**Chemical Pathways vs. Land-Based Pathways for Carbon Removal**

**General Objective**

Compare approaches to carbon removal that rely on chemical pathways (i.e., direct air capture) with land- or photosynthesis-based approaches (i.e., afforestation/reforestation).

**General Guidelines and Potential Topics for Carbon Removal Research**

Students will research and investigate the different benefits and tradeoffs between chemical-based and land- or photosynthesis-based approaches to carbon removal. Some topics that might interest students at this nexus include:

* Raw materials and natural resources required for carbon removal pathway
  + What raw materials (i.e., chemicals) and natural resources (i.e., arable land) are required for each carbon removal pathway?
  + How are the raw materials are acquired? What are the restrictions to the availability of the natural resources required?
* Energy and infrastructure requirements for each approach
  + How much energy do these approaches use and where would the energy come from?
* Land area requirements
  + How much land is required for these approaches to reach the 1 billion tonne CO2/yr scale?
* CO2 storage pathways and their permanence
  + How is the captured CO2 stored?
  + How likely is it that storage method will be reversed and the CO2 reenter the atmosphere?

**Outcome**

Students will prepare a deliverable that outlines the benefits and tradeoffs between chemical pathways (i.e., direct air capture) with land- or photosynthesis-based approaches (i.e., afforestation/reforestation) answering the following questions:

* What are the benefits and tradeoffs of each approach you researched?
* What circumstances would you recommend one vs. other approaches to carbon removal?
  + Can you think of specific conditions or regions where one approach may make more sense than others? Provide this example and explain your reasoning.
* If you were to take these findings and present them to policymakers, what do you think is the most important thing to get across to them, and why?