," Connelly explained in an [interview](#) published on the Science/Business website earlier this month. "The use of depleted oil and gas reservoirs offers more surety around storage as they are well studied—we know the volumes that can be stored and we know the area of the seabed that overlies these sites."

More information: STEM-CCS project website: www.stemm-ccs.eu/

ECO2 project website: www.eco2-project.eu/

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