

# CLIMATE CHANGE: CHALLENGES TO SUSTAINABLE DEVELOPMENT IN INDIA

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**ABSTRACT:** -There is widespread consensus that the Earth is warming at a rate unprecedented during post hunter-gatherer human existence. The last decade was the warmest since instrumental records began in the nineteenth century, and contained 9 of the 10 warmest years ever recorded. The causes of this change are increasingly well understood. Climate change is one of the multifaceted problems facing today's generations. The intervening intricacy of the problem is attributed to its deeper global ramifications on a vast range of issues impacting the very survival of life on Earth. Understanding such a complex issue with vast and varied dimensions and implications, assumes greater significance for all stakeholders, especially for our policy makers. There are varieties of perceptions regarding the exact size and consequences of climate change. There is now strong evidence that climate change is a reality. Today, it has been scientifically established that significant global warming is occurring. Warming of the climate system is unambiguous. There is no denying the fact that the problem exists and it is assuming alarming proportions, each passing day. Therefore, there is an imperative need to meet the emerging challenges of climate change.

**KEYWORDS-** Climate Change, Environmental Impact, Economic Impact, Sustainable.

**INTRODUCTION:** -Stresses on the climate system are already causing impacts on Earth's surface. These include not only rising surface temperatures, but also increasingly frequent floods and droughts, and changes in natural ecosystems, such as earlier flowering of plants, and pole ward shifts in the distribution of several species. All of these changes are inextricably linked to the health of human societies. Climatic conditions affect human well-being both directly, through the physical effects of climatic extremes, and indirectly, through influences on the levels of pollution in the air, on the agricultural, marine and freshwater systems that provide food and water, and on the vectors and pathogens that cause infectious diseases.

As it is now widely accepted that humans are influencing global climate, decision makers are now focusing on the type and timing of actions to limit the rate of change. Attention is shifting to the balance between the possible impacts of climate change, and the economic costs, technological advances and societal adaptations that are necessary for mitigation. Extensive discussions are taking place throughout the world in all forms of media on the subjects of global warming and climate change. These discussions point to the global dangers posed by the earth's warming. Discussions are also taking place on the related question of resource limitations, given the manner in which humans are using the planet's limited resources. This will consist of providing some background to these issues, identifying some of the current and future risks involved, the possible financial and other impacts posed by these risks, and the worldwide efforts that are being made to minimize these risks. The issue of climate change has been recognized by many professions. The actuarial community can benefit from finding out the perceptions of the different professions of how climate change will affect the work done by them.

Climate change also is expected to affect health via various indirect pathways, including the patterns of infectious diseases; the yield of food-producing systems on land and at sea; the availability of freshwater; and, by contributing to biodiversity loss, may destabilize and weaken the ecosystem services upon which human society depends. Adaptations to the health hazard posed by global climate change can be both proactive and reactive, and can occur at the macro, meso and micro-scales; that is, at the population, community and individual levels. Climate change represents a one-off global experiment so there will be limited opportunity to carry out preliminary evaluation of adaptation options. There is therefore a strong case for prudence, both in mitigating climate change and in adapting to its impacts.

### **What is Climate Change?**

Climate change is the subject of how weather patterns change over decades or longer. Climate change takes place due to natural and human influences. Since the Industrial Revolution (i.e., 1750), humans have contributed to climate change through the emissions of GHGs and aerosols, and through changes in land use, resulting in a rise in global temperatures. Increases in global temperatures may have different impacts, such as an increase in storms, floods, droughts, and sea levels, and the decline of ice sheets, sea ice, and glaciers.

**Environmental and Social Impacts of Climate Change:** Climate change involves a variety of potential environmental, social, and economic impacts. In most situations, these impacts will be adverse; in a few isolated situations, these could be more favorable (such as increased crop yield). The severity of the adverse impacts will increase with the rise in the average global temperature. Even if global warming is kept within 2°C relative to pre-industrial levels, adverse impacts will be experienced and the world will need to take appropriate measures to adapt to new climate conditions. If, in spite of the world efforts, the temperature increase goes beyond the 2°C threshold, it has been assessed that the consequences would become increasingly severe, widespread and irreversible. Canada has already become warmer by 1.5°C on average from 1950 to 2010.<sup>18</sup> Climate change is expected to make extreme weather events, such as heat waves, acute rainfall, floods, storms, droughts, and forest fires, more frequent and/or more severe in Canada.

**The areas in which adverse impacts will be experienced are described below:**

**Floods and Droughts:** Floods are expected to occur more frequently on more than half of the earth's surface. In some regions, they could decrease. During winter, snowfalls are expected to decrease in mid-latitudes, resulting in less significant snowmelt floods during the spring season. In Canada, increased rainfall is forecasted for the entire country. On the other hand, meteorological droughts (less rainfall) and agricultural droughts (drier soil) are projected to become longer or more frequent in some regions and some seasons, especially under the RCP 8.5, because of reduced rainfall and increased evaporation

**Reduction in Water Resources:** Renewable water supply is expected to decline in certain areas and expand in others. In regions where gains are expected, temporary deficits of water resources are still possible because of increased fluctuations of stream flow (caused by higher volatility of precipitation and increased evaporation during all seasons) and of seasonal cutbacks (because of lower accumulation of snow and ice). Clean water supply may also decrease due to a warmer environment inducing lower water quality.

**Rising Sea Levels:** In some regions such as the U.S. Eastern Coast, tides are reaching up to three feet higher than they used to 50 years ago. Rising sea levels will have more and more negative consequences near the coasts—such as flooding, erosion of the coasts, and submergence of low-lying regions—putting at risk populations, infrastructure, animals, and vegetation near the coasts. Low-lying regions (like Bangladesh) and whole islands (like the Maldives and Kiribati) are at risk of destruction in the short term from rising ocean levels, floods, and more intense storm urges.

**Changes in Ecosystems:** In the past millions of years, climate changes have naturally occurred at slower paces, permitting the ecosystems to adapt. However, in the 20th century many argue that we have entered the Anthropocene. Species extinction rate has exceeded by up to 100 times the “normal” pace (i.e., without anthropogenic impact). We are facing a major biodiversity crisis and we might even be entering a sixth “mass extinction”. In the 21st century and beyond, the risk of extinction that land and aquatic species are exposed to is higher under all RCP scenarios. As early as 2050, the rapid changes that are currently taking place are expected to jeopardize both land and ocean ecosystems, particularly under RCP 6.0 and RCP 8.5. It may be noted that the changes in ecosystems involve much more than climate change. Massive extinctions are caused by many factors including urbanization, increased world population, etc. Of course, climate change has made its contribution which will amplify with time.

**Food Production and Security:** Obvious climate change impacts on terrestrial food production can already be observed in some sectors around the globe. In the past few years, climate extremes such as droughts have occurred in major producing areas, resulting in many episodes of price hikes for food and cereals. Although these effects are beneficial in certain areas, adverse consequences are more frequent than favourable ones, especially, because key production areas (e.g. California) are located in historically favourable areas which will become unfavorable. Many climate change impacts will increasingly affect food security—particularly in low-latitude regions—and will be exacerbating by escalating food demand. Forecasted ocean-level rise will threaten crucial food-producing areas along the coasts, such as India and Bangladesh, which are major rice producers. Climate change is also a key political issue, and its consequences, such as food insecurity, are already generating conflict in vulnerable regions around the globe.

**Human Health:** If climate change keeps occurring as forecasted under RCP scenarios, it will influence human health in three different ways:

- Extreme weather events have direct impacts such as increased risks of death and disability.
- Alterations of the environment and ecosystems indirectly affect human health, such as a higher prevalence of waterborne illnesses caused by higher temperatures or increased death and disability rates during extreme heat episodes. Climate change will exacerbate current illness loads, especially in regions with fragile healthcare systems and lesser ability to adapt. Poor regions—especially poor children—are expected to be the most vulnerable to climate-related health risks.
- Other indirect consequences pertaining to societal systems will arise, such as under-nutrition and mental disorders caused by stressed food production systems, increased food insecurity and relocation resulting from climate extremes

Global warming projections suggest that climate change impacts will vary greatly among regions, and happen on different time scales. However, it is important to keep in mind that a myriad of interrelations exist among communities worldwide. Effects of climate change occurring in a particular region may trigger current effects around the globe via internationally connected systems like the economy. For example, extreme climates interfering with agricultural harvests or warming sea temperatures leading to reduced fishing yields in a given region may affect both prices and food supply throughout the world. Moreover, climate change may modify migration patterns of human beings, other living organisms and physical materials, thus triggering collateral consequences elsewhere, even in remote areas. “Migration can affect many aspects of the regions people leave, as well as many aspects of their destination points, including income levels, land use, and the availability of natural resources, and the health and security of the affected populations—these effects can be positive or negative.”

**CONCLUSIONS:** Over the ages human societies have degraded or changed local ecosystems and modified regional climates. Without precedent, the aggregate human impact now has attained a global scale, reflecting the recent rapid increase in population size and energy-intensive, high-throughput, mass consumption. The world population is encountering unfamiliar human-induced changes in the lower and middle atmospheres and worldwide depletion of various other natural systems (e.g. soil fertility, aquifers, ocean fisheries and biodiversity in general). Despite early recognition that such changes would affect economic activities, infrastructure and managed ecosystems, there has been less awareness that such large-scale environmental change would weaken the supports for healthy life. Fortunately that is now beginning to change. Indeed, this volume seeks to present a comprehensive discussion of the relationship between global climate change and human population health. Global climate change is likely to change the frequency of extreme weather events: tropical cyclones may increase as sea surface waters warm; floods may increase as the hydrological cycle intensifies; and heat waves may increase in mid continental locations. As discussed above, a change in the frequency and intensity of heat waves and cold spells would affect seasonal patterns of morbidity and mortality. The production of various air pollutants and of allergenic spores and pollens would be affected by warmer and wetter conditions.

This topic is likely to become a major theme in population health research, social policy development and encouragement during this first decade of the twenty first century. Indeed, consideration of global climatic-environmental hazards to human population health will play a central role in the sustainability transition debate.

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