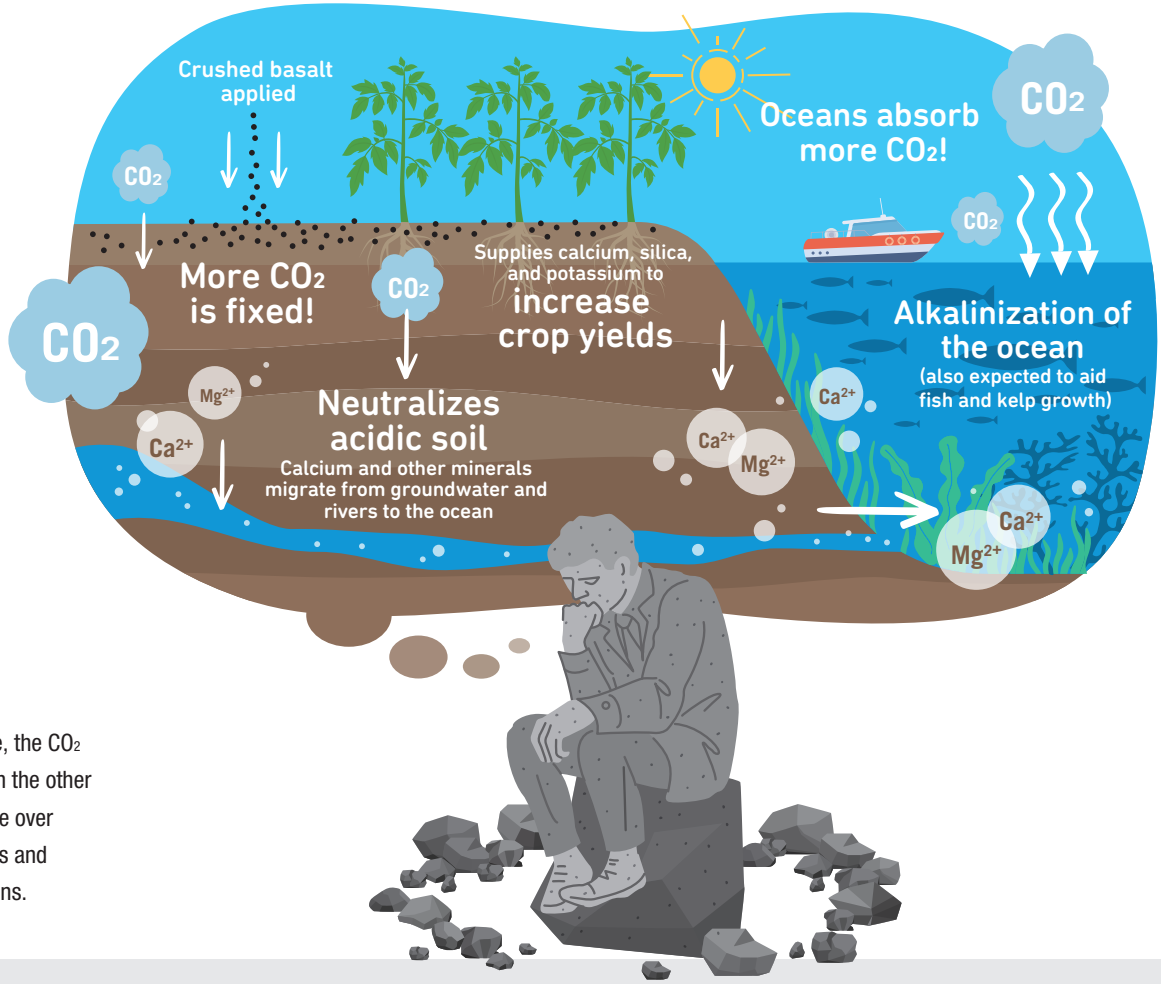
08 PROJECT

Advanced Enhanced Rock Weathering Technology Provides Rapid CO_2 Fixation and Accurate Carbon Accounting

A-ERW Combines Technology and Site Characteristics

Did you know that most of the carbon on Earth exists as carbonates in rocks and sediment? To put it another way, this is more CO_2 than the amount fixed by plants. Additionally, when plants die, the CO_2 they'd fixed is decomposed by microorganisms in the soil and released back into the atmosphere. On the other hand, the sequestering of CO_2 in rock is more permanent, as weathering is a process that takes place over long periods of time. Advanced Enhanced Rock Weathering (A-ERW) artificially speeds up the process and efficiently captures and sequesters CO_2, meaning this technology could bring about negative emissions.



Using Japan's Unique A-ERW Technology in Creating New Value Through Local Production and Consumption to Fix CO_2

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Known as a land of earthquakes and volcanoes, Japan's location on a plate subduction zone gives it easy access to rock exposed to the Earth's surface and suitable for absorbing CO_2. This is an advantage for developing site-specific A-ERW and gathering data to problem-solve effective soil use. For example, A-ERW may reduce dependence on agricultural lime in mitigating acidity, which is a source of CO_2 emissions. For these reasons, Japan wishes to be a leader in this technology and encourage its use in other Asian island countries with similar volcanic geology.

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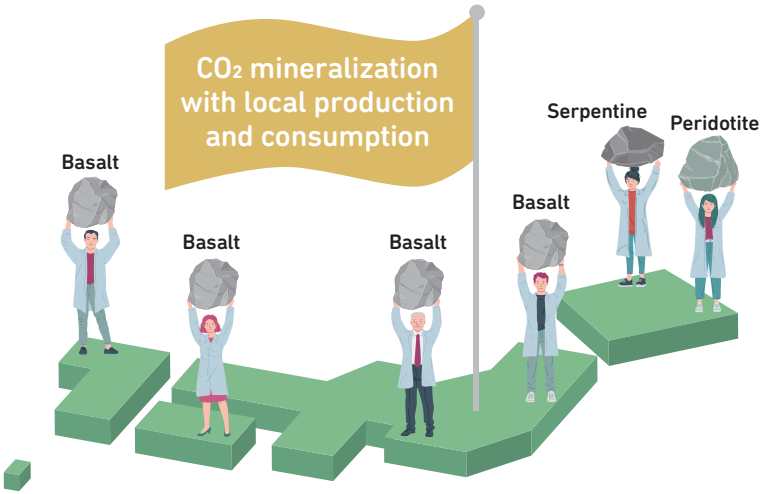
» Amplifying the Power of Nature

CO_2 in the atmosphere is absorbed by rain, and when these carbonic acid raindrops fall on rock, they react with the rock's calcium (Ca) and magnesium (Mg) to form semi-permanently fixed carbonates. A-ERW is a weathering enhancement technology that artificially accelerates this process by crushing rocks to expand their surface area and matching them to the characteristics of the site where the crushed rock is applied. The amount of CO_2 already being removed from the atmosphere by natural weathering is an estimated 300 million tons per year, so the decarbonization impact potential from A-ERW is great.

» Vast Amounts of Data and Advanced Calculations Are Needed

In parallel with a demonstration project using a gas-solid contacting house, we are also testing A-ERW by applying crushed rock in diverse regions. After the rock is applied to cultivated soil, we track crop growth conditions, yield, effect on soil improvement, and carbon storage. We also measure the remaining amount of calcium, which acts as a natural fertilizer. After application to abandoned mines, we check for effectiveness in neutralizing highly acidic acid mine drainage, alkalinization of nearby seawater, CO_2 fixation, and impact on marine life. We plan to achieve a real-world social implementation model for A-ERW by demonstrating accurate ***carbon accounting*** based on measured data.



KEYWORD

Carbon Accounting

The process of quantifying the carbon balance; that is, the increase or decrease in greenhouse gas emissions produced by businesses. Transparency in measuring, reporting, and verifying is essential for carbon crediting.*

* A system in which reductions in greenhouse gas emissions are deemed credits that can be bought and sold between companies. Greenhouse gases that cannot be completely eliminated by a company may be offset by acquiring credits.

FUTURE VISION

2025

Collection of Accurate Data

We will conduct trial applications at each site (gas-solid contacting house, farmland, forested slopes, and abandoned mines) to collect carbon accounting data and develop rules for measurement and verification.

2027

Expected Benefits Besides CO_2 Fixing

In addition to improving accuracy in carbon accounting, we will also verify collateral effects such as positive impacts on crop cultivation and neutralization of acid mine drainage.

2029

Steady Progress Towards Commercialization

We will begin full-scale CDR crediting via CO_2 fixation in gas-solid contacting houses. We will also establish an accurate carbon accounting system to demonstrate the effectiveness of applying crushed rock to farmland.

Implementation Waseda University, Hokkaido University, Kyoto Prefectural University, Mitsubishi Heavy Industries, Ltd.

Project Introduction Video https://www.youtube.com/watch?v=68dylv1Ajj0&list=PLZH3AKTCrVsVm3UN1x40WW_QK-cEXaoo3