Carbon Capture and Storage (CCS) to mitigate the threat of climate change.

The global threat from climate change and the global threat from terror are running a close race - to win the No.1 position as the most dangerous menace facing international communities. They threaten the very existence of the planet.

As testimony, a World Economic Forum report states that 13 out of 26 countries surveyed mention climate change as their leading security concern. The report also suggests that the planet as we know it is running short on time.

As early as 2011, data reflected that the earth was already warmer by 1ºC above the 1,850-1,900 level and had used up two thirds of the allowable cumulative CO2 emissions, to contain temperature rise to 2ºC. Annual emissions are around 36 giga tonnes today. 40 per cent of this stays in the atmosphere, 30 per cent is absorbed by the sea and the residual 30 per cent is captured by land and plants. At this rate, by 2050 we would have used up our entire CO2 emissions limit.

As far as India is concerned, the country's emissions are on an upward trajectory, making it the third largest GHG emitter in the world. Between 2017 and 2018, CO2 emissions in India climbed by 6.3 percent(three times higher than 2016-2017). The rest of the world's emissions have also been growing, with CO2 emissions 1.8 percent higher in 2018 than 2017.

It is imperative that we find solutions to control the CO2 in the atmosphere.

The IPCC maps out four pathways to achieve the desired 1.5C, with different combinations of land use and technological change.

1. Reforestation, electric transport systems and greater adoption of carbon capture technology.
2. Carbon prices must be set three to four times higher than the 2 degrees C target
3. Climate injustice - must stay below 2 degrees Celsius of global warming. At the present 4 degrees, we are facing an existential threat
4. Carbon pollution to be cut by 45% by 2030

From toxic waste to a sustainable, profitable business

Scientists and entrepreneurs must build technologies that can take over from nature and make recycling carbon dioxide a profitable industry. Only then will it be adopted by industry in a significant manner.

Carbon Capture and Storage

One of the solutions that the world is turning to is Carbon Capture and Storage (CCS). CCS is an integrated suite of technologies that has a proven 90% capture rate of the CO2 produced,while using fossil fuels in electricity generation and industrial activities. This technology captures CO2 before it enters the atmosphere byseparating CO2 from the gases produced during electricity generation and industrial processes. It does thisthrough pre-combustion capture, post-combustion capture and oxyfuel combustion.The CO2, once captured, is transported for safe use or storage. Millions of tonnes of CO2 are transported for commercial purposes via pipelines, ships and road tankers.

Traditionally, CO2 emissions, once captured areforced into underground rocks at great cost and no economic feasibility.

Until now the processof stripping out CO2 from the relatively low concentrations in which it appears in flue gas has been too expensive undertake without subsidy. However, an Indian plant in Tuticorin, Tamil Nadu has overcome the problem by using a new CO2-stripping chemical. The plant is capturing CO2 from its own coal-powered boiler and using it to make soda ash, a base chemical used in manufacturing glass, detergents, sweeteners, rising agents and paper products. The plant says that its chemicals will lock up 60,000 tonnes of CO2 a year. The breakthrough technology is attracting interest from around the world. While the companyCarbon Clean may have a lead, another one called Carbon8 near Bristol is buying CO2 to make aggregates. Other researchers are also creating ripples by making plastics and fuels from waste CO2.

In yet another breakthrough technology carbon dioxide has been pumped underground in Iceland, and it rapidly turned into stone, demonstrating a radical new way to tackle climate change.

Other commercial uses of captured CO2

CO2 can be used as a value-added commodity. It can be being permanently stored in concrete that has been cured using CO2, or in plastic materials derived from biomass that uses CO2 as one of the ingredients. It can also be converted into biomassthrough algae farming, using CO2 as a feedstock. The harvested algae can then be processed into bio-fuels that take the place of non-biological carbon sources.

Captured CO2 is also used in the oil industry for enhanced oil recovery (EOR) from mature oilfields. CO2 can have a positive commercial value, support deployment of CCS and create a revenue stream for other CCS projects.

CO2 is stored in carefully selected geological rock formations that are typically located several kilometres below the earth's surface. As CO2 is pumped deep underground, it is compressed by the higher pressures and becomes essentially a liquid. There are a number of different types of geological trapping mechanisms (depending on the physical and chemical characteristics of the rocks and fluids) that can be utilised for CO2 storage.

Much of the work on capture is focused on lowering costs and improving efficiency as well as improving the integration of the capture and power generation components. These improvements will reduce energy requirements.

At present, there are a few large-scale integrated CCS projects that include

Boundary Dam power station - The world's first large-scale CCS project in the power sector commenced operation in October 2014 at the Boundary Dam power station inSaskatchewan, Canada.

Petra Nova,is a CCUS coal plant is the world's largest post-combustion carbon capture facility installed on an existing coal-fuelled power plant and plans to store more than 1.6 million tonnes of CO2 a year.

Sleipner and Snøhvit CO2 storage projects in Norway have stored over 16 million tonnes of CO2 into offshore deep saline formations.

Abu Dhabi CCS project is the world's first commercial CCS facility for the steel industry, capturing 800,000 tonnes of CO2 and, injecting it in maturing fields to enhance oil recovery

Tuticorin Carbon Capture Use and Storage(CCUS) project is an unsubsidised, fully commercial CCUS which has been able to significantly reduce the costs associated with capturing the CO2

Climate change is without doubt the greatest threat to human rights in the 21st century. It is a big challenge and need assistance in terms of technology, finance, systems and support. Governments around the world have pledged huge support. This is a great responsibility and it requires complete solidarity to ensure we reach zero carbon emission by 2050. Research from the Intergovernmental Panel on Climate Change (IPCC) has shown that not only will climate action be 138% more expensive without CCU, butthat meeting the 2°C target would be quite impossible without the use of this technology to limit CO2 in the atmosphere.