Today I Learned About Carbon Capture

"The idea in carbon capture is that CO_2 that's created by the burning of fossil fuels, you stop from going into the atmosphere. And you do that by capturing it and then you put it somewhere other than the atmosphere."

Howard Herzog, MIT Energy Initiative
TILclimate podcast: Today I Learned About Carbon Capture

Why is Concrete So Important?

Concrete. It's in our sidewalks, our buildings, our bridges. In fact, concrete is the second-most used liquid on the planet, after water[1]. The way we make concrete releases large amounts of carbon dioxide (CO_2.) A regular amount of CO_2 is necessary for life on Earth, but as we release excess CO_2 into the atmosphere, it acts like a blanket around Earth, trapping heat. This excessive trapped heat is warming our ocean, air, and land, causing dramatic changes in weather and climate patterns all over the world.

To learn more about concrete and its relationship to climate, read the MIT Explainer, "Concrete" at https://climate.mit.edu/explainers/concrete

Low-Carbon Concrete?

The key ingredient in concrete – and the source of most of its carbon emissions – is cement. Cement is usually made by mining calcium carbonate out of the ground and then heating it above 2600˚F. The chemical reaction as the cement forms releases CO_2 as a byproduct. In order to heat it to such high temperatures, fossil fuels such as natural gas, coal, or oil are used – and the burning of fossil fuels also releases CO_2.

In the ocean, corals build huge coral reefs out of calcium carbonate – the same material as in cement – but without releasing CO_2. In fact, the corals take CO_2 out of the ocean to make their skeletons. Scientists have found a way to mimic this process, using captured CO_2 from factories and power plants and ocean water.

Biomimicry is when scientists, engineers, designers, and others look to natural systems to develop new technologies, processes, and ideas. Today, you will practice biomimicry by producing calcium carbonate from sea water, carbon dioxide, and sodium hydroxide.

To learn more about biomimicry, visit https://asknature.org/

1 MIT Explainer: Concrete https://climate.mit.edu/explainers/concrete
Images from The Noun Project by Peter van Driel and Eucalyp

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"The problem is the buildup of greenhouse gases in the atmosphere, and so what we want to do is look at solutions that reduce the amount of greenhouse gases we're putting into the atmosphere."
Howard Herzog, MIT Energy Initiative
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One Topic, Many Angles

Listen to the TILclimate podcast episode "Today I learned about carbon capture," https://climate.mit.edu/podcasts/e7-til-about-carbon-capture

Then, each member of your group will read one of the following articles:

- MIT Explainer: Carbon Capture https://climate.mit.edu/explainers/carbon-capture
- MIT Explainer: Concrete https://climate.mit.edu/explainers/concrete
- MIT Explainer: Carbon Pricing https://climate.mit.edu/explainers/carbon-pricing
- Ask MIT: How efficient is carbon capture and storage? https://climate.mit.edu/ask-mit/how-efficient-carbon-capture-and-storage
- Ask MIT: Do we have the technology to go carbon neutral today? https://climate.mit.edu/ask-mit/do-we-have-technology-go-carbon-neutral-today

Reading Questions

While you read, ask yourself the following questions:

1. What new information does this reading give you?
2. What information would you need to understand this reading?
3. What questions do you still have?
4. What is the key takeaway from this reading?
5. In one or two sentences, explain the key takeaway from your reading.

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"There's no silver bullet in dealing with climate change. There's no one solution that's going to provide the answer."
Howard Herzog, MIT Energy Initiative
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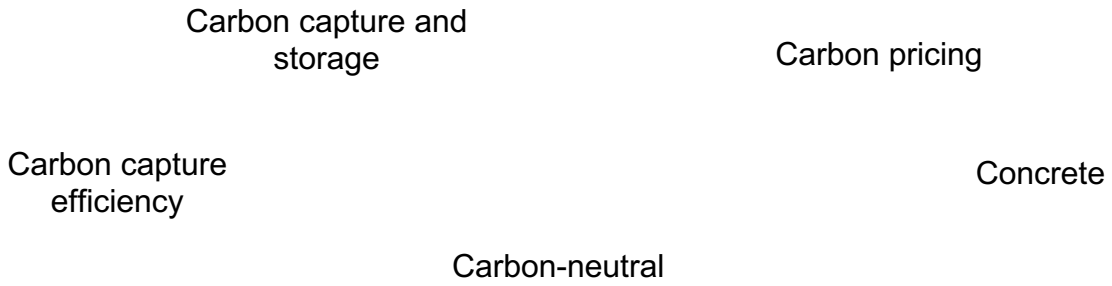
Each One, Teach One

1. On a large piece of paper, whiteboard, or digital whiteboard, write the key concepts from each reading with space between them. For example:



2. As each member of your group briefly explains their reading, draw lines between concepts that are connected, and write the connection along the line.

Discussion Questions

1. What did you learn from someone else's reading or a connection you made?
2. Did any new information help answer any of your questions from your reading?
3. What new questions do you have, or do you still have the same questions?
4. What is carbon capture and storage? How does it work?
5. Carbon capture and storage can be one tool to slow climate change. What are some of the other tools in our collective toolkit?
6. Which of these tools do you think should get the most support and funding in the coming years? Why?

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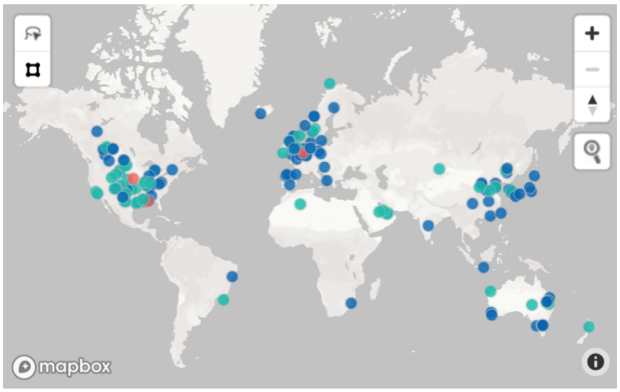
"The method of capturing carbon dioxide that has been used for the longest is to run the flue gas through a solution of chemicals called amines. The carbon dioxide dissolves in the amines."

Prof. Brad Hager, MIT Department of Earth, Atmospheric, and Planetary Sciences
TILclimate podcast: Today I Learned About Carbon Capture



Carbon Capture Facilities

Carbon capture and storage (CCS) is a relatively new and rare technology, but there are dozens in operation around the world, and many more under construction.

1. Visit https://co2re.co/FacilityData
2. To answer the questions below, use the filter drop-down menus to focus on a region, country, facility category, and/or facility status.

Questions

1. Where is your closest CCS facility? What kind is it? What is its status?
2. How old are most operational CCS facilities?
3. When will most new CCS facilities be operational?
4. Choose a few facilities of interest to you. What interests you about them? What kind of carbon do/will they capture, and where does it go?
5. If you learned that a CCS facility was being planned in your area, would you support it? Why or why not? What factors might change your mind in either direction?
6. What other questions do you have about CCS?