

# **Carbon-Dioxide Removal**

## Why in news?

As nations gather for the <u>COP 28</u> in Dubai, the question of carbon capture's future role in a climate-friendly world will be in focus.

## What is Carbon Dioxide Removal (CDR)?

- **Carbon removal** Using technologies, practices, and approaches to remove carbon dioxide (CO2) from our atmosphere through deliberate and intentional human actions.
- It captures CO2 from the atmosphere and locks it away for decades or centuries in plants, soils, oceans, rocks, saline aquifers, depleted oil wells, or long- lived products like cement.

**CARBON CAPTURE PROCESS** 



### • **Process-** CDR can be done through traditional or technological processes or both.

| Process                | Examples   |
|------------------------|--|
| Traditional<br>process | <ul> <li>Afforestation</li> <li>Reforestation</li> <li>Agricultural practices that sequester carbon in soils (carbon farming)</li> </ul> |

- **Forms of CDR** The most common form of carbon capture technology involves *capturing the gas from a point source* like an industrial smokestack.
- Carbon storage- It includes
  - **Carbon capture and storage (CCS)** The carbon can be moved directly to permanent underground storage.
  - **Carbon capture, utilization, and storage (CCUS)** Carbon can be used in another industrial purpose first.

As of 2023, CDR is estimated to remove around 2 gigatons of CO2 per year, which is equivalent to 4% of the greenhouse gases emitted per year by human activities.

#### What are the different CDR methods?

| CDR method                      | About   | Challenges   |
|---------------------------------|---|--|
| Afforestation/<br>Reforestation | <ul> <li>Converts abandoned or degraded<br/>agricultural lands into forests.</li> <li>Additional trees can sequester more<br/>carbon dioxide from the atmosphere.</li> </ul>  | <ul> <li>Increases the competition<br/>for land.</li> <li>May limit the options for<br/>food production and<br/>biodiversity conservation.</li> </ul>  |
| Biochar                         | <ul> <li>A substance produced by <u>burning</u><br/><u>organic waste</u> from agricultural lands<br/>and forests in a controlled process<br/>called <u>pyrolysis.</u></li> <li>Improve soil quality, which in turn<br/>improves soil fertility, productivity<br/>and crop yield.</li> </ul> | <ul> <li>Health and environmental<br/>impacts of particulate matter<br/>produced during pyrolysis.</li> <li>Sourcing sustainable<br/>biomass at a scale.</li> </ul>                          |
| BECCS                           | <ul> <li>Combines energy production,<br/>biological carbon removal and<br/>geological storage.</li> <li>Uses biomass in combustion to<br/>generate energy, then captures the<br/>emitted carbon for geological<br/>injection.</li> </ul>  | <ul> <li>Can create <u>competition for</u><br/><u>land use</u> with food<br/>production, placing pressure<br/>on food security.</li> <li>Can increase the use of<br/>fertilisers.</li> </ul> |
| DACCS                           | • <u>Extracts CO2 directly</u> from the atmosphere, and is permanently stored in geological formation or used for other application.  | <ul> <li>Accelerates fossil fuel<br/>extraction activities,<br/>potential CO<sub>2</sub> leakage from<br/>storage sites</li> </ul>   |
| Enhanced rock<br>weathering     | • Involves <i>pulverising silicate rocks</i> to bypass the conventionally slow weathering action.   | • Energy intensive process and generates emissions.  |

|                  | • A <u>chemical removal method</u> that | • Potential for <u>increased</u>   |
|------------------|---|------------------------------------|
| Ocean alkalinity | involves adding alkaline substances to  | <u>greenhouse gas emissions</u>    |
| enhancement      | seawater to accelerate the natural      | and can <u>release by-products</u> |
|                  | sink.                                   | like trace metals.                 |



- CDR methods require appropriate governance and policies as they can cause adverse side-effects apart from the prelitivelsements.
- The need of the hour is to accelerate research and development and incentivise CDR deployment, a political commitment, including reliable measurement, reporting, and verification of carbon flows as recommended by IPCC.

### References

- 1. The Hindu- What is CO2 removal explained
- 2. The Hindu- Why carbon capture is no easy solution

