



## CCUS Policy Framework and its Deployment

**For Prelims:** CCUS Technologies, Paris Agreement.

**For Mains:** CCUS Technologies, Applications, Net Zero emissions by 2050, Environment Degradation, Conservation.

### Why in News?

Recently, [NITI Aayog](#) has released a study report, titled '[Carbon Capture, Utilisation, and Storage \(CCUS\) Policy Framework and its Deployment Mechanism in India](#)'.

- The report explores the importance of Carbon Capture, Utilisation, and Storage as an emission reduction strategy to achieve deep decarbonization from the hard-to-abate sectors.

### What are the Key Highlights of the Report?

- **About:**
  - CCUS can provide **a wide variety of opportunities to convert the captured CO<sub>2</sub> to different value-added products** like green urea, food and beverage form application, building materials, chemicals (methanol and ethanol), polymers (including bio-plastics) and enhanced oil recovery (EOR) with wide market opportunities in India, thus contributing substantially to a circular economy.
  - CCUS projects will also lead to a **significant employment generation**. It estimates that about 750 mtpa of carbon capture by 2050 can create employment opportunities of **about 8-10 million on full time equivalent (FTE) basis in a phased manner**.
- **Suggestions:**
  - Broad **level policy interventions needed** across various sectors for its application.
  - As, India has updated its NDC targets for achieving 50% of its total installed capacity from non-fossil-based energy sources, 45% reduction in emission intensity by 2030 and taking steps towards achieving Net Zero by 2070, the role **of CCUS becomes important as reduction strategy to achieve decarbonization** from the hard-to abate sectors.
  - India's dependency on fossil-based Energy Resources is likely to continue in future, hence **CCUS policy in Indian Context is needed**.

### What is Carbon Capture, Utilization, and Storage?

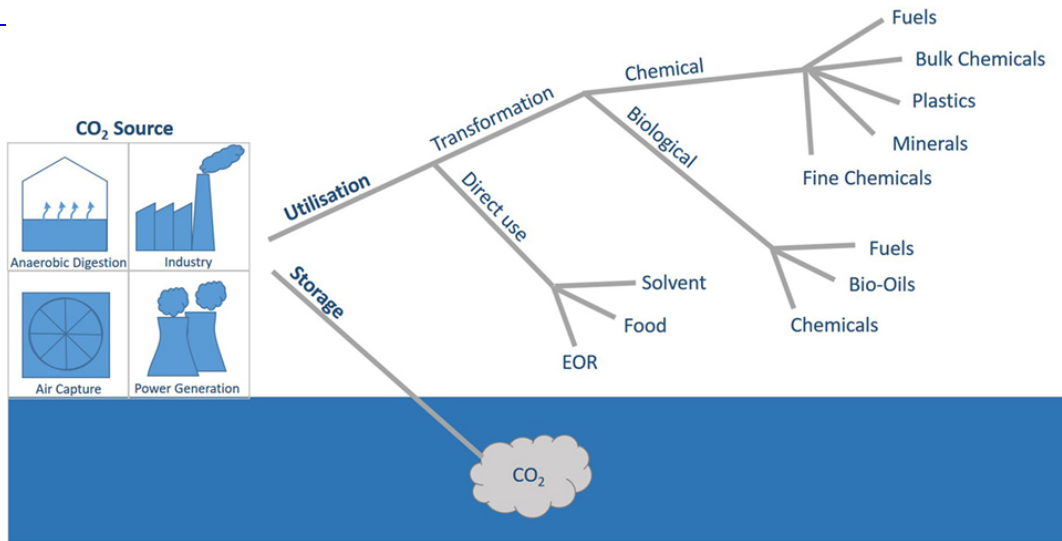
- CCUS encompasses **methods and technologies to remove CO<sub>2</sub> from the flue gas and from the atmosphere**, followed by recycling the CO<sub>2</sub> for utilization and determining safe and permanent storage options.
- **CO<sub>2</sub> captured using CCUS technologies is converted into fuel** (methane and methanol), refrigerants and building materials.
- CCUS is considered an important tool to help countries halve their emissions by 2030 and reach net-zero by 2050.
  - These goals are crucial to meet the [Paris Agreement targets](#) for restricting global warming

to 2 degrees Celsius ( $^{\circ}\text{C}$ ), and preferable to  $1.5^{\circ}\text{C}$ , over pre-industrial levels.

## What are Applications of CCUS?

- **Mitigating Climate Change:** Despite the adoption of alternative energy sources and energy efficient systems to reduce the rate of  $\text{CO}_2$  emissions, the cumulative amount of  $\text{CO}_2$  in the atmosphere needs to be reduced to limit the detrimental impacts of climate change.
- **Agriculture:** Capturing  $\text{CO}_2$  from biogenic sources such as plants and soil to boost crop growth in a greenhouse could work.
- **Industrial Use:** Combining  $\text{CO}_2$  with steel slag - an industrial byproduct of the steel manufacturing process — to make construction materials compatible with the Paris Agreement goals.
- **Enhanced Oil Recovery:** CCU is already making inroads into India. For instance, Oil and Natural Gas Corporation signed a MoU with Indian Oil Corporation Limited (IOCL) for Enhanced Oil Recovery (EOR) by injecting  $\text{CO}_2$ .

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## What are the Challenges associated with CCUS?

- **Expensive:** Carbon capture involves the development of sorbents that can effectively bind to the  $\text{CO}_2$  present in flue gas or the atmosphere, which is expensive.
- **Lesser Demand for Recycled  $\text{CO}_2$ :** Converting  $\text{CO}_2$  into useful chemicals of commercial importance, or utilizing  $\text{CO}_2$  for oil extraction or remediation of alkaline industrial wastes, would add economic value to this greenhouse gas.
  - However, the demand for  $\text{CO}_2$  is limited compared to the vast amount of  $\text{CO}_2$  that needs to be removed from the atmosphere, to reduce the detrimental environmental impacts of climate change.

## Way Forward

- Any viable system for storing carbon must be effective and cost competitive, stable as long-term storage, and environmentally benign.
- Countries should narrow down on the handful of technologies that show more promise and channel investment in them.
- Replacing a conventional fuel with a synthetic fuel like methanol produced via CCU is likely to be a successful mitigation strategy only if clean energy is used to capture  $\text{CO}_2$  and convert it into synthetic fuel.

[Source: TH](#)

