



# Ocean Alkalinity Enhancement

Ocean Alkalinity Enhancement (OAE) using the methods that Limenet is employing involves a process that naturally enhances the ocean's ability to absorb and sequester carbon dioxide (CO<sub>2</sub>) from the atmosphere. Limenet's approach focuses on increasing the alkalinity of seawater, which in turn enhances its capacity to absorb and hold CO<sub>2</sub>. This is achieved through the creation of equilibrated calcium bicarbonates, which are then added to the ocean.

## About Limenet

Limenet is an Italian climate tech company that has developed an innovative technology for carbon removal. This technology is centred around the storage of CO<sub>2</sub> in equilibrated calcium bicarbonates and then adding this to seawater to enrich its alkalinity. Limenet's approach is inspired by the natural carbon absorption processes and aims to accelerate these processes to address the growing anthropogenic emissions that the seas and biosphere can no longer balance. Their technology works by transforming carbon dioxide, collected from the atmosphere or other sources, into an aqueous solution of calcium bicarbonates using calcium carbonate, marine water, and renewable energy.

## Overview of Limenet's OAE Method

### Process:

Limenet's technology involves using calcium carbonate, seawater, and renewable energy to transform atmospheric or other sources of CO<sub>2</sub> into a solution of calcium bicarbonates. This process mimics and accelerates the natural geological carbon cycle, where the oceans absorb CO<sub>2</sub> over millennia.

### Enhancing Ocean Alkalinity:

By dissolving carbonatic compounds in seawater, the technology increases the water's alkalinity. This enhanced alkalinity is crucial in resisting changes in acidity levels, which are currently being driven upwards due to increased CO<sub>2</sub> absorption by the oceans.

# Benefits in the Fight Against Climate Change

## Carbon Sequestration:

Enhanced alkalinity allows the ocean to absorb more CO<sub>2</sub> from the atmosphere, effectively acting as a carbon sink. This helps in reducing the overall concentration of greenhouse gases in the atmosphere, crucial in combating global warming.

## Mitigating Ocean Acidification:

Ocean acidification, a significant problem caused by increased CO<sub>2</sub> absorption, affects marine life, particularly organisms that rely on carbonate ions for their shells and skeletons.

By increasing alkalinity, Limenet's technology helps counteract this acidification, potentially safeguarding marine biodiversity.

## Sustainable and Eco-friendly:

The process utilizes renewable energy and natural compounds, making it an environmentally sustainable solution.

# Potential Scalability as a Carbon Removal Solution

**Modular and Scalable Technology:** Limenet's approach is designed to be modular, meaning it can be scaled up to handle larger volumes of CO<sub>2</sub>. This scalability is vital for addressing the vast amounts of CO<sub>2</sub> emissions globally.

**Long-term Storage Capacity:** The technology promises long-term stability of the sequestered CO<sub>2</sub>, estimated to be stable for thousands of years, reducing the need for ongoing monitoring and maintenance.

**Future Expansion:** Limenet has plans for the technology to be scaled up significantly, aiming for storage capacities on the mega-ton and even giga-ton scale in the future. This level of scalability indicates its potential as a major contributor to global carbon removal efforts.





## Summary

Limenet's method of enhancing ocean alkalinity presents a promising approach in the fight against climate change. Its ability to increase the ocean's capacity to absorb and store CO<sub>2</sub>, along with its scalability, positions it as a potentially significant solution in global efforts to reduce atmospheric CO<sub>2</sub> levels and mitigate the impacts of climate change. However, as with any emerging technology, continuous research and development are essential to fully understand its impacts and optimise its effectiveness.

## **Limenet** **Ocean Alkalinity Enhancement Project**

The validation and verification of projects related to greenhouse gas (GHG) emissions and carbon credit transactions is a fundamental step in the responsible management of environmental activities.

## Project Validation & Verification

Limenet leverages the innovative RINA digital platform to monitor the amount of CO<sub>2</sub>e sequestered while receiving real-time verification opinions on the individual machines deployed for delivering carbon sequestration material to its project locations at sea.

Publicly available verification data is then utilized to inform the issuance of credits on a public blockchain-based system, ensuring full transparency and integrity of the assets. These blockchain-native credits are made available via the Carbonmark platform.

The verification activity carried out through the digital platform adheres to the principles and requirements of the ISO 14064-2 standard. This standard provides for the validation and independent verification of voluntary projects aimed at reducing emissions and/or increasing GHG removals. It focuses on the quantification, monitoring and reporting of projects related to GHG emissions and/or their removal.

### **Credit Issuance & Security**

**Carbon credits are tracked on a public blockchain system.**

**This affords automation opportunities for integration into other applications.**

#### Regulatory Focus

ISO 14064-2:2019 specifies principles, requirements, and project-level guidance for quantifying, monitoring, and reporting activities intended to cause greenhouse gas (GHG) emission reductions or removal improvements. This standard is part of the rules aimed at combating climate change and can help organizations achieve the goals of the 2030 Agenda.

### **Key benefits of this approach taken by Limenet include:**

- Digital Design Validation
- Real-time and automatic reporting
- Digital verification opinions that can be obtained in real-time or periodically
- Possibility to share information with interested stakeholders
- Immutability and integrity of the data
- Assurance of verification for carbon credit transactions