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_2 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_2 from the flue gas and from the atmosphere,** followed by recycling the CO_2 for utilization and determining safe and permanent storage options.
- CO_2 **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 (°C), and preferable to 1.5°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 CO2 emissions, the cumulative amount of CO_2 in the atmosphere needs to be reduced to limit the detrimental impacts of climate change.
- **Agriculture**: Capturing CO_2 from biogenic sources such as plants and soil to boost crop growth in a greenhouse could work.
- **Industrial Use:** Combining 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 CO_2.

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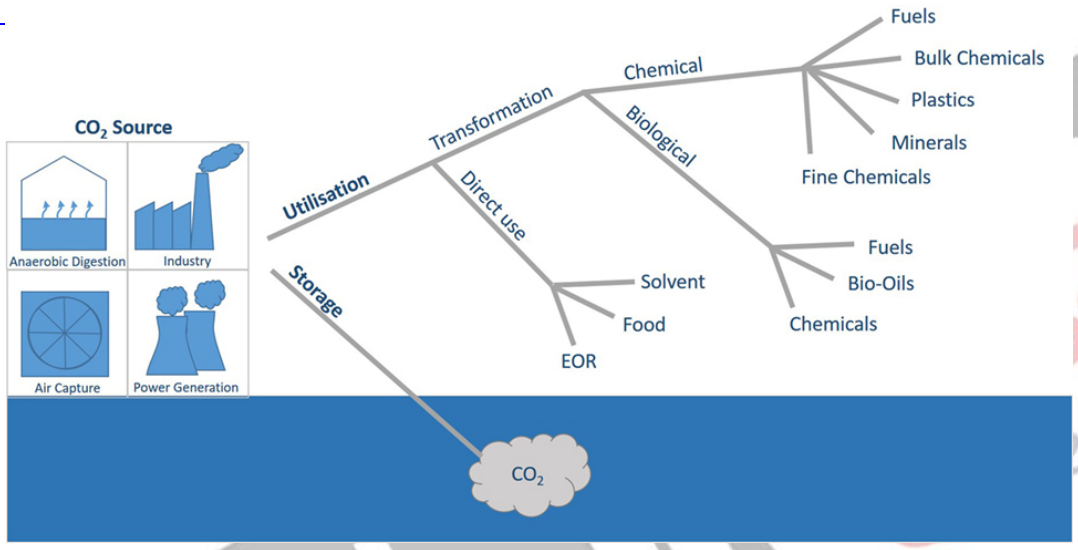

What are the Challenges associated with CCUS?

- **Expensive:** Carbon capture involves the development **of sorbents that can effectively bind to the CO2 present in flue gas or the atmosphere**, which is expensive.
- **Lesser Demand for Recycled CO_2:** Converting CO_2 into useful chemicals of commercial importance, or utilizing CO_2 for oil extraction or remediation of alkaline **industrial wastes, would add economic value to this greenhouse gas.**
    - However, the demand for CO_2 is limited compared to the vast amount of 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 CO_2 and convert it into synthetic fuel.

Source: TH