

Don't Debate Climate Change, Stop It !

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Climate change is a long term change in the earth's climate, especially a change due to a change in average atmospheric temperature. It is caused by the factors such as biotic processes, variations in solar radiations received by the earth, plate tectonics and volcanic eruptions. Factors that can shape climate are called climate **Forcings** or **Forcings** mechanism. Melting polar ice caps, collapse of vegetation and wild life and violent surges of hurricanes are all concerning reasons to understand how climate change can affect so many facets on planet earth. An example of how large, fast and radical changes result in vegetation stress, rapid plant loss and desertification in certain circumstances in an event that occurred about 300 years ago- **Carboniferous Rainforest Collapse**. Global warming is thought to have brought about the collapse of these tropical habitats. This happened during the carboniferous period when Europe and North America lay on the equator and were covered by tropical rainforests. Climate change i.e. when the earth's climate became hotter and drier, the rainforests got devastated covering the habitat into isolated islands and causing extinction of many plants and animal species. It also triggered off the reptile revolution. This discovery is a chilling message that humanity could be wiped off the face of the earth if today's Amazon rainforest is allowed to disappear.

The decline in **Arctic sea**, both in extent and thickness over the last several decades is evidence for rapid climate change. Satellite observations show that the arctic sea ice is now declining at a rate of **13.3%** per decade. Antarctica has been losing about 134 billion metric tonnes of ice per year since 2002. With glaciers melting at vast rates, a chain of events is being set into motion that cannot be reversed. The effect of global warming on social, ecological and physical health is areas for great distress. Countries like **Greenland** are deteriorating at a highly elevated rate. Global warming caused by human activities that emit heat trapping CO₂ has raised the average temperature by about 0.6⁰ Celsius over the past century.

Scientists agree the earth's rising temperature is fuelling longer and hotter heat waves, more frequent droughts, heavier rainfall and more powerful hurricanes. The earth's ocean temperature are getting warmer too which means that the tropical storms can pick up more energy. So **global warming could turn a category 3 storm into a more dangerous category 4** storm. Warmer seas are also associated with the spread of invasive species and marine diseases. The evolution of stable marine habitat is dependent on myriad factors including water temperature. If an ecosystem becomes warmer, it can create an opportunity where outside species or bacteria can suddenly thrive where they were once excluded. This can lead to forced migration or even extinction. Warmer seas also lead to melting from below of polar ice-shelves compromising their structural integrity and leading to spectacular shelf collapses. Scientists also worry that warmer water could interrupt the so called ocean conveyor belt- the system of global currents that is largely responsible for regulating earth's temperature. Its collapse could trigger catastrophically rapid climate changes. An irregular weather pattern, increased precipitation in the form of rain has already been noticed in polar and sub-polar regions. More global warming will lead to more evaporation which will cause more rains. Animals and plants cannot adapt to increased rainfall easily.

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A new study suggests that by the end of the century, parts of Middle East may become uninhabitable for human beings. Extreme heat waves could create conditions in several Middle Eastern cities that would exceed the threshold of what human being can endure. Scientists used what is known as **WBT (Wet Bulb Temperature)**, the combination of temperature and humidity. **At 35° WBT, a combination of 45° C and 50% humidity, any exposure of more than 6 hours would be probably be intolerable even for the fittest of humans.** That temperature was already almost reached in **Iran** earlier 2015 which is the hottest year recorded in history. In the danger zone are countries like **Singapore, Malaysia, Indonesia, Cambodia, Philippines.**

The destruction left by Hurricanes Irma and Harvey in the Unites States left many scientists wondering why this year has been particularly disastrous for the weather. Harvey pummeled Texas while Irma barreled through the Caribbean and Bahamas. Many homes were destroyed and lives lost after the worst hurricanes came in from the Atlantic Ocean. Prof. **Richard Allen, the Prof. of Climate Science at the University of Reading, told The Telegraph**, he believes **that** the hurricanes we have seen are made worse by climate change. He also explained that additional heating due to emissions of GHG from human activities will inevitably make them more deadly. Extra energy from warmer water increases the intensity of the winds in the cyclones as mentioned earlier.

Bone chilling cold gripped most of US in 2018 beginning, breaking century old records and leading to several deaths that authorities contributed to exposure to dangerously low temperature. **Niagara Falls froze & sharks also froze to death** in the Atlantic due to a shot of bitter Arctic Air as a result of bomb cyclones. A storm is called a bomb cyclone when the pressure drops rapidly (24 millibars in 24 hours). Bomb cyclones also drain air from Polar Regions after it weakens. This explains the Arctic Air freezing parts of US. In Cape Cod, Massachusetts, the Atlantic white shark conservancy found three sharks washed up and stranded due to cold shock. It is worrying to consider that unless GHG emissions are actively curbed, this type of freak weather conditions may represent the new normal in the future.

Pope said, “ The violence that exists in the human heart is also manifest in the symptoms of illness that we see in the Earth, the Water, the Air and in Living things”.

What are the governments of various countries doing to curb the causes of global warming? In recent times, heads of various governments have signed three relevant agreements- The Kyoto Protocol (1997), Doha Amendment (8th December, 2012) and the Paris Agreement (December, 2015). Kyoto Protocol (11th December, 1997) is an international agreement linked to **United Nation Framework Convention on climate change (UNFCCC)** which commits its parties by setting internationally bending emission reduction targets. It was adopted in Kyoto Japan on 11th December, 1997. The detailed rules for the implementation of the Protocol were adopted in Marrakesh, Morocco in 2001 and are referred to as **Marrakesh Accords**. Its first commitment period started in 2008 and ended in 2012. Recognizing that developed countries are mainly responsible for the current levels of GHG emissions due to 150 years of industrialization, the Protocol places a heavier burden on the developed nations.

The **Doha Amendment** refers to the changes made to the Kyoto protocol in 2012, after the first commitment period of the Kyoto Protocol concluded. 194 countries agreed to the extension of the protocol and endorsed the selection of South Korean city of **Sondgo** as the location of **Green Climate Fund**. The Amendment adds new emission reduction targets for the second commitment period (2012-2020) for participating countries. It adds NF3 to the list of GHG.

The Paris Agreement (**Accord de Paris December, 2015**) is an agreement within the UNFCCC dealing with GHG emissions, mitigation, reduction starting from 2020. It aims to respond to the global climate change threats by keeping the global temperature rise below 2° C. each country has to

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report its contribution to reduction of global warming and each target should exceed the previous one. But in **June 2017, President of the US, Donald trump** announced his intention to withdraw from the agreement saying that it would undermine US economy and put the US at permanent disadvantage. On the other hand in July 2017, **France's Environment minister Nicolas Hulot** announced France's 5 year plan to ban all petrol and diesel vehicles by 2040 as part of their plan to make the country carbon neutral by 2050. He also declared that France would no longer use coal to produce electricity after 2022. Brazil's **National Climate Change** plan is focused on expanding renewable electric energy sources and beefing up the use of biofuels in the transportation industry. **China is the world's biggest producer and consumer of coal and the number one GHG emitter** but since it is a developing nation, it doesn't need to lower its emission under Kyoto Protocol.

India is the world's **number three** emitter of GHG (greenhouse gases) but it has set an ambitious goal of getting 20 gigawatts of solar power by 2022. A gigawatt of electricity is enough to power a small city under the Kyoto Protocol, Australia agreed to hold the growth in GHG to 8% above 1990 levels for the 2008-2012 period. In November 2011, Australian lawmakers approved an ambitious carbon trading plan- the world's largest outside Europe. **Under this, Australia's 500 worst polluters would be forced to pay a tax on every ton of carbon they emit starting 2012 July.**

The university of **Notre Dame's ND Gain Index** combines measures of a country's vulnerability to climate change and other global challenges with data on the country and readiness to improve. On its basis, **Norway stands first as the best prepared country to tackle global climate change followed by Finland and Sweden.** Norway has topped the table since the index was launched. The top ten is dominated by the western countries- those that are mostly responsible for climate degradation.

Richard Branson, the founder of Virgin Airlines says- "Taking bold action on climate change simply makes good business sense. It is also the right thing to do for people and planet. Setting a **NetZero GHG** emissions target by 2050 will drive innovation, grow jobs, build prosperity and secure a better world for a billion people".

What alternatives are the countries of the world looking at today? **Geo-engineering** is one major option. It includes large-scale radical interventions in the Earth's natural systems to counteract climate change. For example, if millions of people in China all planted a tree on the same day to capture carbon dioxide from the atmosphere, it might alter the planet to be considered geo-engineering- if everyone switched to using recycled paper simultaneously, it can also be called geo-engineering. Geo-engineering can be done by **solar radiation management** SDR and **carbondioxide removal** CDR. Solar radiation management involves use of reflective mirrors to deflect a percentage of sunlight back into space, preventing sunlight from reaching the earth by using solar shades, using volcano eruptions to inject SO₂ into the atmosphere. Sulfurdioxide reacts with water vapour to make droplets of sulfuric acid that scatter sunlight back into space like billions of tiny mirrors. One of the first people to suggest this was Soviet climatologist, **Mikhail Budgo** and was revived again in 2006 by Nobel Prize winning scientist, **Paul Crutzen**. It also involves injecting reflective aerosols into the atmosphere. We can reduce the Earth's absorption of sunlight by using large balloons or aircraft to put more sulphur particles into the stratosphere. But some scientists say that this could trigger chemical reactions which could lead to destruction of ozone layer.

Another process under geo-engineering is ocean fertilization which includes addition of iron to the ocean to stimulate phytoplankton production, enhance biological productivity and accelerate the removal of carbondioxide. Researchers in **Colombia University** are manufacturing a carbon scrubber which could take one ton of CO₂ out of the air per day. These scrubbers trap carbondioxide entering them on an **Ion-Exchange resin**. But the device developers point out that millions of these

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would have to be deployed to suck up excess carbon .We can enhance the ability of the ocean to store carbon by grinding up,dispersing and dissolving rocks such as limestone, silicates etc. **Aerial reforestation** is another method by which we plant new trees in areas deforested by natural disasters or human action. This increases the carbon sink potential of a given area of land Some scientists have proposed using airplanes to drop tree seedlings over a wide area of land.

Clouds naturally reflect sunlight back into space. Many attempts have been made to engineer the weather with **cloud-seeding experiments**. **Stephen Salter and John Latham** have proposed launching of a huge **flotilla of cloud seeders** -**about1500** remote controlled boats that would automatically pipe water up from the oceans and spray it into the atmosphere.-how practical it is - only time will tell.

One of the simplest and currently most fashionable geoenvironmental proposals is based on a practice used by **ancient Amazonian Indians**. It is proposed to make **biochar** by burning biomass and municipal waste in the absence of oxygen to create charcoal which is then mixed into the soils as an additive The basic idea is to cook waste agricultural products (plant stems, stalks, and roots) to make charcoal and then simply bury it, taking the carbon it contains out of circulation. It is inspired by **Terra Preta** black soils where communities have used charcoal to improve fertility. But environmentalist **George Monbiot** has argued: "We would either have to replace all the world's crops with biomass plantations, causing instant global famine, or we would have to double the cropped area of the planet, trashing most of its remaining natural habitats."

Whatever the method employed ,the fact remains that the present scenario presents a grim picture of the environment .As **General Ban Ki Moon said**" **We are the first generation to be able to end poverty and the last generation that can take steps to avoid the worst impacts of Climate change.**

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