Scientific and Technological Challenges of Carbon Sequestration and Options for India

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Coal is essential for producing electricity and plays a fundamental role in sustaining global energy supply as well as global economy. At present coal accounts for 29% of total world energy supply and about 69% of India's electricity supply. Full realization of potential benefits of coal based second generation technologies is far from satisfactory as their application in most developing countries has been constrained by high capital cost of such technologies. Third generation clean coal technologies aim at reducing the CO_2 concentration in the atmosphere through hi-tech means. This can be achieved in two ways (1) separation of carbon dioxide from the flue gas, its transport and storage through terrestrial or geological methods (2) adoption of technologies such as underground coal gasification, coal bed methane and coal mine methane etc. for power generation. The second approach demands consistent efforts in improvement of technology and energy efficiency of coal use.

The CO_2 disposal techniques need further research experience to develop in-situ assessments and monitoring studies. Geophysical data integration and advancements in drilling technology are major technical challenges besides economics. While efforts in these continue to intensify in India, a programme of carbon sequestration research is taking shape through joint projects. This paper describes associated risks involved and expected benefits in geological sequestration as well as in terrestrial sequestration i.e., plantation of forestry in degraded areas. Development of geological and terrestrial sequestration techniques and their adoption to get sequestration credits for fuel based CO_2 emissions, which may eventually be tradable and valuable, can be envisaged under mutual bilateral programmes.