Carbon Capture Utilization and Storage Technologies

Green Economy

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ROADMAP

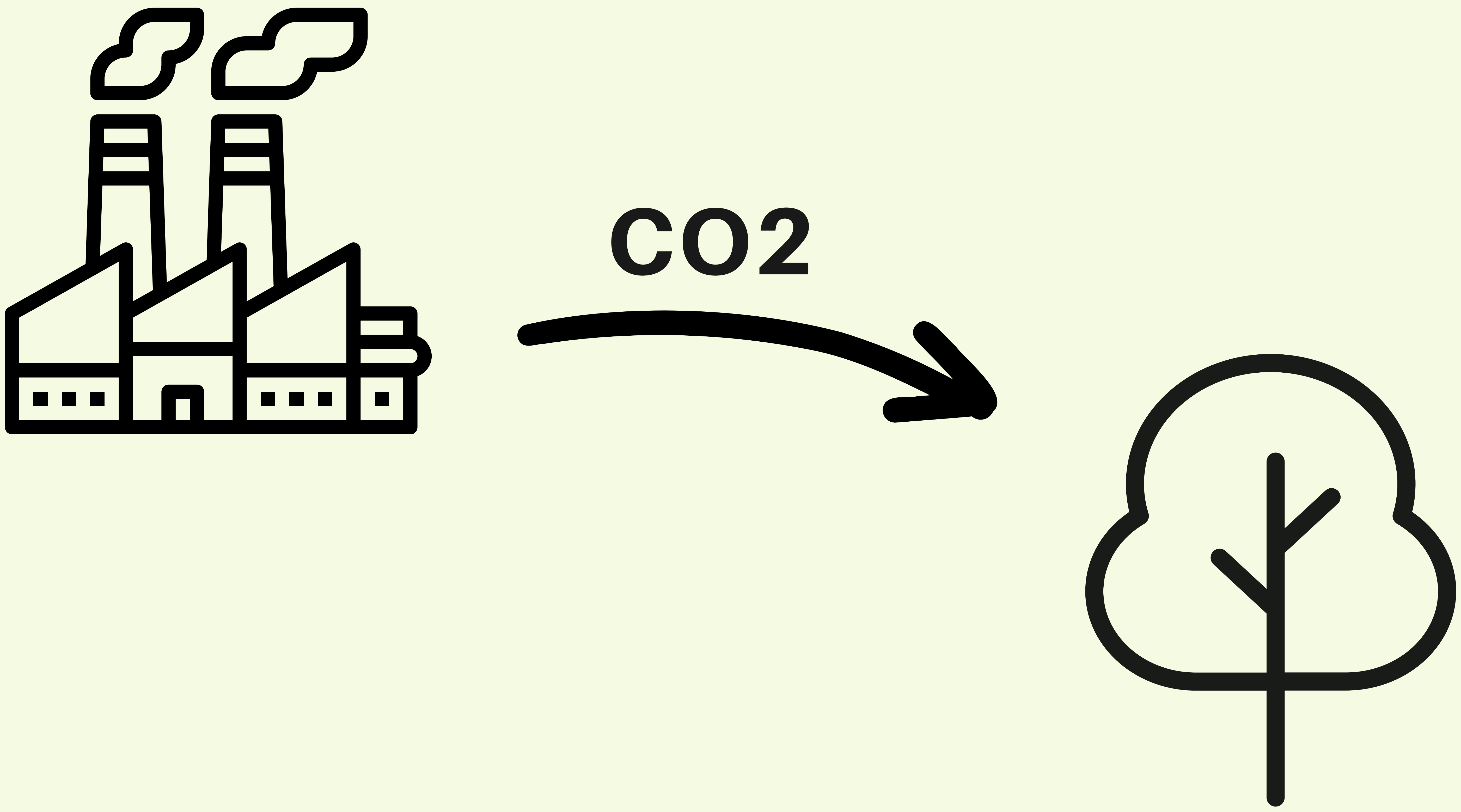
1 - Carbon Capture Technologies

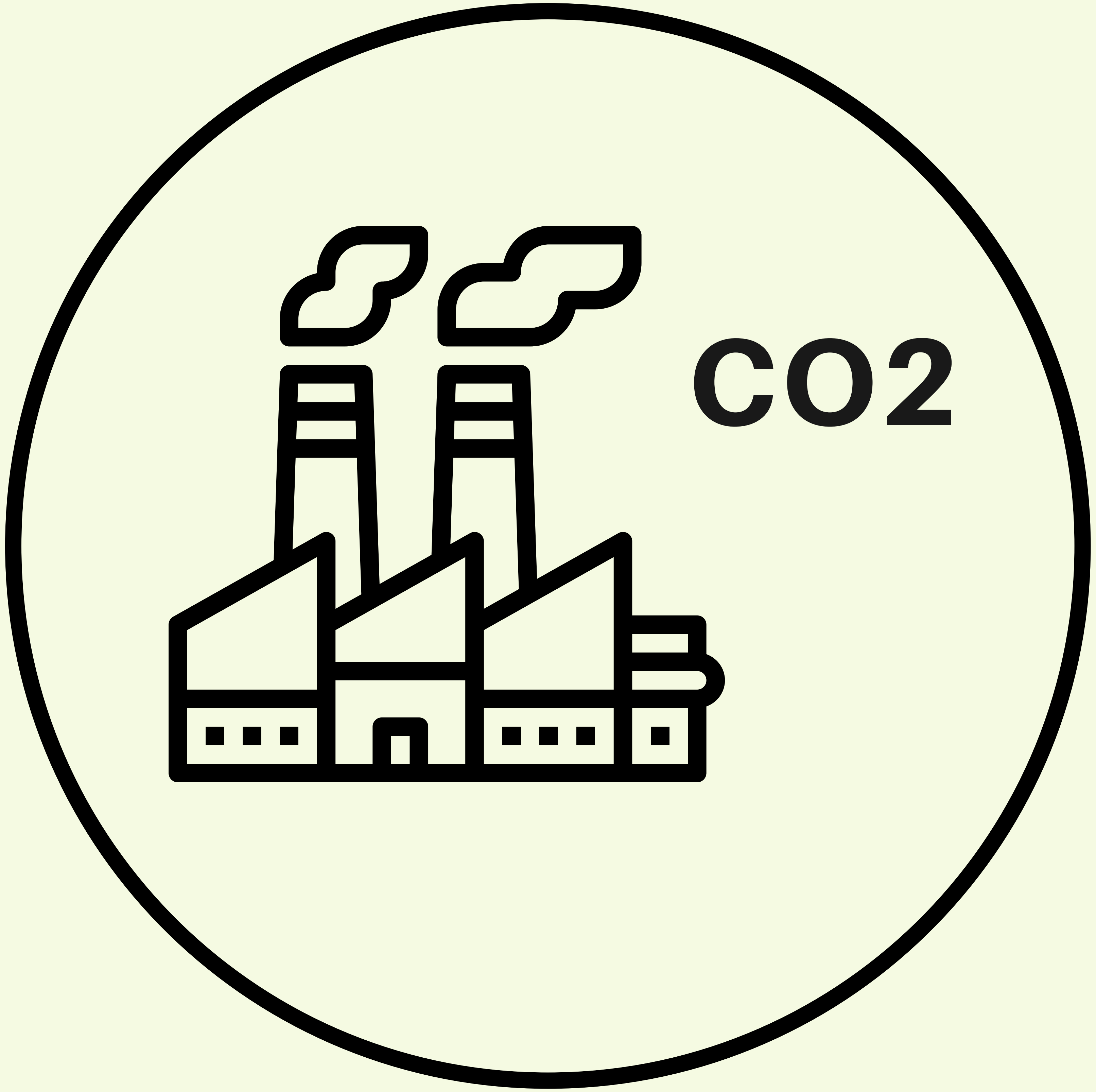
2 -Carbon Utilization

3 - Carbon Storage methods

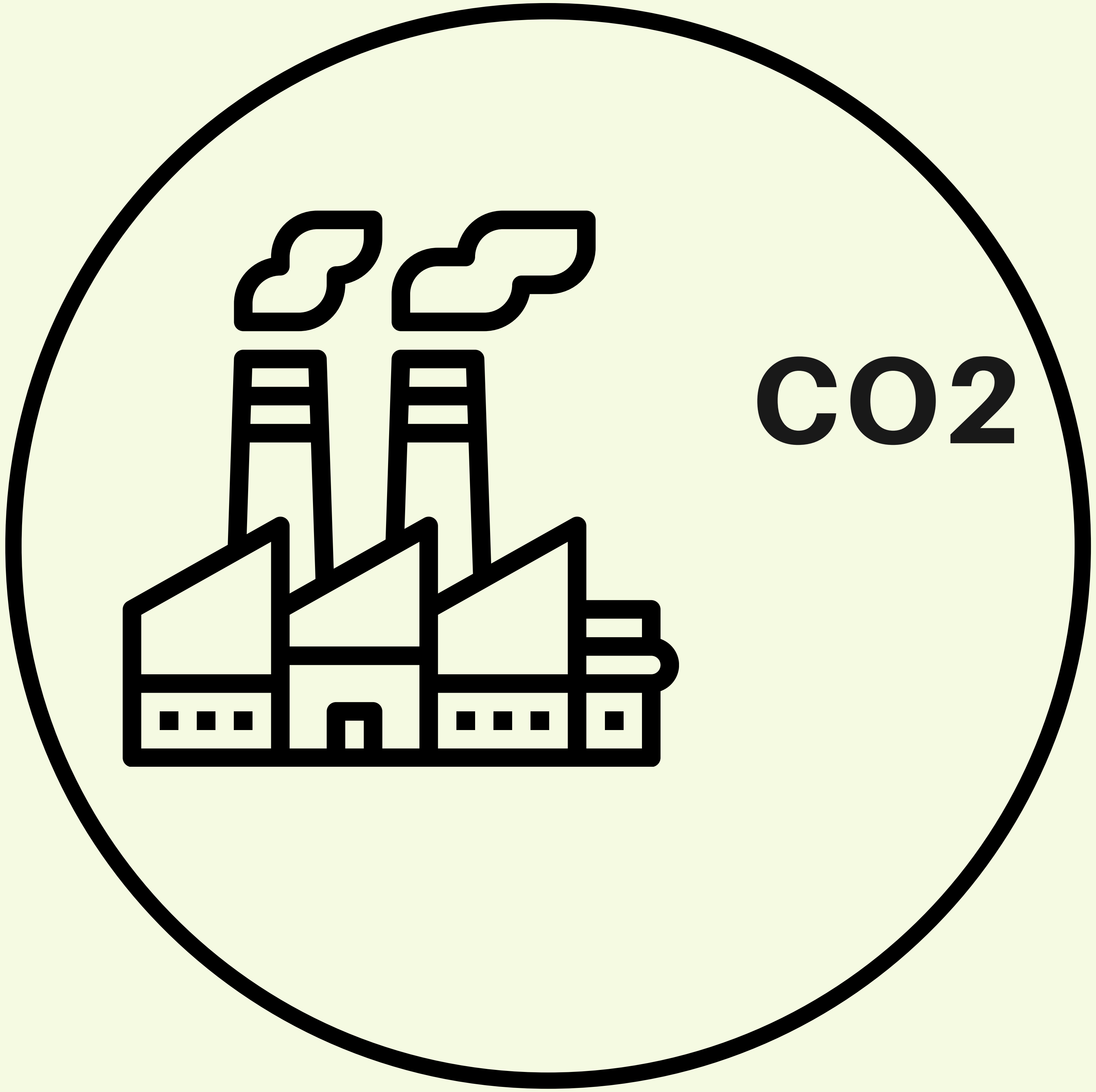
4 - Research and Development

5 - Conclusion


CO2



HOW DO WE BETTER THIS?



PRE COMBUSTION

POST COMBUSTION

OXY-FUEL COMBUSTION

COMBUSTION-TECHNOLOGIES

PRE

capture CO2 emissions

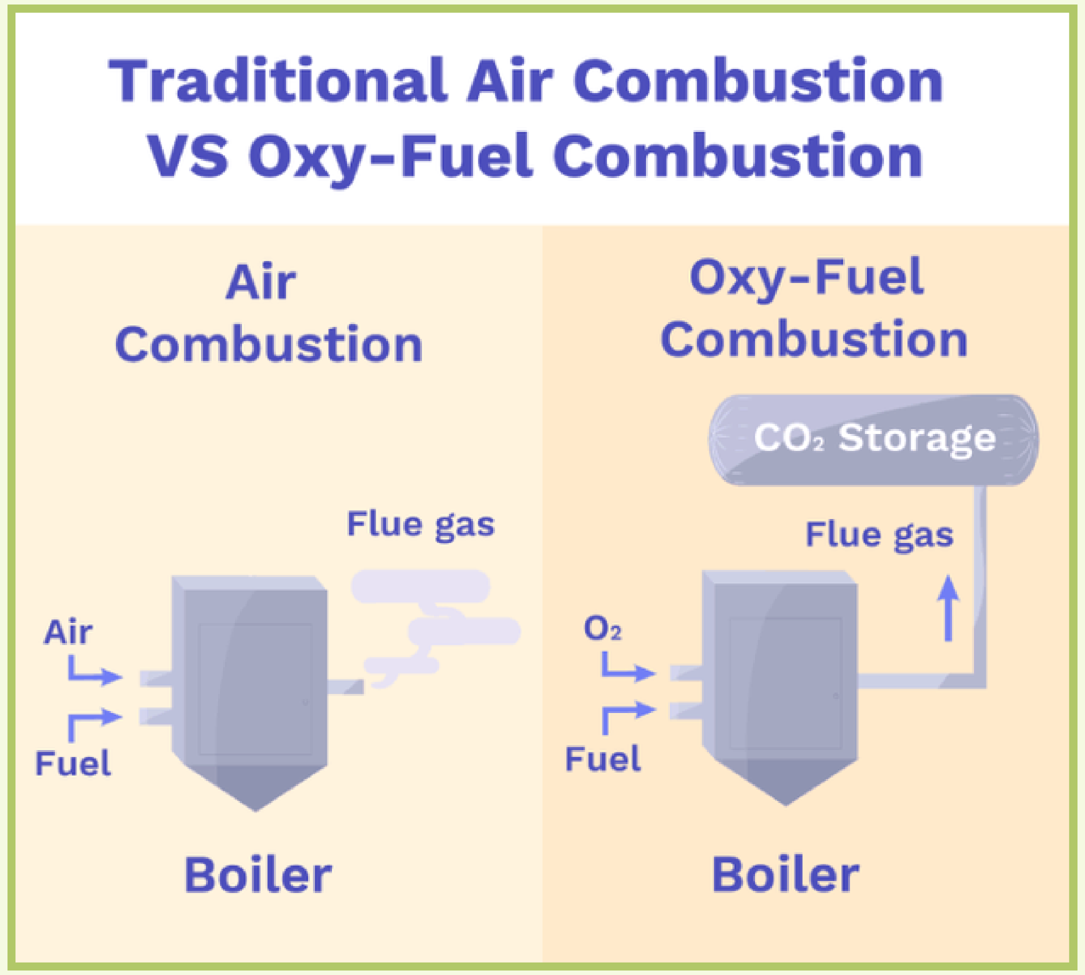
POST

- The carbon is captured before the fossil fuel is burned, using a solvent
- The fuel is converted into a mixture of hydrogen and CO2, and the CO2 is separated before combustion

- This method involves capturing CO2 emissions after fossil fuels are burned to generate power or heat.
- A chemical solvent captures the CO2 to separate it from the solvent for storage or use.

COMBUSTION-TECHNOLOGIES

OXY-FUEL



- Traditional power plants directly release flue gas (smoke from combustion)
- Oxy-fuel power plants capture this gas to compress it & then store or use it further

Comparison of their efficiency and applicability

	Pre-Combustion Capture:	Post-Combustion Capture:	Oxy-Fuel Combustion:
Efficiency:	More energy-efficient. The separation of CO_2 occurs before combustion, allowing for a higher concentration of CO_2 in the flue gas.	Less energy-efficient, because it involves separating CO_2 from a more dilute flue gas after combustion.	More energy-intensive due to the separation of oxygen from air before combustion.
Applicability	High-temperature processes (manufacturing and refines) Often used with natural gas or coal gasification.	It can be applied to a wide range of combustion processes, including coal, natural gas, and biomass.	Coal plants are best suited; industries with specific high-temperature requirements.

CO_2 Utilization

Fuel Production

Captured carbon dioxide (CO_2) from industries is transformed into synthetic fuels by combining it with hydrogen. These synthetic fuels can power cars, planes, and other vehicles, offering a cleaner alternative to traditional fuels

Enhanced Oil Revovery

Carbon dioxide is injected into depleted oil reservoirs, reducing oil viscosity and improving flow. This process enhances oil displacement toward production wells, increasing recovery rates.

Biological Utilization

Captured carbon dioxide (CO_2) can be utilized in controlled environments like greenhouses. Plants use it during photosynthesis to produce carbohydrates and oxygen. Increasing CO_2 levels in such environments can potentially boost photosynthesis and, consequently, plant growth.

Chemical Manufacturing

Carbon dioxide (CO_2) can be used as a feedstock (raw materials or substances used as a starting point in industrial processes) in various processes to produce a wide range of chemicals.

ECOLAIR

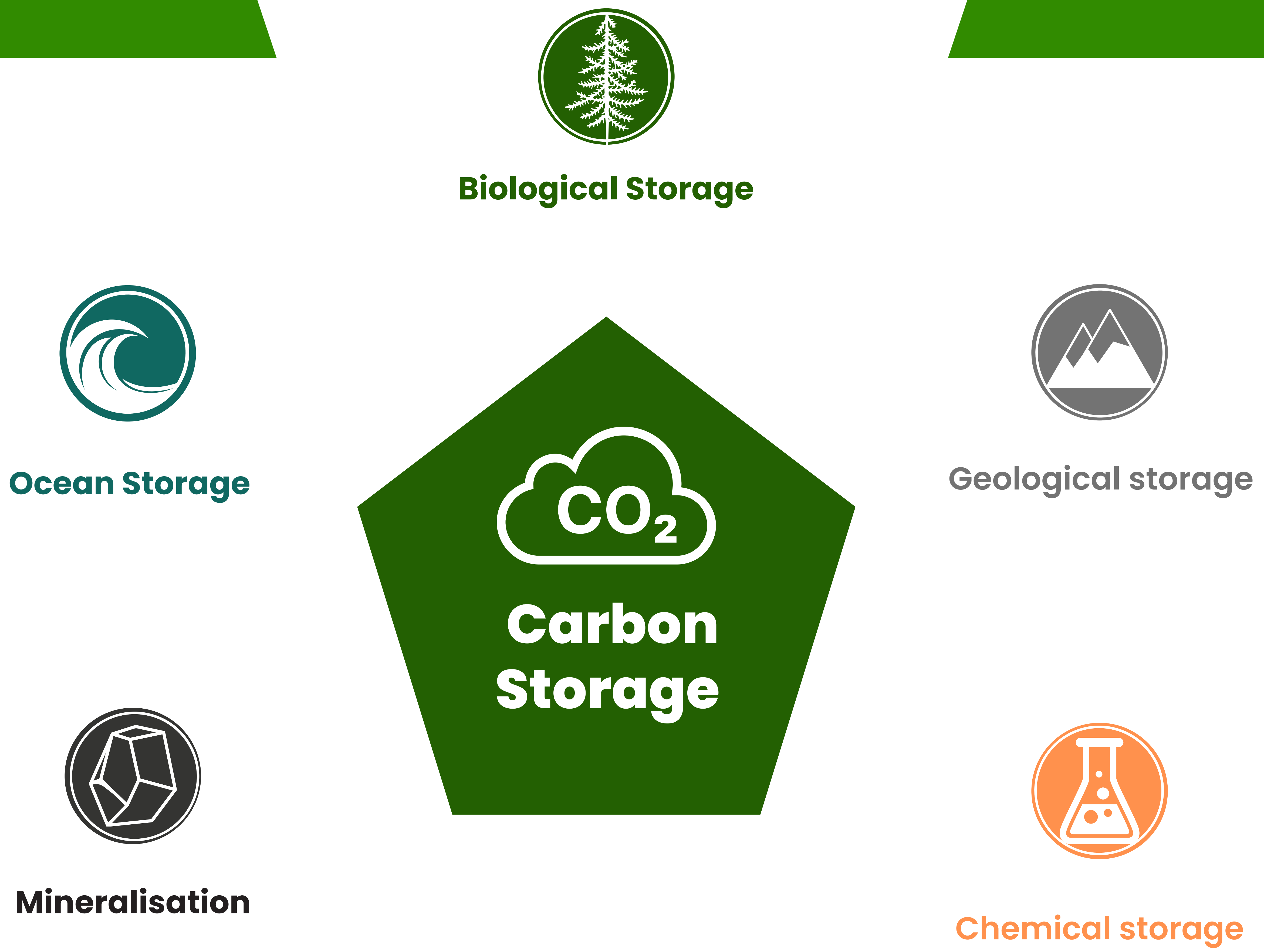
Colombian Company started by a girl and her father, who kick-started an idea for a science fair project.

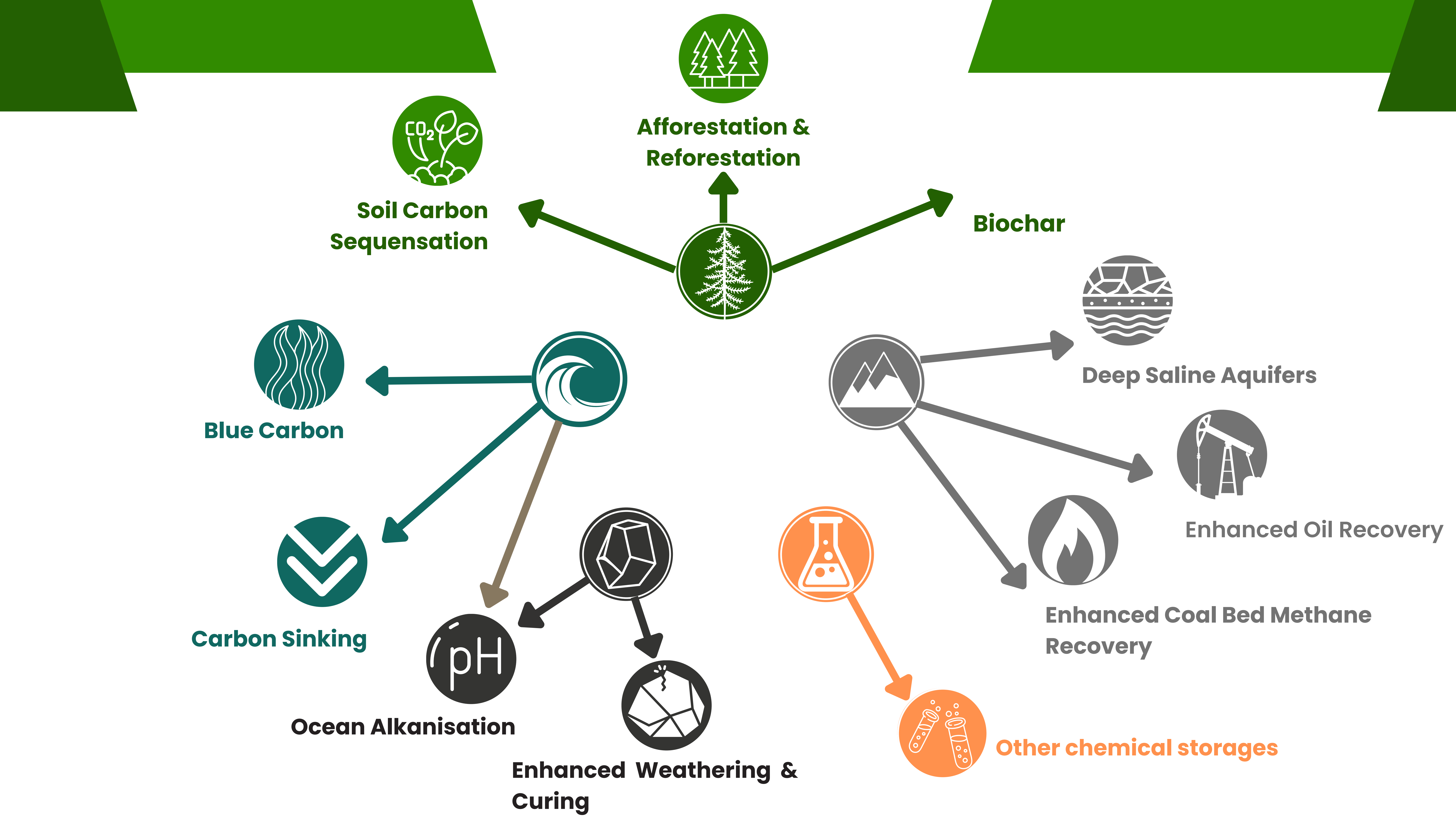
Construction Materials

Tiles, rural roads, panels, cobblestone, among others.

Biodegradable Bags

With a minimum life span of 18 months


Biological Storage
Ocean Storage
Geological storage
CO_2
Carbon Storage
Mineralisation
Chemical storage



Afforestation & Reforestation
Soil Carbon Sequensation
Biochar
Blue Carbon
Deep Saline Aquifers
Enhanced Oil Recovery
Carbon Sinking
pH
Enhanced Coal Bed Methane Recovery
Ocean Alkanisation
Other chemical storages
Enhanced Weathering & Curing

Project Evaluation

	Safety	Monitoring	Scalability/ Applicability	Cost	Long-term Stability
Afforestation & Reforestation	Gernerally safe, risks assiciated to wildfires, disease, etc.	Satellite imagery and on-site assessments	Higly scalabel, limited by competing land use and regional effectivity	Low starting cost, medium long-term cost	Susceptible to climate change impacts, risks of deforestation, fast carbon cycle
Biochar	Pyrolysis is considered safe, improving soil quality	Difficult to measure overall carbon storage impact	Limited by feedstock availability and soil type	Can be cost effective, costlier on larger scale	Long-term soil stability, fast carbon cycle
Soil Sequensation	Very safe	Monitoring impact might be difficult	Can be applied in various agricultural settings.	Medium starting cost, longterm gain	Long-term carbon storage, susceptible to land use changes
Blue Carbon	Generally safe, vulnerable to climate change impacts	Frequent monitoring required, estimating impact is challanging	Applicable in coastal areas globally, limited to specific ecosystems	Cost-effective for conservation efforts and restoration	Provides short & long-term carbon storage, vulnerable to sea-level rise and habitat degradation
Carbon Sinking	Considered safe, still more research required	Monitoring through pilot projects	Highly scalable, unintended consequences need to me evaluated	Low cost per unit of carbon sequestered	Long-term slow carbon cycle

Project Evaluation

	Safety	Monitoring	Scalability/ Applicability	Cost	Long-term Stability
Ocean Alkanisation	Potential ecological impacts, regulatory concerns	Monitoring ocean chemistry is feasible	Can be applied globally, energy-intensive, etc.	High initial costs; ongoing operational costs	Long-term carbon storage, high ecological uncertaincy
Enhanced Weathering & Curing	Generally safe and natural processes, scalablity is problematic	Monitoring through pilot projects	Infrastructure & availability constraints, energy-intensive	Medium cost, high cost per unit carbon removed	Long-term carbon storage
Deep Salline Aquifers	Generally safe if proper site selection, induced seismicity, leaks	Monitoring of injection and subsurface conditions, long-term difficulties	Limited by suitable geological formations, infrastructure requirements	Medium to high capital cost, monitoring and verification	Long-term carbon storage if geological conditions are right, site-specific uncertaincies, subsurface changes
Enhanced Oil recovery	Generally safe, utilizes established oil industry practices, CO2 leaks	Well-established CO2 injection and rocovery monitoring processes	Applicable globally with limits being specific geological conditions	Medium capital cost, monitoring costs	If properly managed can provide long-term carbon storage
Enhanced Coal Bed Methane Rocovery	Generally safe, potential for methane leakage, site-specific risks	Monitoring technology avaliable, monitoring long-term carbon storage may be challanging	Globally applicable, potential competition with methane extraction	Medium capital cost, economic competitiveness	Can be without leaks be a promising long-term carbon storage

Research and Development

Existing

Experimenting with materials and chemicals with carbon dioxide as we have seen

Making viable fuels for vehicles instead of storing carbon in pellets

Using predictive AI to forcaset carbon emmisions through carbon footprint data

Today, there are 21 CCUS facilities around the world with capacity to capture up to 40 MtCO2 each year.

Future

Advancements in storage solutions as well as making this cost effective

Need to be careful with oil and gas companies, more regulations required with CCUS methods

Retrofitting CCUS technologies to existing clean energy plants and society in general

SME'S/Projects/ Startups

Goal of cutting CO2 emissions from natural gas usage

Carbon Capture and Utilisation

CARBONQUEST Carbon Capture Carbon Utilization Projects & Case Studies About Us

Slashing emissions in the built environment

CarbonQuest captures CO_2 before it is emitted, enabling buildings to decarbonize more efficiently

30 story building in Manhattan
60% of the gas boiler's emission are combined with cement to produce building materials (blocks)

Potential Breakthrough?

CO2RAIL

Direct Air Capture (DAC) system can sit in any configuration on a train and uses energy from a regenerative braking system to capture carbon from ambient air.

Carbon Negative Transportation