Carving out a model for enhancing CO_2 sinks

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In the Paris Summit (United States Conference on Climate Change), held during December 2015, India has strongly advocated climate justice and adhered to the principles of equity and common but differentiated responsibilities (CBDR) on the issue of climate change actions. Intended nationally determined contributions (INDCs) for the period 2021-30 were presented which aimed at propagation of healthy, green and sustainable path to economic development, reduction of emission intensity of its GDP by 33 per cent to 35 per cent by 2030 from the 2005 level, increasing the share of non-fossil-fuel-based energy resources to 40 per cent and creation of carbon sinks of 2.5-3 billion tones of CO{-2}equivalent.

Let us talk about INDC of adding sinks for 2.5-3.0 billion tones of carbon dioxide (CO{-2}) during 2021-30. Among other solutions, carbon capture and sequestration (CCS) is an emerging technology, which is under development. This is a three-step process including

capturing carbon dioxide from its point source, its transportation and then storage away from the atmosphere. Storage options in geological formations are deep saline aquifers, basalt formations, unmineable coal seams and depleted oil or gas reservoirs. Inter Governmental Panel on Climate Change (IPCC) report indicates that geological formations have capacity of 2,000 gigatonne of likely CO{-2}storage. This includes 675-900 gigatonne CO{-2}in oil and gas fields, 1,000 to 10,000 gigatonne of CO{-2}in saline formations and 3-200 gigatonne in coal beds worldwide.

Globally, CCS after a slow down got some impetus in 2015 with the opening of Aquistore located south-eastern at 2.8 km from Saskatchewan, Canada serving as storage site for world's first commercial, post combustion CO{-2}capture, transportation and storage project from a coal based power plant. It demonstrates storing liquid CO{-2}at a depth of 3.4 km underground in the deep brine and standstone. A few other large scale CCS projects in power sector are getting to be operational in 2016 and 2017. In the steel industry, CO{-2}capture of 0.8 Mtpa (million tonnes per annum) in Abu Dhabi in a DRI plant became the first project and is in operation since 2013. Nearly 22 large scale CCS projects are in operation or nearing completion world-wide and would store approximately 40 million tones a year. Bio-CCS and catalytic conversion for utilisation of captured CO{-2}(CCU) into value added products is getting attention.

As per global carbon capture and storage institute, India is one among 24 developing countries that are currently engaged in CCS activities such as capacity development, planning and pre-investment and project development. It is in the phase of identification of the full scope of CCS, and there is no major demonstration project. With 30 per cent population yet to get grid supply, India's total electricity installed capacity has a major share of coal-based power (60.8 per cent) and is expected to continue as dominant energy resource for the next two to three decades. To sustain coal use, clean coal technology and CO{-2}sequestration research are now picking up in academic institutions and research and

development centres. In India, R&D began under the aegis of ministry of science and technology, its first initiative jointly with ministry of power was the National Program on Carbon Sequestration Research way back in 2006 with major thrust areas identified. Policy development studies started and CO{-2}capturing research has been carried out in CSIR research laboratories.

Our Industry sector is majorly dependent on coal and has to adopt ways to develop CO{-2}mitigation and recycling. Then industry has already proposed a few projects and started a few already. For instance, Oil and Natural Gas Commission has proposed an experiment to test enhanced oil recovery through CO{-2}injection into a depleted oil reservoir in Ankleshwar, Gujarat. National Thermal Power Corporation (NTPC) has already pilot tested a project to sequester CO{-2}in open pond using algal technology. And National Aluminium Company (NALCO) has proposed algal sequestration of CO{-2}. Bharat Heavy Electricals Ltd. and Tata Steel are also actively working towards clean coal and carbon capture research.

We have a long way to go, and although initial steps have been taken they need to be sustained to be beneficial in the long term. With the existing expertise in the country in CO{-2}capture and bio-sequestration methods, the cost barrier can be eventually overcome by learning-by-doing as has been the case with most advanced technologies. To meet the target of creating additional carbon sinks of 2.5-3.0 billion tonne, it is apt that CCS is replaced with CCU, that is, Carbon Capture and Utilisation using chemical, biological and mineralogical processes to avoid all underlying risks involved in CO{-2}storage. The time is ripe to start pursuing CCU in the mission mode and to make the emission reduction affordable as a step towards compliance to International agreements.

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Carbon capture & sequestration is an emerging technology