

Global warming

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Global warming is simply defined as an increase in the average global temperatures. Though, it is an environmental problem, it has serious implications on the global economics, geopolitics, society, humanity and all living beings. **“Global warming is one of the most controversial science issues of the 21st century, challenging the very structure of our global society”**, says Mark. Though, there has been controversies between two schools of scientific thought, one calling it is a myth and the other considering it is a reality, there is sufficient evidence to support the later. Anthropogenic activities, causing increased emissions of green house gases, are behind the global warming. It has been established, that, if not addressed properly and immediately, it would have catastrophic impacts.

Global warming means earth is becoming warmer gradually. There is increase in average global temperatures of air and oceans, accompanied by widespread melting of glaciers and rising of sea level. The United Nations Intergovernmental Panel on Climate Change (IPCC) in its ‘Synthesis Report on Climate Change’, states that there is clear evidence for a 0.6 °C rise in global temperatures and 20cm rise in sea level during the 20th century. It predicts that “global temperatures could rise by 1.4 to 5.8 °C and sea level could rise by 20 to 88cm

by the year 2100." Majority of the scientists and research organisations, including IPCC have reached on consensus that global warming is caused by massive increase of green house gases such as Carbon dioxide (CO₂) in atmosphere resulting from burning of fossil fuels and deforestation.

The temperature of earth is maintained by the balance between the heat energy coming from the sun and the heat energy returned back to space. Some atmospheric gases: Carbon dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Chlorofluorocarbons (CFC) and water vapours are important to this temperature balance. They form the green house blanket in the atmosphere. This blanket absorbs some of the long wave radiation and re-radiate it back to surface, which causes the atmosphere to warm up to 35°C. Without these gases the earth's atmospheric temperature would be 15 to 20°C. If more such gases are added to the atmosphere, the earth's temperature would increase accordingly. And these are being added enormously.

This is why the global warming is taking place with greater pace due to the abundant increase in emissions. "The scientists community is largely persuaded that not only is earth's climate warming, but rate of warming is accelerating due substantially to, human activity." says Dr. Terrence M. Joyce, Senior Scientist and Director of Ocean & Climate Change Institute.

The main evidences of global warming are three basic indicators- temperature, precipitation and sea level. Firstly, the temperature of land surface, ocean waters and free atmosphere has been measured through fixed thermometers, balloons in the air and satellites. By these sources, scientists have produced record of last 130 years, which shows a global warming of 0.65(+ - 0.05degree C) over this period. We also know that 2010 was globally the warmest years on record.

Secondly, the recorded data of precipitation also reveals that there is upward trend in global precipitation. It shows that precipitation has increased over land at high latitudes in northern hemisphere, especially during cold seasons. As the cyclones, i.e. hurricanes, tornadoes, storms are closely related with the process of precipitation; the world has experienced more frequent and stronger hurricanes and storms during the recent past; Hurricane Katrina in the US in 2005 and 2010 Super Flood in Pakistan.

Thirdly, the global sea level has risen by about 20cm over the past 100 years. Initially, it was believed that the rise in sea level had occurred due to temperature increase as water expands on heating. But it has been revealed by relevant data that the 40 per cent increase in the sea level was due to warming and 60 per cent increase was due to melting of ice. This is pretty dangerous news as both the poles of earth are covered with ice- Arctic and Antarctic, with huge mass of ice. If melting is accelerated due to global warming it would cause catastrophic rise in oceans.

The magnitude of the impacts warrants seriously looking into the responsible factors for emissions in order to devise effective strategies to cope with this peril. There are many sources/agents which are responsible for emissions of green house gases – resulting mainly from the burning of fossil fuels and deforestation. Industrial processes, power generation, transportation and domestic consumption of fossil fuels are major sources of anthropogenic emission. Unfortunately, the fossil fuel i.e. oil, coal, natural gas supply 85 per cent of energy supply whereas the clean forms of energy i.e. nuclear, biomass and hydrogen only form 15 per cent of energy supply.

On the other hand, cutting of trees for settlements and natural fire incidents like the

summer fire in Australia and unusual fire in Russia in 2010, due to high temperatures, are also causing deforestation at massive level. In this way the forests, which are major source of balancing CO₂, are also decreasing resulting in its increase in the atmosphere.

Since, the emissions are proportional to the consumption; these are not evenly distributed around the world. North America is a leading emitter followed by Europe and Asia. Together they make 90 per cent of the global industrially produced CO₂. The developed countries have emitted much more than developing countries. Besides, the developing countries are striving for economic progress, subsequently increasing emissions as economic development is closely associated with energy production. Now, all the countries, particularly developed countries have to share responsibility to cut the emissions for the purpose of humanity otherwise we are going to suffer the possible implications.

Global warming is going to divest communities that are already the most marginalised in world. These are the communities that are least responsible for the industrial and historical emissions that created the problem. However, future climate change will have impacts on all parts of human society, including coastal regions, storms and floods, health and water resources, agriculture and biodiversity. Some of the impacts are discussed separately.

One; the coast line regions are most vulnerable. As the UN's panel on climate has reported that sea level could rise by 20-88 cm in next 100 years, this is a serious problem for coastal areas which will be more prone to storms and floods. In response, the bigger and developed countries would have to build higher walls on the coasts but still they will have to lose some agricultural land. However, the small island countries like Maldives face dire situation. The sea rise would flood up the dry land, making these islands inhabitable. Another country, Bangladesh which is deltaic region would lose considerable portion of land and its agriculture – a prime source of livelihood there will be destroyed.

Two; storms and floods are major natural hazards. The records show that the temperature regions, particularly in the northern hemisphere, have witnessed more storms over the last 50 years. Two-fifth of the world population lives under the monsoon belt. Monsoons are caused mainly by temperature difference between oceans and continents. This difference will increase and the monsoons, which are normally life-giving rains, would exacerbate tremendously flooding the regions and destroying the agriculture – the major economic activity in the developing countries.

diseases and injury due to extreme events; increased frequency of diarrhea and cardiovascular diseases. By far the most important threat to human health is access to fresh drinking water. Though, the runoff is projected to increase by 10 to 40 per cent by mid century at higher latitudes but the negative impacts of global warming on fresh water system outweigh its benefits.

Currently, approximately 1.7 billion people, a third of world population, live in countries that are water stressed. IPCC suggests that with the projected global population increase and the expected climate change, five billion people may experience water stress by 2025.

Fourth; ecosystem which is an essential component for biodiversity, is going to be seriously affected by global warming. The species at maximum threats are: The mountain gorilla in Africa, amphibious Bengal tiger, polar bears and penguins, etc. The reason for threat to these species is that they are unable to migrate in response to climate change due to human activity and urbanisation. Another example of an ecosystem under threat is coastal protection. There are evidences that the coral reefs are diminishing due to temperature increase; which will disturb basic food chain in marine life.

Fifth; the most worrying concern of climate change is the effect it will have on agriculture. The world is already facing food crisis. According to UN, more than 800 million go to sleep hungry every night. Increase in temperature would have two effects: first, in higher latitudes it will increase food production due by moderating temperatures and increased CO₂; it second, it will reduce the crop yield in the low latitudes due to higher temperatures and destruction of agricultural land by salinity. Generally, there will be a drop in food production in both the developed and less developed countries.

The above impacts assume that there is a linear relationship between the increase in temperatures and its implications. However, there is increasing concern among the scientists that climate change may occur abruptly and explode surprises for humanity-beyond its control. It is observed that environment is changing at a faster rate than expected. A report by a US National Academy of Science (NAS) says, "Available evidence suggests that abrupt climate changes are not only possible but likely in the future, potentially with large impacts on ecosystem and societies".

Moreover, there is a point of no return- "threshold", after which warming may become unstoppable. The earth's climate can change abruptly when the responsible factors reach the thresholds. Most scientists think that the point lies not far beyond 20C hotter. It is the point at which anthropogenic warming can trigger huge release of Carbon dioxide from warming oceans or similar releases of both CO₂ and CH₄ from melting permafrost, or both. To limit warming to 20C we must stabilise concentration of green house gases in the atmosphere at a specific 'stabilisation level'.

Knowing the dangerous consequences of inaction, the world needs to act to check the global warming. As the global warming is caused by anthropogenic emissions, the most logical approach to this problem would be to cut emissions significantly. This, however, has a major implication for the world economy- the energy of which is mainly based on fossil fuel burning. Several efforts have been spearheaded in the past but consensus has not been reached due to contentious position of some most industrialised countries.

From the Kyoto Protocol 1997 through Copenhagen, 2009 to Cancun Conference 2010, the world leaders have been unable to agree on substantial cuts in emissions and adequate funding for adoption. Though, there has been some progress in foundation work along with commitments from the world leaders to tackle this danger to planet earth, there is a long way to go for effective action.

Being the developed countries these are well equipped, technologically, to cut the emission by transforming their economies from fossil fuel-based energy to renewable resource energy. The solar energy available is the most abundant form of energy available to humans. Wind energy is another plenty source of energy. Nuclear source is also a non-pollutant source of energy. The developed countries should not only explore this source but they should also support/help the underdeveloped countries to generate electricity from this source. We need to understand that we have to switch over to these sources of energy as the fossil fuels are bound to be finished by the increasing levels of consumption; so why late, why not now?

Furthermore, the effort at the international level is not the only way to control global warming; all the people can play their individual role as well. After all are the end users of all that is produced in the industries and energy sector. Individuals can help reduce the green house emissions by many ways like: driving less, sharing a car with a friend or colleague to office, eating local, improving vehicles' fuel efficiency, consuming less, using

less electricity (and saving money), energy efficiency at work and home and by reducing waste products. These acts would serve the purpose of emission reduction in two ways: One; the less- consumption would result less production and subsequently less burning of fuels. Two; it will generate a moral pressure on the industries and governments to realise the dilemma and agree to the emission reduction policy.

There is a feasible counter balance to reduce CO2 from atmosphere by growing forests on land and vegetation in sea but it will not do much. Ultimately, a combination of improved energy efficiency and alternative energy resources is the way to mitigate global warming. Though it will cost us but 'the earlier effective action is taken, the less costly it will be', says Sir Nicholas Stern, the Chief Economist at World Bank. We need to act now, we need to act before it's too late, as the major threat from global warming is its unpredictability.

The global warming has become the real test of the foundations of our modern society, civilisation and democracy. Its anthropogenic causes are amply proved. Its implications have started hitting humanity, which are too harmful to be ignored. The solutions are at hand. Therefore, the world leaders have responsibility to respond to it effectively for the cause of humanity - our future generation. **"Climate change, and what we do about it, will define us, our era, and ultimately the global legacy we leave for future generations"**, says Ban Ki Moon.
