

PARLIAMENT QUESTION: CARBON CAPTURE AND UTILISATION (CCU) TESTBEDS

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The Department of Science & Technology (DST) is in the process of considering the recommendation of the Expert Panel for five Carbon Capture and Utilization (CCU) testbeds in the Cement sector in different parts of the country. The objectives of these CCU testbeds are to capture Carbon Dioxide (CO₂) emission from cement manufacturing and convert it into value-added products like synthetic fuels, urea, soda ash, concrete aggregates, and food- grade CO₂. These testbeds are going to act as a platform for validating and demonstrating CCU technologies at small scale in real industrial settings through Industry-Academia collaborations. This initiative has significant relevance to enable Industrial decarbonisation in the country with special focus on emissions-intensive sectors like Cement by promoting circular carbon economy, thereby aligning well with India's overarching target of net-zero by 2070.

The Expert Panel constituted by DST has recommended five CCU testbeds, and the Department is in the process of considering the recommendations of the Expert Panel for further processing and financial sanctions. The site-wise details of Institutions and Industry partners involved

in these recommended CCU testbeds along with proposed technological solutions to be deployed, are given below:

Sl. No.	Site location	Institutions	Industry Partner	Technological Solutions
1.	Chittorgarh, Rajasthan	National Council for Cement and Building Material, Ballabgarh and Indian Institute of Technology, Roorkee	JK Cement Limited	Oxygen-based Calcination to capture 2 TPD (Tonnes Per Day) of CO ₂ and its utilization (0.4 TPD) in lightweight concrete products and olefins.
2.	Sundergarh, Odisha	Indian Institute of Technology, Kanpur	JSW Cement Limited	Carbon-negative using solvent-based carbon capture technology at a scale of 1 TPD and utilizing captured CO ₂ for mineralization into concrete using ICCM (Integrated Carbon Capture and Mineralization technology)
3.	Rajganjpur, Odisha	Indian Institute of Technology Bombay, Mumbai	Dalmia Cement (Bharat) Ltd.	Water-based catalyst-driven CO ₂ capture process, at a scale of 2 TPD, designed for integration within a live cement plant, enabling conversion of captured CO ₂ into calcium carbonate, sodium bicarbonate and formic acid.
4.	Kurnool, Andhra Pradesh	CSIR-Indian Institute of Petroleum, Dehradun, Indian Institute of	JSW Cement Limited	Vacuum Swing Adsorption Process for CO ₂ capture (1 TPD) from Cement Kiln Gas and its

		Technology, Tirupati, and Indian Institute of Science, Bengaluru		utilization within the construction material value chain.
5.	Reddipalayam, Tamil Nadu	Indian Institute of Technology Madras and Birla Institute of Technology and Science (BITS) Pilani, Goa	Ultratech Cement Ltd.	New kiln burning technology based on oxygen-enriched burning, capture using adsorption/absorption, and mineralization of captured CO ₂ (2 TPD) using concrete blocks, waste concrete fines and concrete plant sludge.

The Carbon Capture and Utilization (CCU) testbeds are expected to lower Carbon Dioxide (CO₂) emissions within India's cement sector, which constitutes approximately 7-8% of the Nation's industrial carbon emissions. These recommended CCU testbeds are envisaged to demonstrate the carbon capture and utilization at small scale i.e. up to 02 TPD (Tonnes Per Day). Apart from reduction in CO₂ emissions, these testbeds are expected to generate valuable by-products, such as synthetic fuels and construction materials, and thereby contributing to the circular carbon economy.

Further, the successful implementation of testbeds is going to enable Indian industries to adopt the technologies and scale up them to a full commercial level. These modular solutions have the potential to replicate in other hard-to- abate sectors, including power, iron & steel, oil & natural gas, chemical industry, etc. through customized engineering into pre-existing industrial frameworks.

This information was given by Dr. Jitendra Singh, Union Minister of State (Independent Charge) for Science & Technology, Minister of State (Independent Charge) for Earth Sciences, MoS PMO, Department of Atomic Energy and Department of Space, MoS Personnel, Public Grievances and Pensions, in a written reply in the Lok Sabha today.

NKR/PSM/AV

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