

## Direct Air Capture aka Artificial Trees

Direct Air Capture is the process of taking CO<sub>2</sub> straight from the air and compresses it into a stream for sequestration or utilisation.

Carbon Sequestration is the long-term removal of carbon dioxide from the atmosphere. The aim is to slow or reverse the CO<sub>2</sub> pollution. This, in the long run, would help in reversing the effect in global warming, and thus is a restorative effect/

Carbon Capture and Utilisation is the process of capturing CO<sub>2</sub> to be recycled for further usage., so isn't a restorative technique

Although trees are perfectly capable of fulfilling this role, DACs complete this task much faster and have a much smaller land footprint, as they are often stacked vertically.

Carbon dioxide removal is achieved when surrounding air comes in contact with a chemical; typically an aqueous alkaline solvent or functionalized sorbents are used. These chemicals are stripped of CO<sub>2</sub> through the application of thermal energy, resulting in a CO<sub>2</sub> stream that can undergo dehydration and compression, while simultaneously regenerating the chemicals for reuse. When combined with long-term storage of CO<sub>2</sub> DACs can act as a carbon dioxide removal tool whereby net negative emissions may be achieved.

DAC is not an alternative to traditional, point-source carbon capture and storage, but can be used to manage emissions from distributed sources, like exhaust fumes from cars, and reversing

DAC is still in its early stages of development, though several commercial plants are in operation or planning across Europe and the US.

### Benefits of this technology:

- **Mobility-** They can be built and deployed anywhere in the world and remain effective. This means that they can be built in areas unsuitable for agriculture, human habitation or other natural CO<sub>2</sub> mitigation efforts like reforestation and afforestation.
- **Accessibility-** These systems are technologically feasible with the knowledge and equipment available today, with almost no land use issues
- **Permanent removal-** CO<sub>2</sub> can be permanently removed from the atmosphere and permanently stored

### CONs:

- **Building and Costs-** These systems are large-scale infrastructure projects requiring design and construction of roads, building facilities, equipment and machinery in order to make these systems a reality. This would require investment as well as international and intergovernmental collaboration.
- **Storage after Processing-** The main concern of DACs is what to do with the CO<sub>2</sub> after it has been removed from the air. Underground storage brings concerns over possible leaks and other environmental damage or contamination, as well as monitoring of storage sites.
- **Overall Energy Usage-** These facilities require energy input to operate, and one of the main concerns of DAC systems is that they will be so energy-intensive that the CO<sub>2</sub> produced by power generation plants to run the DAC system will still outpace any CO<sub>2</sub> removal the DAC