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Dynamics of Climate Change in India -An Analysis

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ABSTRACT

According to the United Nations, Climate change refers to long term shifts in temperatures and weather patterns and these shifts may be natural, such as through variations in the solar cycle. Climate change will affect the basic elements of life for people around the world, like access to water, food production, health, and the environment, and also present a range of risks and impacts that are expected to negatively impact our economy. These risks include property loss and damage, infrastructure and service costs, and risks to financial stability. The sectorial and regional analysis around the world economy shows that the impact of climate change spreads across all the sectors and regions, with the biggest negative impact on the health and agricultural sectors. From a national perspective, agriculture, electricity production, energy, human health, and forestry are all directly linked and very vulnerable to impacts from climate change. Climate change has inevitably started altering the climatic dimensions and is now causing substantial damage to the Indian economy. India is among the countries most vulnerable to climate change. It has one of the highest densities of economic activity in the world and very large numbers of poor people who rely on the natural resource base for their livelihoods, with a high dependence on rainfall. The negative impact of climate change is unavoidable and will have significant economic, social, and environmental impacts. People will need to adapt in order to mitigate the negative effects of climate change and capitalise on new opportunities. This means taking actions that mitigate the negative effects of climate change while capitalizing on potential new opportunities. The real challenge for developing countries like India is to build a balance between the required growth and ensuring minimal damage to the environment.

1. Introduction

Climate change poses a multifaceted challenge with profound implications for India, a country characterized by diverse ecosystems, socio-economic disparities, and complex geopolitical dynamics. India's diverse landscape, from the Himalayas to its extensive coastline, renders it highly vulnerable to the impacts of climate change. Rising temperatures, altered precipitation patterns, and increased frequency of extreme weather events are reshaping ecosystems, threatening biodiversity, and amplifying risks to water and food security.

The socio-economic dimensions of climate change in India intersect with existing vulnerabilities, disproportionately affecting marginalized communities. Agriculture, a backbone of the Indian economy, confronts mounting challenges from erratic rainfall, heat stress, and changing cropping patterns. Smallholder farmers, lacking access to adaptive resources, face heightened risks of crop failure and livelihood insecurity. Urban areas grapple with worsening air quality, heat island effects, and water scarcity, amplifying health risks and exacerbating socio-economic disparities. Climate-induced migration further strains urban infrastructure and exacerbates social tensions.

India's response to climate change is intricately linked with its aspirations for sustainable development and global leadership. As one of the world's largest emitters, India faces pressure to balance economic growth with emissions reduction commitments. The transition to renewable energy sources presents opportunities for economic growth and energy security, yet challenges persist in scaling up renewable infrastructure and addressing energy poverty. Internationally, India's stance in climate negotiations influences global climate governance, reflecting its strategic interests, development priorities, and alliances.

Understanding the dynamics of climate change in India requires a holistic approach that integrates environmental sustainability, socio-economic equity, and geopolitical considerations. Addressing these challenges demands collaborative efforts across sectors, stakeholders, and scales, emphasizing adaptation, resilience-building, and sustainable development pathways. This abstract underscores the urgency of concerted action to mitigate climate risks and safeguard the well-being of present and future generations in India and beyond.

2. Objective & Methodology

The objective of the paper is to make a descriptive analysis about the different aspects of climate change with help of secondary data. Paper presents a qualitative and quantitative analysis based on data obtained from various international and national reports, government documents and research publications. Paper describes about the climate change and dimensions of climate change with the support of facts and figures.

3. Climate Change: Indian Context

India is one of the most vulnerable countries to the growing threats of climate change, but the impact may differ from one region to the other, due to the complex geographical structure of the country. A study by the Ministry of Earth Sciences, Government of India has analysed that since the middle of 20th century, India has witnessed a rise in average and extreme temperature, decrease in monsoon precipitation, rise in sea levels and increased instances of droughts and cyclones.

3.1. Factors Influencing Climate Change in India

Climate is a vibrant phenomenon and undergoes continuous changes over centuries. There are natural forces like photosynthesis of the plants, eruption of volcanoes, emission of methane from agricultural activities, vapor emissions etc. The important factors, which are responsible for climate change and are causally contributed by human, are:

Greenhouse Gases (GHGs) : The emissions of Greenhouse Gases", which are considered to be one of the main causal factors accelerating climate change in the post industrialization era. GHGs constitute; Carbon Dioxide (CO2),Methane (CH4), Nitrous Oxide (N2O), Hydro fluorocarbons (HFCs) etc.

Deforestation: There is considerable reduction in the forest cover due to encroachment and land use change and economic development activities like construction of roads, canals and power stations. Forests are the major source of carbon absorption and the womb of the biodiversity, which acts as the main artery of any environment and ecosystem.

National Action Plan on Climate Change (NAPCC) estimates that 77 to 68% of the forest areas in the country are likely to experience shift in forest types by the end of the 21st century.

Land-use Change: Land-use change is another major reason to be viewed seriously and a huge portion of forestland is diverted for non-forest use.. A relative growth in the land-use change is also visible in urban and rural areas due to urbanization and industrialization.

Fragmentation of forests and habitats are another major reason for loss of biodiversity. Bur there are no data which gives any indication of loss of biodiversity and loss of biomass due to this land use change.

Energy Usage: After the liberalization and globalization, India is on a high growth path and envisages about 7 to 8% GDP growth rate per annum. The energy generation has grown manifold due to the ever increasing demand for energy since 1992.

Coal, Gas and Diesel being the major sources of power in India, the emissions of GHGs are also on the rise. In the other hand, the unorganized sector is also engaged in power generation through low capacity diesel generator sets and coal-fired generators.

3.2. Impact of climate change on the Economy

Climate change has a wide range of economic impacts and all the sectors of the economy will be affected very much. The impact of climate change will gradually affect economic processes means effect of increasing temperature on energy demand, and others may come as extreme situations like sudden floods or forest fires. These impacts may be either negative or positive but the assessment of impact of climate change subjected to a fundamental challenge of complexity. The mechanisms through which climate may affect the economy, positive or negative is extremely difficult to estimate.

3.3. Climate Change in India: Sectoral Analysis

3.3 (1).Agriculture

Agriculture in India still contributes for a substantial share in GDP (14%), larger share in employment (42%) and it has a direct bearing on the lives of 1.38 billion people. The sector's contribution has had a drastic change for the past few years because of climate change mainly due to unusual rains and frequent droughts. India has experienced so many large scale droughts and higher temperatures tend to reduce crop yields.

Water is the most critical agricultural input but more than 50% of the total cultivated areas do not have proper irrigation facilities in place. One the most significant negative effects of climate change is that, it adversely affected the irrigated crop yields due to high temperature and changes in water availability.

3.3 (2).Tourism

According to World Travel and Tourism Council, travel and tourism contributed 9.6% to India's GDP. But the sector is highly vulnerable to extreme climatic changes with massive impact on infrastructure, requiring emergency preparation measures, increasing maintenance costs, and disrupted commercial activity. Reduced spring and summer seasons due to climate change causes losses for certain types of tourism and on the other hand, snow melting in mountains is adversely affect the winter tourism sector.

4. Human Health & Climate change

Climate change poses significant threat to the health of the general public. It is expected that climate change will affect the health sector through increase in the frequency, intensity, and extent of extreme weather events as well as reducing air quality, increased spread of climate-sensitive diseases and intensified food insecurity. All of these effects are predicted to have a significant impact on national mortality and morbidity. Some other impacts is due to increasing sea levels are death and injury caused by flooding, reduced availability of freshwater due to saline water intrusion, contamination of water supply due to water pollution, increase in disease spreading insects, and the food insecurity.

5. Mitigation and Adaptation

There are two options available to address the problems which may arise out of pollutions caused to the air, water or soil. The "Mitigation and Adaptation". Mitigation involves actions that reduce the likelihood of the event or refers to measures for reduction of emissions of GHGs that cause climate change like switching from fossil fuel based power generation to alternative sources of renewable energy like solar, wind, nuclear etc.

Adaptation involves actions that reduce the impact of the event or process without changing the likelihood that it will occur. The process may include relocating the communities living close to the sea level or switching to crops that can withstand higher temperature etc

6. Conclusion

It is clearly understood that Climate change is affecting the various pillars of Indian Economy i.e. agriculture, tourism, human capital and the need for adopting strong climate policies. The impacts of climate changes on infrastructure, environmental and public health can hamper efforts towards attaining India's developmental goals and deteriorate the country's economic growth.

The challenges in relation to climate change will require developing periodically updated assessments of climate change and its impacts, evaluating the efficacy of existing policies, learning from sustainable practices across India and around the world, and responding dynamically in line with scientific advancements.

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