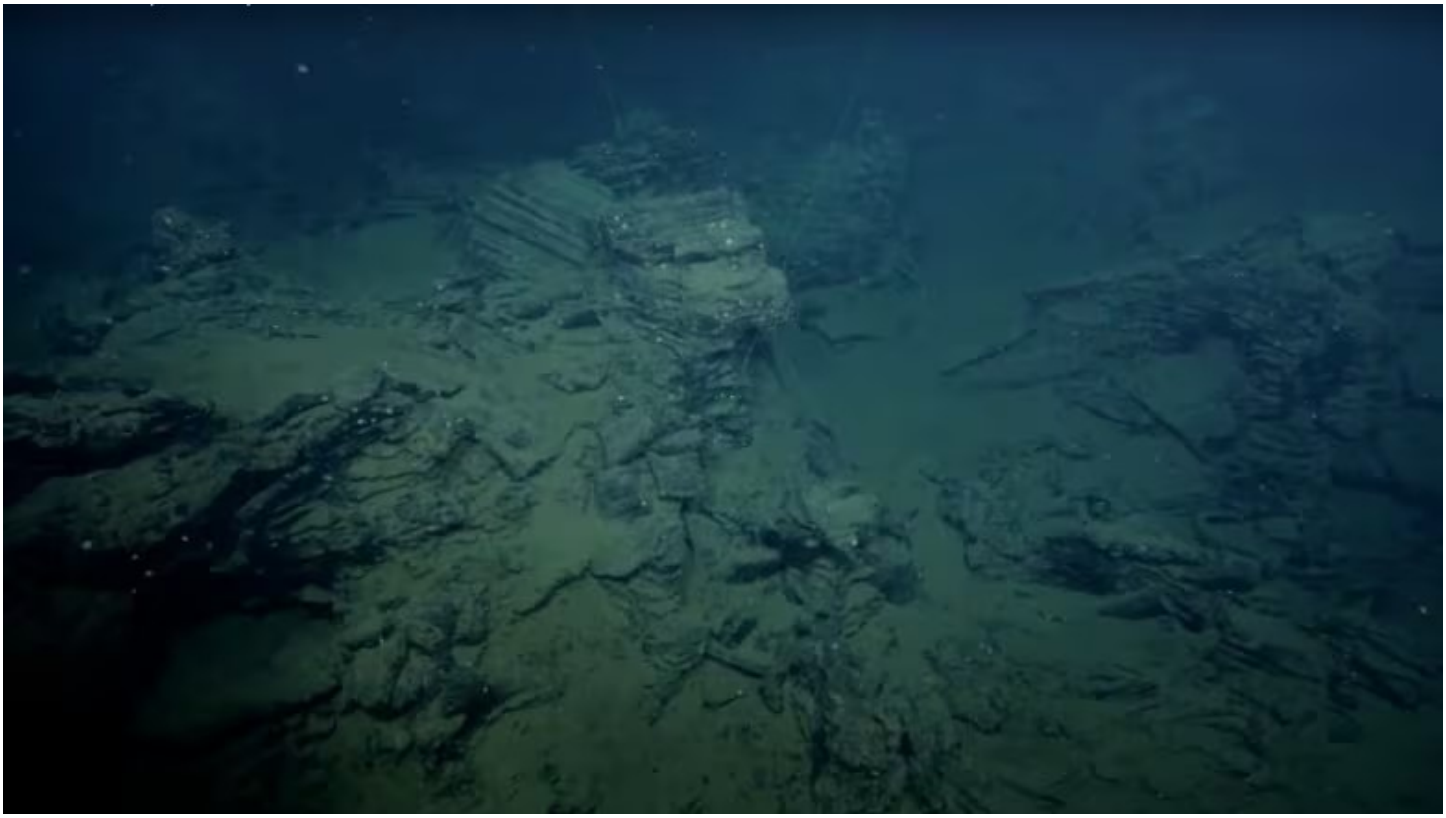
Edmonton

Technology aims to sequester carbon deep in the ocean off B.C. coast

Pre-feasibility study done in 2018 with U.S. Department of Energy

Julia Wong · CBC News · Posted: Nov 02, 2023 3:00 AM CDT | Last Updated: November 2



This photo, taken in 2011, shows underwater basalt rock in the Endeavour area of the Cascadia Basin in the Pacific Ocean. The Solid Carbon Project is hoping to inject CO2 into a formation such as this. (Submitted by Ocean Networks Canada)

A project off B.C.'s coast focused on removing carbon dioxide from the air is aiming to tap into a resource that makes up roughly 70 per cent of the Earth's surface — the ocean.

The Solid Carbon Project, which is overseen by Ocean Networks Canada, wants to use the ocean in carbon sequestration efforts as a way to fight climate change, according to Kate Moran, the project's principal investigator.

"People tend not to look at the ocean for these kinds of solutions," said Moran, who is also president of Ocean Networks Canada. "In fact, the ocean has the biggest capacity, including the ocean basalt, to actually help us with removing CO2 from the atmosphere."

Generally speaking, carbon sequestration aims to reduce greenhouse gases by capturing CO2 from the atmosphere and injecting it underground.

In the case of Solid Carbon, carbon dioxide would be sucked from the atmosphere by direct air capture technology powered by wind turbines floating in the middle of the ocean. It would then be injected into basalt rock formations, where the CO2 would react and eventually — over 10 to 25 years — turn into rock.

The technology would be the first of its kind in Canada, says Moran.

Kate Moran, the principal investigator of the Solid Carbon Project, says 'people tend not to look at the

ocean for these kinds of [climate] solutions.' (Samuel Martin/CBC)

Other projects have injected carbon dioxide into the sedimentary basin of the ocean, but Moran said what makes this initiative unique is that the final destination is basalt, which sits underneath sedimentary rock.

"This technology is the ultimate in terms of durability, because it will react with the basalt, form rock and never go back into the atmosphere," Moran said.

The power of basalt

The team is focusing on the Cascadia Basin, which is approximately 300 kilometres southwest of Vancouver Island.

Moran said the basalt there has the capacity to store 750 gigatonnes of CO2, which is the equivalent of roughly 15 to 20 years of global emissions.

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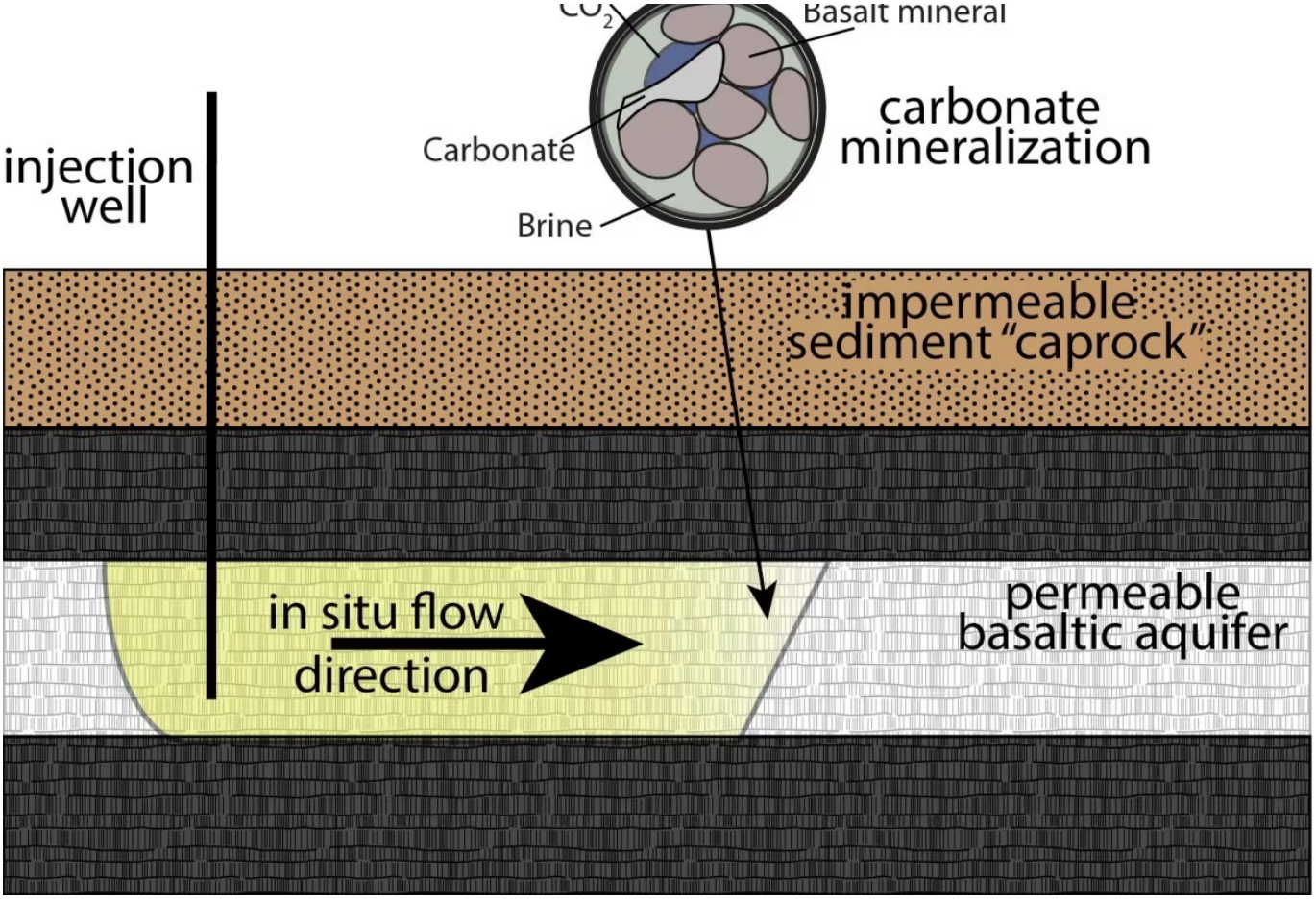
A pre-feasibility study was completed in 2018 with the U.S. Department of Energy, and a feasibility study is underway. Moran said the next step would be a demonstration project, which can begin as soon as they can secure $60 million in funding — an amount she is confident can be raised from government, industry and other benefactors.

The demonstration, which would include an actual injection of CO2 into basalt formations and monitoring, would take roughly two years.



This graphic, made by Ocean Networks Canada, demonstrates the Solid Carbon process. (Submitted by Ocean Networks Canada)

Tip Meckel, a senior research scientist investigating geological carbon storage at the Gulf Coast Carbon Center in Austin, Texas, said that offshore carbon capture is not new.

Meckel, who is not involved with Solid Carbon, points to the Sleipner CCS project in the North Sea near Norway, which started in 1996. The offshore project captures CO2 from natural gas production and injects it into a sandstone formation approximately one kilometre below the seabed.

"It's considered to be the longest-running, largest-scale CO2 injection project strictly for the purposes of storage, as opposed to other industrial activities like enhanced oil recovery," Meckel said.

He said there are a few obstacles impeding more offshore carbon capture.

"It is expensive to capture and transport and re-inject CO2," he said. "The challenges seem to be mostly economic, trying to make sure that the project can work economically so that it isn't strictly a sunk cost."

Logistics and feasibility

Curran Crawford, a professor of mechanical engineering at the University of Victoria and a lead on the Solid Carbon Project, said he has been working with students to ensure the project is doable.

To keep emissions down, the project would rely on wind power. Curran said the turbines would be 150 metres tall with rotors giving it a diameter of 240 metres, on a floating triangle platform 100 metres across.

This rendering shows the wind turbines that would power capture technology to suck CO2 out of the air in the middle of the ocean. (Submitted by Ocean Networks Canada)

The electricity generated by the wind turbines would power equipment that would extract CO2 from the air. The carbon collected would then be fed through a

pipeline to the underwater injection site.

The work the team has done so far shows that "it looks technically feasible," Crawford said. "It is not going to capsize or something like that."

Crawford said the technology could be used anywhere in the world, stressing that roughly 90 per cent of basalt on Earth is under the ocean.

He cautions that it will be important to do the appropriate environmental studies before the project gets underway.

Curran Crawford, a professor of mechanical engineering at the University of Victoria, says the work his team has done so far on the Solid Carbon Project shows that 'it looks technically feasible.' (Samuel Martin/CBC)

"You don't want to be in migratory bird paths and things like that. Underwater, you want to look where you're anchoring your system, that there's not some sensitive ecosystem or something like that," he said.

Moran said possible earthquake activity was studied by a postdoctoral student

from the University of Calgary, who found there was only nominal risk.

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