

# Climate Change: Real-World Case Studies

## Buildings that Clean the Air

Urban Sequoia was one of the innovations presented at the 2021 UN Climate Change Summit in Glasgow, Scotland. This concept envisions cities as urban forests, where every building captures carbon, purifies the air, and regenerates the environment.

The Urban Sequoia team built a prototype building to prove the viability of this approach. The high-rise is made from nature-based materials like biobrick, hempcrete, timber, and biocrete. Its façade, made of biomass (carbon-based material from plants and animals) and algae, actually produces biofuel for heating systems, cars, and airplanes. This one building can sequester 1,000 tons of carbon every year. The captured carbon can be used by various industries.

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City Essay

## Turning Carbon Dioxide into Rock

Most factories emit carbon dioxide. But in 2021 a giant plant near Reykjavik, Iceland, opened that pulls carbon dioxide out of the air and funnels it deep underground, where it turns into rock. Orca—named after the Icelandic word for “energy”—draws 4,000 tons of carbon dioxide out of the air every year, about the same amount as 870 cars.

Orca works by using fans to draw air into a collector with a filter. When the filter is full of carbon dioxide, the collector closes, the temperature rises, and the carbon dioxide is released as a highly concentrated gas. The gas is mixed with water and injected into basalt rock nearby, where it is mineralized. It turns to stone in about two years. Orca is the first and biggest installation for the “direct air capture” industry.

## Ecosystem Engineering Oysters

New York Harbor was once home to 220,000 acres of oyster reefs, which supported one of the most diverse ecosystems on the planet. Oyster reefs are like the trees of the forest and create habitat for hundreds of species. Oysters clean the water and remove pollutants such as nitrogen. One oyster can filter 50 gallons of water a day!

Oyster reefs are also a powerful natural defense against increased and severe storms due to climate change. They reduce flooding, prevent erosion, and soften the impact of large waves. They do this by absorbing wave energy and slowing the water before it hits the shore.

The Billion Oyster Project was launched in 2014 to restore oyster reefs in New York Harbor. Engineers figured out where to place the reefs and how big to make them by creating an exact replica of the restoration area and subjecting it to a mini hurricane. To date, 15 oyster reefs have been restored, with many more to go. Oysters are thriving better at some reefs than others; engineers and scientists are always learning.