



SCIENCE, TECHNOLOGY, AND THE ENVIRONMENT

# CARBON CAPTURE

– A WEAPON IN OUR BATTLE AGAINST CLIMATE CHANGE?



Carbin Minerals is a small company founded by University of British Columbia scientists. Its big news? It just won a million dollar prize!

The firm was competing to come up with the best technology to help solve pressing world problems. A panel of 70 experts from many countries judged the contest entries. Carbin Minerals was one of 15 winners out of 1133 entrants. It will use the money to develop its **innovative** carbon capture technology.

## CARBON CAPTURE 101

Carbon capture involves pulling carbon dioxide (CO<sub>2</sub>), a greenhouse gas, out of the atmosphere. It then locks up this CO<sub>2</sub> permanently. It's a way to 'decarbonize' the planet. The hope is that this will avoid the

worst impacts of climate change down the road.

Levels of carbon dioxide in the Earth's atmosphere are increasing. That is largely due to the burning of fossil fuels. To bring down these carbon dioxide levels, we need to reduce the amount of carbon we pump into the atmosphere. One way is to transition from fossil fuels to 'cleaner' renewable sources such as solar and wind.

But that might not be enough to reach Canada's goal of **net-zero** carbon emissions by 2050. That's why some scientists see carbon capture as a crucial part of the overall climate solution.

Carbon capture has traditionally worked in one of two ways. The first involves stripping carbon from smokestack emissions in industrial operations. The

## DID YOU KNOW?

The concentration of CO<sub>2</sub> in the atmosphere is expressed in parts per million (ppm). Before the Industrial Revolution, which began in 1760, atmospheric CO<sub>2</sub> was about 280 ppm. By March 2022 it had risen to 418 ppm, a 50-percent increase.

second calls for capturing carbon directly from the air. The carbon dioxide is then compressed. Afterwards it is either injected deep underground or used to make other products.

## GRABBING CO<sub>2</sub>

The idea that won the UBC team its award captures carbon in a different way. It builds on a process called carbon mineralization.

## DEFINITIONS

**INNOVATIVE:** new, original, and advanced

**NET-ZERO:** resulting in neither a surplus or deficit because gains and losses cancel out



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It works like this. Earth has **magnesium**-rich rocks under its crust. When brought to the surface, these rocks react with carbon dioxide in the atmosphere. The magnesium absorbs the gas and converts it into solids. This process removes carbon from the atmosphere and stores it away.

Where do you find such rock? Think of mining sites full of crushed rock left over once valuable ore is removed. This rock waste can become a vault that locks up carbon for eternity.

It will take huge quantities of rock to budge global CO<sub>2</sub> levels. The costs will be daunting. But it's just one example of the novel carbon capture technologies that scientists are working on.

## A HUGE CO<sub>2</sub> OUTPUT

Canada is one country that is looking to carbon capture to help achieve its emissions targets. The federal government has set a goal of grabbing and storing 15 **megatons** of carbon per year.

In Canada, most existing and proposed carbon capture projects are in Alberta and Saskatchewan. These two

provinces rely heavily on the oil and gas industry. But that energy sector contributed 26.2 percent of Canada's total emissions in 2019. So to be able to continue extracting fossil fuels, the provinces must lower their emissions. Carbon capture technologies can help.

## YESTERDAY'S INDUSTRY?

Chris Severson-Baker of the Pembina Institute in Alberta agrees that carbon capture is necessary. However, he advises against investing much public money in the oil and gas industry. He argues that it is an industry in decline.

Over 400 academics agree. They wrote to the federal government warning against **subsidizing** expensive carbon capture technology in the fossil fuel industry. Instead, they say that we should focus on technologies that don't emit carbon in the first place.

## STOPPING THE TRAIN

However, some experts say we shouldn't choose one approach over the other. According to the **International Energy Agency**, the world needs both. Otherwise, we won't meet emission reduction targets.

## WHY NOT JUST PLANT MORE TREES?

As they grow, trees and other plants consume carbon dioxide from the atmosphere and release oxygen. They are nature's own carbon capture solution.

The United Nation's Trillion Tree Campaign aims to grow one trillion trees by 2030 to mitigate climate change. But most climate change experts agree we can't plant enough trees, fast enough, to do the job alone. Nature-based solutions can reduce atmospheric carbon, but our current emissions exceed what the planet can absorb.

"You needed to have this discussion 30, 40 years ago because back then you still had a chance to stop the train," says U.S. Professor Klaus Lackner. He is sometimes known as the Godfather of Carbon Capture.

"For two centuries we've simply dumped the waste from energy production – which is carbon dioxide – in the atmosphere. We are gradually waking up to the fact that that's not acceptable."

Now, to avert the worst damage from climate change, he says, "we need to throw everything we can at it." ★

## DEFINITIONS

**INTERNATIONAL ENERGY AGENCY:** an intergovernmental agency founded in 1974, within the framework of the Organization for Economic Cooperation and Development (OECD), to coordinate energy supply and demand worldwide. Its headquarters are in Paris.

**MAGNESIUM:** a silver-white metal that is a chemical element  
**MEGATON:** one million tons (ton: a unit for measuring weight, containing 2000 pounds and equal to 907 kilograms)  
**SUBSIDIZE:** to help a person or company pay for something



## COMPREHENSION QUESTIONS

1. What does **CO<sub>2</sub>** stand for?

2. How does this greenhouse gas get into the Earth's atmosphere?

3. What was the concentration of **CO<sub>2</sub>** in the Earth's atmosphere before the Industrial Revolution?

4. What is the current concentration of carbon dioxide in the Earth's atmosphere?

5. Explain what **carbon capture** is.

6. Identify and describe one of the two methods normally used to capture carbon.

7. Which company won a prize for developing a new carbon capture method? How big was the prize?

8. Describe the new carbon mineralization technology that this company developed.

9. Identify two problems associated with this method of carbon mineralization.



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## ORGANIZER

A. Change is difficult. Whenever a new idea is proposed to address an existing concern, there will be people in favour of and people opposed to that idea. Considering the details of carbon capture technology presented in the article, complete the chart below to reflect the perspective(s) of each group that may be impacted by this new technology.

Stakeholder	Perspective/Considerations
Oil and gas companies	
Mining companies	
Carbon capture companies	
Environmentalists	
Governments	
International organizations (e.g., UN – COP26)	
Car manufacturers	
Car owners	

B. After gathering and considering the information in the above table, *I believe that carbon capture technology IS / IS NOT* (circle one) *an important investment in the battle against climate change because...*

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