CLIMATE CHANGE AND THE DEGRADATION OF THE NATURAL WORLD – CHALLENGES FOR SUSTAINABLE DEVELOPMENT

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Abstract: Climatic conditions are responsible for life in a particular terrain. Life exists, alters itself and survives according to the climatic condition in that particular environment. This phenomenon is called climatic adaptation. In the natural cycle, climate change is gradual and does not affect the ecological balance. But in the case of human-induced climate change, the natural cycle is completely pulled-off its natural composition and placed at a level where it is not alterable and hazardous to the environment and its species. With the sudden rise in temperature, the remaining ice sheets on the earth's surface in places like Green land and Antarctica have started to melt. In addition to this, the weather has become more extreme which has lead to major storms, longer duration of rain, floods, drier drought periods, fewer cold spells, more heat waves and extreme radiation. The Global sea level rise will increase drastically by 2100. Sustainable Development is the only key to stop the rapidly increasing harmful effects of climate change caused by human activity, to save the natural world and its species.

Key Words: Pollution, Anthropogenic activity, Climate Change, Global Warming, Atmosphere, Temperature, GHG, Environment, Biodiversity, Air, Sea Level Rise, Amazon, United Nations, Sustainable Development.

I INTRODUCTION

Climate change refers to the pattern of change in the winds, ocean currents and other measures of the earth's climate. Global climate change is an ever-changing factor. The earth has gone through many periodical changes to be the way it is today. However, the changes in the terrain and climate were natural, slow and took place over a vast period of time. The earth's climate is interactive between the atmosphere, land surface, polar ice, oceans and other bodies of water and living things. The Global Assessment of Scientific Information on Environment, Climate Change and Socio-Economic Impacts are done by the Intergovernmental Panel on Climate Change [IPCC] which was established in 1988 by the World Meteorological Organization [WMO] and the United Nation Environment Program [UNEP]. Evidence and observation from IPCC suggest that human activity is adding tremendously to the warming of the earth's atmosphere. The major cause of such is the burning of fossil fuel, pollution of air, water and soil, change in land due to deforestation, excessive cattle ranching and agriculture, etc.

These activities modify the atmospheric constituents on the earth's surface and disturb the natural tendency of absorption and scattering of radiant energy in the atmosphere. The increase in the concentration of Green House Gases [GHG's] and aerosols are affecting the environment and greatly contributing to climate change in the 20th century. Further and intense changes in climate are expected in the 21st century. The unprecedented warming of the globe due to human activity has changed the climatic system to an extent where serious action has to be taken before extreme conditions arise on the planet.

II EFFECTS OF CLIMATE CHANGE:

In the polar region rise in temperature will cause polar ice caps to melt causing an increase in ocean levels, flooding of coastal areas. Habitat loss of wild animals in the polar region will lead to species loss and

imbalance in the natural cycle. When the polar ice caps melt due to global warming, it will lead to an increase in sea level rise. When the sea level rises it will cause adverse effects on the land. Countries like Maldives, Mauritius, Bangladesh, etc are under the threat of being submerged under the sea due to sea level rise.

III FACTS ON CLIMATE CHANGE:

The United Nations Frame Work Convention on Climate Change [UNFCCC] stated the following in its publication "Feeling the heat" on May 12, 2010. The earth's surface temperature has risen on an average of 0.74 degrees since the 1800s. There might be an increase of another 1.8 degrees C to 4 degrees C by the year 2100.

The main reason for the rise in temperature is industrialization, burning of fossil fuel, coal, deforestation, intensive farming and extensive grazing. CO2, methane, nitrous oxide are the gases which brought the earth to life by retaining heat on the surface of the earth. But excessive trapping of these gases causes an alarming rate of global temperature change. Many animals and plant species have already gone extinct and in the next 100yrs, many will become extinct as they are suffering from pollution, loss of habitat, poaching, etc.

The US Environmental Protection Agency [EPA], stated in frequently asked questions about Global Warming and Climate change in April 2009 that the levels of GHG's emission due to human activities into the atmosphere are increasing at a faster rate than any in hundreds of thousands of years. Past climate information suggests that the warmth at the Northern hemisphere in the last half century is unusual in at least the past 1300 yrs.

On Jan 16th, 2012, Peter Gleick CEO of Pacific Institute in his article 'Climate Change Disbelief and Collision between Human and Geological Time' stated that… 'Climate does change naturally for a reason which is understood by scientists. But the process is slow and it happens in over thousands of years. Human-caused climate change is different. The billions of human population on the planet have learned to use huge quantities of carbon-based fossil fuel for short term energy demands. For the first time in 4 billion years history of the earth, the earth is being altered at such a vast pace in a short period of time'

The US Global Change Research Program stated in May 2014 in the US National Climate Assessment, there are multiple independent pieces of evidence which confirm human activities to be the primary cause of global warming in the past 50 yrs. The burning of coal, oil and gas has increased the CO2 in the atmosphere by more than 40% since the industrial revolution. Data show that natural factors like the sun and volcanoes cannot have caused the warming of the globe as the temperature rise in the past 50 yrs.

The National Aeronautics and Space Administration [NASA] on May 17th, 2017 wrote 'there is a rise of about 8 inches in the sea level in the last century. The rate of temperature increases in the last two decade is nearly double in the last century. Most of the warming has also occurred in the past 35 yrs. The planets average surface temperature has risen to about 2.0 degree F'.

The Intergovernmental Panel on Climate Change [IPCC] on Nov 2014 in its 'Climate Change 2014 Synthesis' report said, 'The recent GHG emissions are highest in history and human influence on climate change is clear. The atmosphere and the ocean have warmed causing snow levels to diminish which has, in turn, increased the sea level. The GHG emission is driven by population and economic growth higher than ever'.

IV EVIDENCE OF CLIMATE CHANGE IN THE PRESENT SCENARIO

Air temperature rises over land: Weather stations clearly depict the rise in temperature, heat wave and droughts are increasing leading to destructive wildfires, loss of water supplies in the ground and smaller water bodies, leaving wildlife in many areas in the world with water scarcity and death by dehydration.

E.g. African Elephants and climate change

Elephants have a strong reputation to occur across a range of diverse habitats; they are exposed to varied climatic conditions and feed on different herbivorous food. Though elephants are resistant to climate change the sudden shift in extreme climatic conditions has left them vulnerable. The sudden rise in global temperature has left them sensitive to extreme heat and also susceptible to various diseases. The long journey in the hot sun is no more the natural way. The added heat, lack of habitat, lack of proper food and water source due to human activity and global warming is posing a severe threat to their very existence.

Air temperature rises over the oceans: As the earth is covered with 70% of water, warming of air over the ocean causes extreme weather conditions and leads to floods, hurricanes and extreme precipitation events. E.g. the series of oceanic events leading to the death of phytoplankton is causing excessive CO2 in the ocean which is transferred to the terrain adding to global warming.

Melting of Arctic ice: Due to climate change, the Arctic region is losing its ice cover and is shrinking at 14 percent per decade. Satellites show that 770,000 sq. miles of less ice was seen in 2010 than in 1981. Even the duration of ice cover has changed. In late spring the ice is breaking up and melting, forcing wild animals like bears to walk and swim for long distance in search of ice.

E.g. Polar bears are high-calorie intake carnivores which depend on hunting seals from the ice cover for their survival. Due to melting ice, their hunting has been largely affected. Polar bears are literally starving to death due to lack of ice cover for their seal hunting. The rapid melting of ice has also made them lose their habitat. They are forced to swim for very long distances much more than the usual in search of the seal population. Using excessive calories to walk and swim long distances in search of food source and lack of food makes them loose too much weight. Small cubs do not endure such tedious hunt and collapse resulting in a decline of the polar bear population. The adult also eventually collapses due to extreme fatigue and starvation.

Polar bears are already considered critically endangered. Some studies show at this pattern in the rise of temperature and illegal poaching, Polar bears might become extinct in the next 40 years. The only long term solution for the survival of polar bear on this planet will be to take immediate action on climate change.

Melting glaciers: In the natural world unaffected by global warming and climate change, glaciers stay balanced; the glaciers melt in summer and are replaced by snowfall in the winter. But when the melting ice is much more than what is replaced, the glacier starts losing its mass and greatly affects the ecosystem and wildlife dependent on the glacier for their survival.

E.g. Kyrgyzstan has one of the richest biodiversity in Central Asia but its species and ecosystem are facing danger due to global warming which is melting the glaciers in Kyrgyzstan at a faster pace. Scientists say that glaciers in Kyrgyzstan are melting at an alarming rate. 8400 square km's of Kyrgyzstan's territory consist of glaciers interconnected with some of the most diverse flora and fauna in the world. Kyrgyzstan's biodiversity varies from glaciers to sub-tropical and temperate ecosystem. The water from the glacier feeds many of the rivers, lakes and wildlife in its ecosystem. 90% of the water in the river of Kyrgyzstan comes from the glaciers.

According to the report submitted to the UN, although Kyrgyzstan occupies 0.1% of the world's landmass, it is home to 1% percent of species in the entire world. 200 plant species, 3,000 invertebrates and 17 vertebrates are endemic to Kyrgyzstan. The ecosystem of Kyrgyzstan is the elixir of its biodiversity. Due to global warming, scientists from the International Climate Monitoring Bodies say that glaciers have receded as much as 35% in the 20th century. About 50 meters of glaciers is said to be shrinking each year. When excess water is melted from the ice glacier, it affects the vegetation in the lower altitudes which is the food source for many herbivorous species. These herbivores are prey animals to carnivores like the snow leopard. Thus the entire food chain gets affected due to melting ice.

The excessive melting of glaciers deposits sediments in the valleys below, affecting the local land, rivers and ecosystem. Excessive glacial melting can lead to floods which surpass the natural ice dams and pours down the mountains destroying the entire forest. Scientists predict such incidence can lead to desertification. Kyrgyzstan research submission in 2009 to the UN Framework Convention on Climate Change predicted the country's glaciers would recede up to 95% in the next century.

Sea level rise: Throughout earth's history sea level has fluctuated in accordance to the melting of ice in the polar latitude, the movement of tectonic plates and rhythmic cycles of the earth's rotation around the Sun. Sea level is never static but the rapid sea level rise in today's world due to climate change caused by anthropogenic activity is of extreme concern. The National Oceanographic and Atmospheric Administration say that 'the sea level is rising approximately at 3.0mm/yr'.

Due to technological advancements in the 21st century, sea level rise is predicted through satellite altimetry data sets and climate modules. With current analysis scientists say that in a warm, carbon-rich future the global amount of continental ice sheets will reduce greatly by melting, the surface of water bodies will get warmer. Even deep-water formations like the North Atlantic Deep Water [NADW] and Antarctic Bottom Water [ABW] is getting warmed greatly. The oxygenation and cooling of deep water will decline. This will greatly warm and thermally expand vast amounts of the global ocean. This rise in sea level will affect the coral reefs, seagrass meadows, kelp beds, rocky intertidal zones and estuaries which are dependent on sea level for their very existence. Low-lying atolls reef crests, sea turtles, Hawaiian monk seal, open ocean birds, etc. that use these habitats for breeding and laying eggs will be greatly affected.

E.g. rapid sea level rise due to climate change and global warming is a threat to 223 federally protected animals and plant species in 23 coastal states in the US. According to the Center for Biological Diversity and U.S. Wildlife Protection Agencies, 'Florida's key deer's and Hawaiian monk seals can be doomed as ocean swallows up their habitats and nesting sites'. The most threatened species of sea level rise in Florida are key deer which will become extinct if sea level rises by 3 feet, loggerhead sea turtle which will disappear if sea level rises by 1.5 feet. Hawaiian monk seal, Delmarva Peninsula fox squirrel, western snowy plover will lose their habitats if the sea level rises by less than 3 feet.

Rise in levels of humidity: Though water vapor is part of the water cycle and contributes to the natural GHG effect, an excess of water vapor due to global warming affects the rate at which water evaporates from the skin of organisms in transpiration or sweating. This condition disturbs the normal functioning of animals and plants alike. The main reason for the increase in humidity is deforestation.

Increase in ocean heat content: The ocean stores and releases heat over a long period of time. This is a natural method of stabilizing the climatic system throughout the globe. The CO2 content in the coastal region is balanced by the sea water. Cold seawater absorbs more CO2 but due to global warming as the sea water is also getting warmer; the CO2 content rises up and fills the coastal area. The CO2 is also distributed to the world by wind currents. The ENSO cycle is a naturally occurring phenomenon in the Pacific Ocean which affects the climatic conditions of the entire planet.

Increase in the surface temperature of the sea: The water temperature in the ocean is going up than usual to an extent that the excess heat is released in the atmosphere as CO2 creating winds, rain clouds, stronger and more frequent storms like tropical hurricanes and cyclones. The rise in CO2 level also affects the terrestrial ecosystem greatly.

*C**limate change and coral reefs:*** Coral reefs are called the rainforests of the ocean. They are just 1% of the total ocean cover but provide the highest levels of biodiversity on the planet. The coral reefs are the elixir of life in the ocean which directly affects life and activity in the terrain.

Carbon emission and climate change have affected the coral reefs extensively. Elevated ocean temperatures have caused mass bleaching of the coral reefs and the corals also face the loss of symbiotic algae. Due to temperature rise and extended summer months [from weeks to months], the reef-building corals have a biological breakdown. Due to bleaching, the corals lose their ability to grow, reproduce and eventually die.

Another major factor is ocean acidification where the increase in CO2 reduces the ocean pH leading to a loss of carbonate ions which is required by coral reefs and all marine calcifies to build their skeleton and grow.

An estimate of the state of coral reefs worldwide by the Global Coral Reef Monitoring Network [GCRMN] suggests that the world has lost 15% of its original coral reefs and an additional 20% is under threat in the next 20-40 yrs.

Coastal development, resorts and recreation sites near the shore, sediment and pollution discharge, global warming, overfishing, CO2 emission from ships, motor boats, lounges, etc. , ocean acidification, oil well explosion, oil leak due to accidents from ships, etc. are causing the loss of coral reefs.

Decreasing snow or melting ice: Much of the snow covers in the northern and southern hemisphere are melting due to global warming. The reason for sea level rise, temperature change, lack of habitat and food for many animals is the melting of ice cover. Snow is important to help control suns energy distribution on the earth. The ice sheets reflect back sunlight thus sending back energy into space and thereby cooling the planet. When the ice cover is replaced by dark land and ocean both of which absorbs sunlight, the temperature of the planet rises.

Temperature increases in the troposphere: Troposphere is the last layer of the atmosphere closest to the earth. The satellite imaging shows clear indications of atmospheric warming as the GHG's build up and traps heat that radiates from the earth. Due to human activity, there is a massive increase in the CO2 levels in the atmosphere. The anthropogenic reason particularly burning of fossil fuel, coal, deforestation, etc. has caused a sudden rise in global temperature.

Amazon and climate change: In recent times Amazon is witnessing historic droughts due to global warming. The worst drought in the Amazon rain forest in the last 100yrs was in 2005-2010. Global climate change is also responsible for many forest fires in the Amazon leading to loss of many species and degradation of the ecosystem.

Dr.Philip Fearnside, a research professor at the National Institute for research in the Amazon, Brazil says that "climate change and deforestation could cause Amazon rainforest to disappear by the end of the century. If GHG's are not brought under control, 85% of the Amazon could be lost in the next 100 yrs. A temperature rise of 4degree C could cause 85% of the rain forest to die. Even a slight rise in temperature would cause 20-40% loss of the rain forest in the next 100 yrs".

The Amazon rain forest which is the lung of the planet is home to the maximum number of species present on the land. The Amazon rain forest provides O2 and absorbs CO2 to balance life on earth. Amazon represents half of the remaining rain forest in the world. Deforestation and climate change have caused the Amazon to dwindle in a way that the very existence of Amazon will be at stake in the next few decades.

The effects of climate change and deforestation on Amazon is causing accelerated global warming. Many scientific experiments and computer modeling show that the Amazon rainforest has become unsustainable because of reduced rainfall and increased temperature due to climatic change. Such conditions might lead to the complete loss of the Amazon rain forest by 2100. The Amazon has witnessed the worst drought in 2005-2010 and 2015-2016. Scientists from the Brazilian National Institute of Amazonian Research argue in an article that the droughts and extremities in Amazon caused by climate change and deforestation are towards a tipping point where the rainforest could eventually start to die.

WWF [World Wildlife Fund] for nature denotes that the combination of climate change and deforestation will increase the drying effects of dead trees resulting in frequent and excessive forest fires. In a typical year, the Amazon absorbs 1.5 gigatons of CO2 from the atmosphere but instead, scientists observed that in 2015, 5 gigatons of CO2 and in 2010, 8 gigatons of CO2 was released into the atmosphere by the Amazon due to deforestation.

These challenges faced by the world have to be approached scientifically and methodically. Leaders, Educationalist and Administrators of many Nations have come to a conclusion through expert research knowledge and unprecedented conferences around the world that sustainable development is the only key for the human race to sustain in this planet. The functioning of Sustainable Development should be an agenda for the entire world, as the Environmental system is the entire world is interconnected. Thus Sustainable Development of the world as a whole is a necessity rather than a concern.

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