

Engineering Response to Climate Change: 15Jan2016

The recent rain and flood catastrophe in and around Chennai and in a few districts in Tamilnadu is a wake up call to all of us to act – to act here and now. People, the rich and the poor alike, were affected much – Whether it is natural or human error, one factor is the reminder that the climate change has begun as a life-threat to us. If we do not act now, then we are to blame ourselves.

Human beings as the apex of the creation were expected to play the role of stewardship, namely protecting, promoting, and enriching the environment and ecology. But we have been playing the havoc, destroying the nature under the pretext of scientific and technological advancement. And today our own existence is threatened as the nature seems to be reacting to the ill-treatment suffered from human hands for centuries. Instead of playing the master of the universe, we are running for cover when the nature grows furious. We need reconciliation with nature and we ought take care of it ever more.

Global warming is staring in our eyes. The increase in temperature from 1880 to 2012 is about 0.85°C. The future global warming is expected to be around further 2°C.

A comprehensive satellite study confirms that the melting ice caps are raising sea levels at an accelerating rate. The polar ice caps have melted faster in the last 20 years than in the last 10,000 years. For the past 20 years, satellites have been monitoring earth's biggest ice shields on Greenland and in the Antarctic, using different technologies from radar to

gravity measurements. The melting of these ‘everlasting ice’ contributes three times as much ice to sea levels.¹

Sea level rise is caused primarily by two factors related to global warming:

- i. the added water from melting ice (glaciers, polar ice caps, Greenland ice); and
- ii. the expansion of sea water as it warms up due to global warming.

The first has been observed by satellites since 1993; and the latter is monitored from coastal tide gauge data, confirming sea level change from about 1870 to 2000.² Tide gauge readings, and, most recently, satellite measurements tell us that over the past century, the Global Mean Sea Level (GMSL) has risen by 10 to 20 centimeters. And the annual rate of rise over the past 20 years has been about 3.5 millimeters a year, roughly twice the average since the early 1990s. A recent study predicts oceans to rise between 0.8 and 2 meters by 2100; and a more dire estimate, including a complete meltdown of the Greenland ice sheet, would push sea level rise to 7 meters, enough to submerge London. Chennai might become similar to Venice and we might need boats to move around in the city as we recently experienced during the recent floods in Chennai!

When sea levels rise rapidly, as they have been doing, even a small increase can have devastating effects on coastal habitats. As seawater reaches farther inland, it can cause destructive erosion, flooding of wetlands, contamination of agricultural soils, and loss of habitat for fish, birds, and plants. When large storms hit land, higher sea levels mean

¹ <http://www.dw.com/en/polar-ice-sheets-melting-faster-than-ever/a-16432199>

² <http://ocean.nationalgeographic.com/ocean/critical-issues-sea-level-rise/>

bigger, more powerful storm surges that can strip away everything in their path. In addition, hundreds of millions of people living in areas, that will become increasingly vulnerable to flooding, would be forced to abandon their homes and relocate. Low-lying islands could be submerged completely.³

Emission of CO₂ from mainly industries and transport vehicles is another area of concern. Reducing carbon emissions, as the nations of the world promised to do in the recent Paris meet, is essential – In fact, urgent. One engineering solution could be to design motor-engines, for industries and for transport, that would emit less CO₂ and consume less fuel. Simultaneously we need to think of simultaneously, immediately, and significantly pulling carbon out of the atmosphere and reduce atmospheric carbon dioxide at a surprisingly low cost, thus providing a crucial bridge to a post-fossil fuel era. The rainforest could be a cost-effective response. Rainforest conservation is also incredibly economical. One acre of Amazon rainforest in Peru, which stores up to 180 metric tonnes of CO₂, can be protected for just a few dollars; the same is true elsewhere in Latin America and Africa.⁴

We cannot now sit and relax saying, my home, my territory, my country are safe. We are more and more experiencing the ‘butterfly effect’ in the universe. A butterfly flutters its wings in, say, England, and that touches off a hurricane on the other side of the world: so goes the usual explanation of the butterfly effect. You could say the effect works in reverse, too: let loose a jet of CO₂ in one spot on the planet, and before

³ <http://ocean.nationalgeographic.com/ocean/critical-issues-sea-level-rise/>

⁴ <http://www.theguardian.com/commentisfree/2016/jan/11/climate-change-solutions-rainforest-melting-polar-ice-caps>

long butterflies in another area permanently cease to flutter their wings. That's the implication of research published *Nature Climate Change* in August 2015.⁵ El Nino effect is just one example. El Niño is accompanied by high air pressure in the western Pacific and low air pressure in the eastern Pacific, causing the instability. So we are not living in an island, isolated from the rest of the planet, but in a global village, interconnected with all parts of the world.

The drastic results would be lack of drinking water and health hazard. More than 50 percent of the world's freshwater comes from mountain runoff and snowmelt. With shrinking of drinking water, in a decade or two, only one-in-five would have access to drinking water. And the throw-away culture leads to health hazard. When there is scarcity of water, we would be forced to the status of use-and-throw dresses, which would add to the waste and garbage in the world!

Pope Francis in his *Laudato Si* underlines the impact of climate change and global inequality. He says:⁶

“Its worst impact will probably be felt by developing countries in coming decades. Many of the poor live in areas particularly affected by phenomena related to warming, and their means of subsistence are largely dependent on natural reserves and ecosystemic services such as agriculture, fishing and forestry.”

He adds:

“Sadly, there is widespread indifference to such suffering, which is even now taking place throughout our world. Our lack of response

⁵ <http://conservationmagazine.org/2015/08/climate-changes-butterfly-effect-imminent-study-says/>

⁶ <http://www.biblesociety.org.au/news/10-golden-quotes-from-the-popes-climate-change-encyclical>

to these tragedies involving our brothers and sisters points to the loss of that sense of responsibility for our fellow men and women upon which all civil society is founded.”

In the Year of Mercy, as announced by Pope Francis, we need to show mercy on the ecology and environment for our own meaningful existence.

We need to deliberate possible solutions to climate change:⁷ A five-step solution could be contemplated.

1. We should set limits on global warming pollutions.
2. We need to invest in green jobs and clean energy
3. Driving smarter cars should be promoted.
4. Green homes and buildings should be enhanced.
5. Building well-informed communities and effective public transportation should be accelerated.

From engineering perspectives, innovation is the need of the hour. There could be three areas of creative inventions:

- i. manufacturing eco-friendly machines, especially automobiles.
- ii. in architecture, green-building could be designed and promoted and in low lying areas dykes could be introduced; and
- iii. as promotion of non-conventional energy solar- and wind energy should be enhanced.

The LICET conference on: Engineering Response to Climate Change, would serve as a platform for scientists and researchers to deliberate on the present situation and to promote effective action. I appreciate the Research Team at LICET, led by the Dean-Research, for organizing a national conference on a timely topic. Wish you all the best.

⁷ <http://www.nrdc.org/globalwarming/solutions/>

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Inaugural address: National Conference on: Engineering Response to Climate Change at Loyola-ICAM College of Engineering and Technology (LICET), 15-17 Jan 2016.