

CLIMATE CHANGE

SCIENCE, EFFECTS & MITIGATION STRATEGIES

(KRISHAN KALRA)

We are all witness to the increased frequency of ‘extreme weather events’ (EWEs) over the last few years. Flash Floods, Cloud Bursts, Cyclones and Droughts regularly make screaming headlines in the newspapers and on TV, also on social media; all of us feel alarmed, express sympathy with the victims, even participate in campaigns to raise money and materials for them. Some more active ones travel to the affected areas and help feed the hungry, give them medicines and clothes. National and State ‘disaster relief outfits’ have become better organized and are able to restrict the number of lives lost to a bare minimum. All too soon, we forget the incidents, go back to our work and it is once again ‘business as usual’. What happened in Uttarakhand (2013) (slide 1), Kashmir (2014), Chennai (2017), Mumbai (2017), Kerala (2018) and, more recently, in Odisha is still fresh in our collective memory. Then there are well publicized international cases of extreme heat in Europe, freak snowfall in Dubai and devastating floods in Manhattan. The EWEs monster doesn’t differentiate between the rich and poor nations! Rising sea levels have already claimed many low lying islands and areas near the oceans. Countries like Maldives face being totally submerged. Parts of Bangladesh are not far behind.

Very few question the ‘reasons for the calamities’. ‘Nature’s Wrath’ is the common refrain. Even fewer attribute such EWEs to the ever more rapid march of ‘Climate Change’. Only a handful believe in the ‘role of human action’ in the increasing frequency of these disasters and the fact that ‘human action’ alone can also help in mitigation of the misery’ and slowing down of the devastating goings on. The purpose of this article is not to reveal any rocket science – because there is none! My only objective is to ‘remind ourselves’ that ‘human action has indeed played a significant role in accelerating the menacing advance of climate change and human action can certainly help in ameliorating the situation’. It is also important to highlight the fact that a ‘business as usual’ approach would lead to unmitigated disaster for all humanity. The possible effects of global warming, say an increase of 2 degrees C in the temperature of the earth - our only home in the huge universe - include a broad spectrum of (a) up to 20% reduction in productivity & 25% loss in nutrition value of crops; meaning ‘food security’ going for a toss (b) huge loss of marine life – staple food for millions – again serious

threat to ‘food security’ (slide 2) (c) unsustainable water stress; leading to loss of millions of lives (d) increased risk of disease (slide 3) and (e) consequent disruptions leading to unimaginable political and social instability.

First, a little bit about the **‘Science of Climate Change’**. At the heart of the matter is the exponential increase in emission of greenhouse gases (GHGs) due to irresponsible industrial activity over the last 6 to 7 decades and these gases getting trapped in the earth’s atmosphere – sort of an annular spherical ring all around the planet. The thicker the ring, greater is the propensity of the planet getting warmer from the energy radiated by the sun (slide 4). As the ‘ring’ becomes thicker, more and more solar energy gets trapped in it. Look at the illustration in slide 5. Mercury is a lot closer to the sun as compared with Venus and yet, its temperature (167 degrees) is drastically lower than that of Venus at 457! Reason? Thickness of the ‘atmospheric ring’ around Venus is much more!

For the last 6,50,000 years – data determined by NASA scientists by drilling ‘ice cores’ in the Antarctica (slide 6) in 1977 – and earlier in Vostok - and analyzing carbon-di-oxide content in the entrapped air bubbles over this long period of time – earth has had the unique good fortune of maintaining an average temperature of 15 degrees C which is very conducive for sustaining human and plant life as well as food chain in the oceans. There is a direct co-relation between the earth’s temperature and carbon content in the air which has never exceeded 300 parts per million (ppm) over this long period, through periods of warming (peaks in the graph) as well as the ‘ice ages’ (dips). (slide 7) Only in the last seven decades has this balance got disturbed radically raising the carbon concentration to over 400 ppm currently and also an increase of about 0.3 to 0.4 degrees in the temperature of the planet. With ‘business as usual’ the carbon concentration is likely to cross 600 by 2050! I leave it to the imagination of the enlightened readers as to ‘what might happen to the temperature of the earth. There are various estimates to indicate an increase of half a degree by 2050 and another degree by the end of the century. Ready for the calamity?

Loss of biodiversity is another victim of Climate Change. The study that “One million species of plants and animals are on the verge of becoming extinct” made headlines recently. There were several articles and reports about the same. This alarming increase in the threat of extinction, symptomatic of the human-induced degeneration of the natural ecosystems, is the key finding of the first global assessment on the health of the planet by the United Nations backed Inter

Governmental Panel on biodiversity and Ecosystem Services. To illustrate my point, let me pose a small question here. All people of the generation – born in forties and fifties – would've seen and heard frogs, one of the longest surviving species that has outlived the dinosaurs, near wells and ponds (slide 8). We have even brought these delightful creatures home as pets. I wonder how many of your readers have ever seen one? I haven't for, may be, 50 years! Environmentalists have predicted that in this century we risk losing 50% of all living species! Mangroves in Sunder Bans – the trees that guard against erosion of land in coastal areas - have decreased by 20% in the last 40 years.

Yet all is not lost. There are solutions at hand – even low hanging fruit – easy ones for each one of us and, of course, we have to leave the big jobs for the governments. Let's first talk about what all we can do. I will list out a few changes we should all make in our day-to-day activities.

- **Plant trees.** Each tree absorbs lot of carbon dioxide and releases oxygen. It's like a 'carbon sink' and air purifier put together. Besides, trees increase our pathetic 'forest cover' that has multiple benefits of attracting rains, keeping the advance of deserts in check and compensating for the depletion due to industrial uses. Just to give you an idea about 'trees per person' in different countries (slide 9); as against 8,953 in Canada – that tops the list – and 4,461 in Russia, we have a shameful 28! Let's endeavor to raise it to at least 100 in, say, 10 years. That's just 10/15 trees to be planted by each person every year even after factoring in for the population increase as also the fact that a third of all trees planted may not survive.
- **Save Water.** Our most precious natural resource, which we have always taken for granted and assumed that it will last forever. Sadly, we are running out of it! And not because the total rainfall in the country is insufficient. We are running out of water because of grossly inefficient distribution and criminal wastage. As far back as the early eighties, a Nobel laureate, speaking at the 'Water Summit' in Zurich, had made the chilling prophecy that "World War III will be fought over Water". He was probably not too far. Our own NITI Aayog has recently come out with a report saying "600 million Indians are already facing high to extremely high 'water stress' and 200,000 of them die every year due to inadequate access to it". We need to save every single drop of water if we want to ensure that our children and grandchildren get at least the bare minimum required for drinking, bathing, washing plus agriculture. Doing every single daily chore like washing hands,

brushing teeth, shaving, bath, flushing, gardening, washing floors, cars & driveways we waste colossal amounts of water, which can all be saved (slide 10). Collect waste water from your R/O units (reportedly wastage here is three times the quantity of purified water) as well as the condensate from air conditioners and use it for washing/cleaning. Avoid using bottled water; in addition to the wastage – lot of people will consume only a part of the quantity in the bottle and discard the rest – you will also help avoid addition to the mounting problem of not-easily-recyclable plastic bottles. **Rain Water Harvesting.** Each house/office/factory must religiously install a proper rain water harvesting system on the premises and ensure that every drop of rain water is channeled into the system to help recharge ground water aquifers.

- **Save Energy.** Switch off all unnecessary lights, fans, appliances, air conditioners even if you are stepping out for a few minutes. TVs and other gadgets on stand-by mode also consume some power, which when multiplied by a few million does add up to significant amounts. Use LED bulbs. Give up your ‘**love for 18 degrees**’; many of us like to set the air conditioners at the minimum possible 18 degrees C and wear jackets and ties in the office and use blankets at home at night. Crazy, as it sounds, they even sell “A/C blankets” in the market! Believe me, when you are sleeping, 26 degrees on the A/C + a fan are quite comfortable for the average human body and you will be able to save large amounts of power and also money on the electricity bills. Soak pulses and beans overnight so there’s need of less gas for cooking. ‘Clean Stoves’ consume 50% less fuel and give out 80% less emissions. Use of thick glass on windows, reflective tiles on the roof and white paint on external walls will amount to amazing savings on the heating and cooling load of your building. Every kwh saved means a small dent in the harmful emissions! A recent study showed that India can save a mind boggling \$42 Billion each year with optimally enhanced energy efficiency. Try to commute by ‘public transport’ like the metros.
- **Do not waste food.** With the craze of outdoing each other, we are all party to obscene wastage of food at parties and weddings. Everyone takes pride in talking about their *Wazwaans* and ‘100+ dishes including 25 desserts’ without giving a thought to the gross wastage and the energy consumed – think of pumping water for irrigation, fuel consumed by tractors & harvesters, trucks and wagons used for transportation, cold rooms for storage etc - in growing every kilo of food along with the resultant addition to toxic

emissions. Also think of all those poor people who go to sleep every day without having a meal!

- **Manage your Waste.** Segregate all the waste generated at home or in the office and, if possible, compost either at home or definitely at a community plant so that very little reaches the land-fills that are forever releasing toxic gases like methane into the atmosphere besides causing problems of the leachate polluting underground water and the mountains of garbage becoming breeding grounds for mosquitos and flies.

If we can all do these little things – with enormously large benefits – hopefully, the governments will take care of the bigger jobs like (i) linking of rivers where necessary and feasible (ii) making irrigation more water efficient (iii) plugging leakages and theft in public supply of water and electricity (iv) quicker switch from fossil fuels to renewable energy options like hydel, solar, wind and bio-mass (v) stricter implementation of laws governing mandatory rain water harvesting, affluent treatment of industrial waste, compulsory water recycling and dual connections for fresh & recycled water and sewage treatment plants (vi) revitalization of lost water bodies, building check-dams, preventing blockage of natural drainage channels etc.

Let me close by quoting Mahatma Gandhi – an environmentalist before even we had heard of the word – who said (a) the earth has sufficient for every one's need but not for greed and (b) we have inherited the planet from our ancestors and are mere trustees and it is our duty to ensure that we hand it over to our future generations in a little better shape than what we got.

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(independent country chapter of the movement started by Al Gore)