

The Role of Carbon Capture in A Low Carbon Future

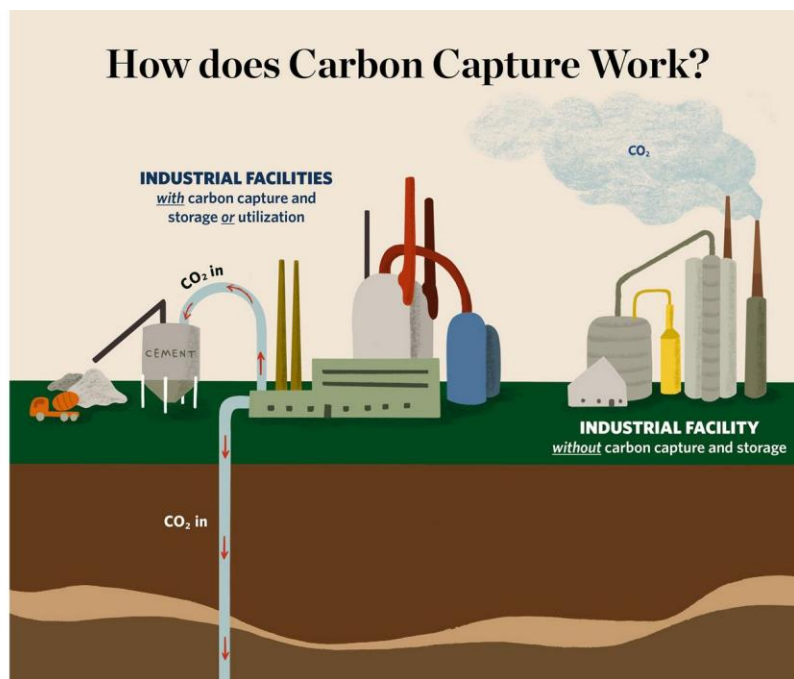
As the urgency to rapidly decarbonize becomes ever more dire, so does the interest in carbon capture technology. The latest Intergovernmental Panel on Climate Change (IPCC) report [explains](#), "significant cuts in global GHG emissions and even close to net-zero emissions [are achievable] by 2050 by deploying multiple available and emerging options."

From creating more sustainable supply chains to adopting electric vehicles and building additional capacity for clean energy, there are options available to reduce emissions. The real challenge is reducing emissions in [hard to decarbonize industries](#), like cement and steel production. Carbon capture provides a potential alternative for these industries – actively capturing emissions, sequestering them, and utilizing them for other sectors.

What is carbon capture?

Carbon capture is [the process of](#) removing carbon from an industrial process' emissions or actively capturing carbon from the atmosphere. In the first case, carbon capture mitigates emissions, while in the second, it removes them from the atmospheric system.

What is carbon capture and storage (CCS)?



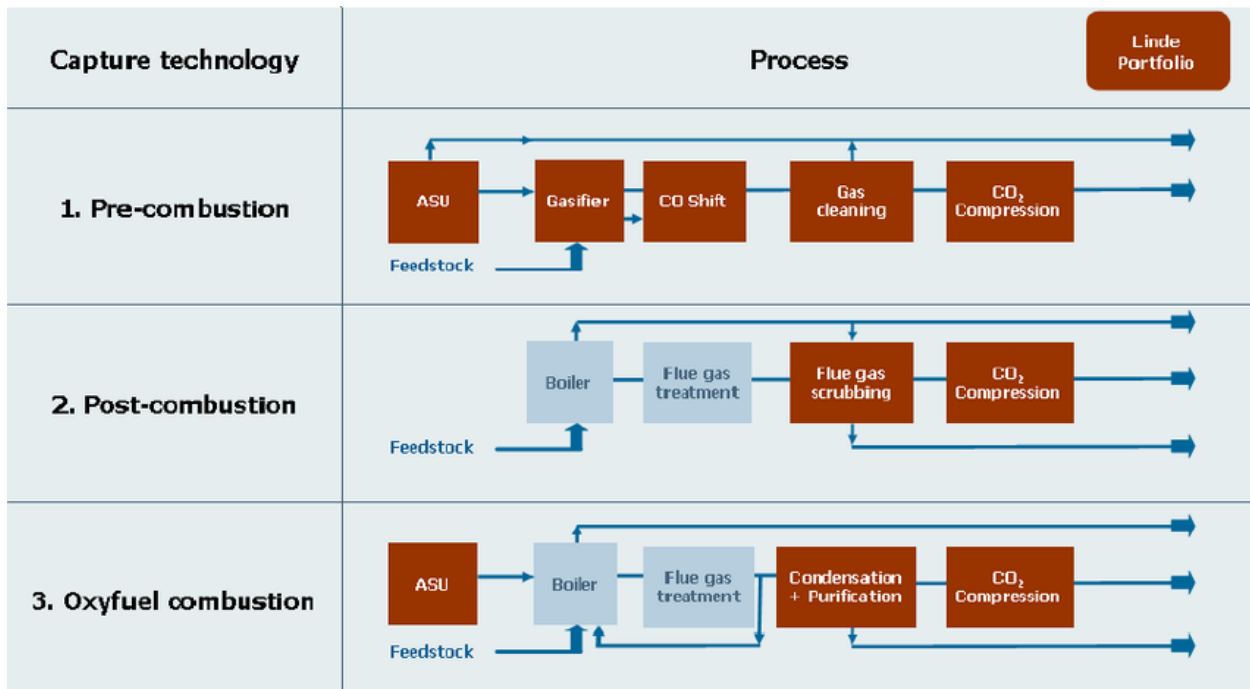
Source: [The Nature Conservancy](#)

Carbon capture is the first part of a [three-stage](#) carbon removal and storage system known as Carbon Capture and Storage (CCS). After the carbon dioxide is captured, it is transported to a storage site. Then it is injected into deep geological formations that trap carbon for permanent storage.

What is carbon capture and utilization (CCU)?

Carbon Capture and Utilization (CCU) differs from CCS [in one vital way](#) – the captured carbon dioxide is used instead of being permanently stored. Captured carbon dioxide is a vital resource [across industries](#), from producing fuel to carbonating beverages. CCU is a potential long-term opportunity for GHG heavy industries.

How to capture carbon



Source: [Research Gate](#)

There are [three ways](#) of capturing carbon: post-combustion, pre-combustion, and oxyfuel. Pre-combustion capture involves sequestering CO₂ before the combustion process. Post-combustion uses technology during the combustion process that reroutes exhaust fumes through a gas separator capable of removing carbon dioxide from the other greenhouse gasses. Oxyfuel is the most common but is only used in a specific situation - burning fuel in an oxygen-rich environment. In this situation, most emissions produced are CO₂ and water vapour. The water vapour is cooled into a liquid, and the CO₂ is pumped out.

Carbon Capture Technology

Each type of carbon capture technology is unique based on [its location](#) in the industrial process. Both pre-combustion and post-combustion technology rely on chemical reactions to bond with CO₂ molecules, making them easier to filter out. On the other hand, oxyfuel capture depends on an efficient combustion environment of pure oxygen. Additionally, while these are currently the three most common carbon capture technologies, new methods are under development.

How Effective is carbon capture and storage?

The efficiency of carbon capture and storage is at the centre of [a debate](#). Studies have found that CCS can capture more than 90% of carbon emissions from a power plant or industrial facility in optimal conditions. However, CCS is an [energy intensive process](#), so the net emissions reductions will be much lower even with optimal efficiency.

Carbon Capture Projects



Source: [Fluor](#)

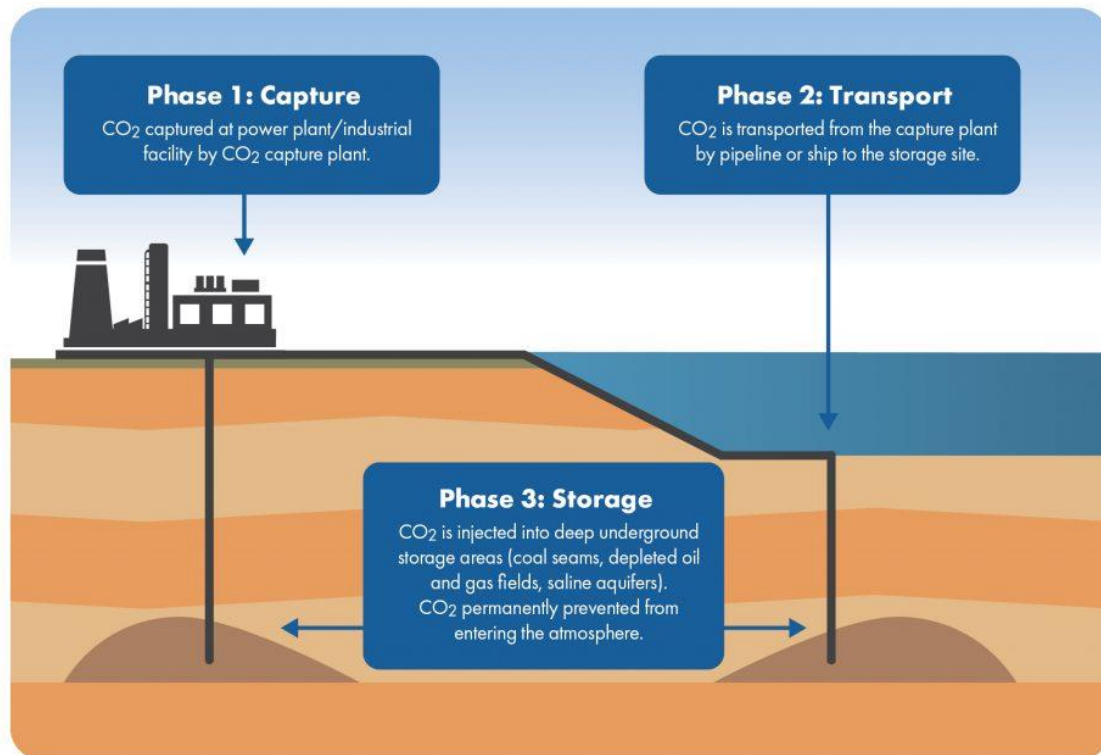
There are several carbon capture projects [around the world](#). Currently, the United States leads the way with thirteen different CCS facilities in active use, with plans for thirty in the coming years. The Middle East has three active CCS sites, and we expect policy-makers from across the region to announce plans for a more extensive rollout of CCS projects. A global leader in the net-zero campaign, [Europe](#) is seeing a surge in growth for carbon capture, with over forty projects underway.

How Does Carbon Capture Work?

Carbon capture has become a go-to across multiple industries aiming to reduce carbon emissions. New CCS plants continue to spring up, and older industrial plants are being retrofitted to add carbon capture

technology. The technology itself is [relatively simple](#) and involves adding an extra process that filters the gasses created by combustion.

Carbon Capture and Storage



Energy Information Australia is an initiative funded by the Australian Petroleum Production & Exploration Association (APPEA).
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Source: [Energy Information Australia](#)

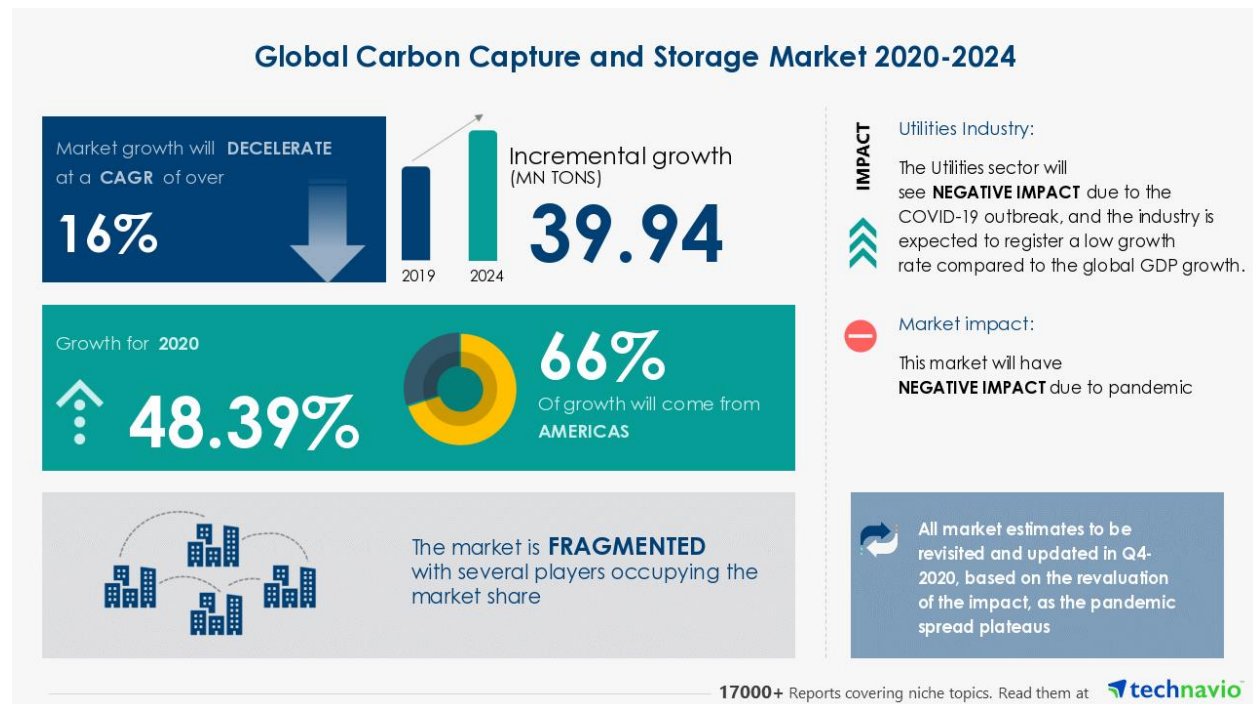
Carbon Capture Companies

There are many companies investing in carbon capture – from [startups](#) to industry giants like [Exxon Mobil](#). While it is hard to define which companies are leading the industry, there are several front runners.

- United States = Global Thermostat and Net Power
- Canada = CO₂ Solutions by Saipem, Quest CCS by Shell, and Carbon Engineering
- Europe: Climeworks (Switzerland) and Carbfix (Iceland).

These companies have been active for several years and are seeking to scale up the use of CCS technology in their respective regions and abroad.

Carbon Capture Stocks



Source: [Business Wire](#)

Carbon capture technology's mounting popularity and growth has led to several companies going public. This allows investors to be involved in the sector through carbon capture related [stocks](#).

The five of the most popular carbon capture stocks are: Aker Carbon Capture, Delta CleanTech, Occidental, Equinor, and Schlumberger. While these stocks draw from various sources and companies, they do not include the seven previously mentioned companies because they are private businesses.

Is Carbon Capture good for the environment?

Many people have branded carbon capture as an environmentally friendly option for hard to decarbonize industries. However, the technology's efficiency is still under [debate](#), and many sceptics point to the high energy requirements. Furthermore, the technology doesn't promote a global shift to low-carbon energy sources.

It raises the question - does carbon capture promote reducing symptoms rather than fixing the cause of climate change?

What is a major problem with carbon capture and storage?

Carbon capture storage is untested at a large scale, and its efficiency at capturing and effectively storing carbon is under scrutiny. Results from CCS projects around the world point to the [technology being inefficient](#) and needing nearly as much power to operate as the CO2 it removes. Reducing power requirements remains one of the most significant hurdles to the large scale adoption of CCS.

CCS – Promoting "Business As Usual"

Carbon capture storage has been touted as a key tool in the fight against climate change. Its use in energy production enables facilities to be "greener." This has led to an increase in "clean" fossil fuel plants, especially in countries with high energy demands and reliance on oil, gas, and coal, such as the United States, the Middle East, and Asia.



Source: [Climate Council](#)

A relatively unproven technology, CCS cannot mitigate the impacts of climate change alone and promotes a "business as usual" approach to industry and energy usage. For CCS to be effective, there needs to be investments in overall energy infrastructure that reduces the need for CCS and limits its use to specific circumstances.