The Challenge of Climate Change and India's Efforts

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Abstract

Climate change has unequivocally established itself as a preeminent global challenge of the twenty-first century, posing profound and multifaceted threats to ecological integrity, biological diversity, public health, and the broader paradigm of sustainable development. The present study undertakes a comprehensive examination of the conceptual foundations, causative factors, and salient consequences of climate change, whilst critically appraising India's multifarious response mechanisms—encompassing constitutional safeguards, legislative enactments, international treaty obligations, and strategic policy frameworks. This investigation elucidates the intricate interplay of both natural and anthropogenic drivers, with specific emphasis on critical manifestations including global warming, escalating heatwave events, glacial recession, sea-level rise, accelerated biodiversity attrition, and escalating public health vulnerabilities. Furthermore, it delves into India's environmental ethos, which is deeply rooted in traditional ecological wisdom, juxtaposed against its contemporary climate governance architecture—comprising constitutional mandates, statutory environmental regulations, active engagement in multilateral environmental accords, and the Nationally Determined Contributions (NDCs) formalized under the Paris Agreement. Additionally, the paper reviews salient recent policy interventions, including Mission LiFE, the large-scale augmentation of renewable energy capacity, the National Green Hydrogen Mission, and India's firm commitment to attaining Net Zero emissions by the targeted horizon of 2070. The findings underscore India's progressive emergence as a constructive leader in global climate governance, endeavoring to effectively reconcile the imperatives of environmental sustainability with those of robust economic development. However, the realization of long-term climate resilience remains contingent upon sustained policy enforcement, continuous technological innovation, enhanced international cooperation, and vigorous public engagement.

Keywords: Climate Change, Climate Action, Environmental Protection, Nationally Determined Contribution (NDC), India's Role, Climate-preserving Traditions

Introduction

From the origin of the Earth 4.54 billion years ago until now, our planet's atmosphere has completely changed several times. So far, we have faced five ice ages, of which the fifth and final ice age began about 2.5 million (25 lakh) years ago. However, the climate change occurring at the present time is quite different and challenging compared to past variations. It is becoming a question of survival not only for humanity but for the entire animal, bird, and plant kingdom because the rapid pace and adverse consequences of these changes are far more intense than previous historical shifts.

What is Climate Change?

"If a major change is observed in the weather of a region over a long period, it is called climate change."[1]

"Climate change occurs directly or indirectly due to human activities, which alter the global atmospheric composition and, after a certain period, bring variance to the natural climate." [2]

Causes of Climate Change

In the 4.5-billion-year history of the Earth, during the course of the planet's dynamics and continuous evolution, natural factors and events have caused various visible changes in the climate—taking the Earth on a journey from a hot ball of fire to glaciers of frozen ice. On the other hand, human and artificial factors have not only altered the direction and state of the climate but, due to their rapid acceleration, have made its adverse consequences appear increasingly terrifying.

1. Natural Causes

In the course of nature's dynamism and evolution, the environment and climate have been continuously changing due to the impact of internal and natural elements. The main factors responsible for this process are:

- **Plate Tectonics (Movement of Plates):** According to this theory propounded by Harry Hess, the entire Earth is divided into six major and six minor plates. These plates are continuously moving through three types of motions—divergent, convergent, and transform. Due to this, various processes related to new creation and

destruction are carried out on Earth—such as earthquakes, volcanoes, and the formation of new mountains, oceans, and islands—which exert a deep impact on the Earth's environment and climate.

- **Volcanoes:** Volcanoes have both destructive and constructive effects on the Earth's climate and environment:
- **Constructive Effects:** Increase in mineral availability, enhanced soil fertility, creation of new land, and cooling effects from certain gas emissions that decrease the Earth's temperature.
- **Destructive Effects:** Volcanic eruptions release gases that increase pollutant elements in the atmosphere and contribute to global warming.
- **Earthquakes:** Earthquakes also produce both constructive and destructive impacts:
- **Constructive Effects:** The formation of mountains and reliefs positively influences weather cycles and rainfall patterns.
- **Destructive Effects:** Generating tsunamis in the ocean and raising sea levels, which threatens the entire Earth's bio-cycle, biodiversity, and human existence.
- **Solar Radiation:** An increase in the intensity of solar radiation accelerates the pace of global warming and gives rise to various environmental and health-related crises.
- **Impact of Ocean Waves and Tides:** The movement of ocean waves and tides helps clean coastal areas, aiding in environmental purification. However, their destructive side causes widespread loss of life and property in areas near the sea.

2. Human / Artificial Factors

Various human activities and interventions exert a deep impact on the climate and environment. Key factors include:

- **Burning of Fossil Fuels:** Since the beginning of industrialization, the use of fossil fuels like wood, coal, petroleum, and natural gas has been increasing rapidly, leading to visible adverse effects such as global warming and air pollution.
- **Unsustainable Exploitation of Natural Resources:** The unsustainable consumption and exploitation of natural resources like water, forests, land, and minerals disrupt nature's self-balancing mechanism, pushing our climate into a state of serious crisis.
- **Human Ambition to Conquer Nature:** Subjugated by extreme modernity and materialism, the human race, instead of worshipping nature, has engaged in a race to trample and conquer it. This has shattered the equilibrium of nature and natural resources, disrupting the balance of environmental elements and manifesting as the climate change crisis

Main Challenges and Adverse Effects Arising from Climate Change

Due to the combined impact of natural and human factors, the climate is changing rapidly, presenting grave challenges before the entire biosphere, including humans, plants, and animals. Some of the major challenges are:

- **Global Warming:** The world's average temperature has risen by more than 1°C compared to the pre-industrial era. If this unbridled pace continues, it will cross the dangerous threshold of 1.5°C by 2040 .[3]This will disrupt the equilibrium of all biotic and abiotic components existing in the biosphere, posing a serious threat to human existence.
- **Heat Waves:** According to the criteria of the India Meteorological Department (IMD), a heat wave is declared when the temperature exceeds 40°C in plains and 30°C in hilly areas .[4]Unbearable and fatal heat waves are repeatedly emerging in the first two decades of the 21st century, affecting not only desert regions like the Sahara and Thar but also the relatively cold climate regions of Europe, resulting in crop failures and severe threats to human health.

Major Consequences of Heat Waves & Climate Shifts:

- Increase in the Earth's average temperature.
- Imbalance in the entire weather cycle and adverse impacts of extreme weather events due to extreme temperatures, erratic rainfall, etc.
- Adverse impact on agricultural systems and a decline in crop productivity.
- Decline in overall industrial and economic productivity due to a reduction in safe working hours.
- Severe damage to biodiversity.
- Loss of life and property driven by changes in rainfall amount and intensity.
- Increase in tropical cyclones .[5]
- **Melting of Glaciers and Sea Level Rise:** The melting of glaciers is both a consequence of global warming and a factor that further accelerates it. A reduction in ice decreases the albedo effect, causing the atmosphere to absorb more heat, which further increases global warming. According to the IPCC report, the global average sea level rose by 0.16 meters between 1902 and 2015. If this trend continues, it will increase by up to 0.39 meters by 2081–2100, potentially destroying 20% to 90% of coastal wetlands by the year 2100.[6]
- **Ozone Layer Depletion:** The concentration and density of ozone gas in the ozone layer are continuously decreasing due to human and industrial activities. The largest roles are attributed to Chlorofluorocarbons (CFCs), Hydrofluorocarbons (HFCs), etc.[7] This depletion causes fatal impacts on human health, increases skin diseases, and contributes to global warming.
- **Health Crises:** The adverse effects of climate change on human health are clearly visible; environmental factors are responsible for roughly 23% of total deaths globally.[8] Key health impacts include:

- Increase in mortality rates due to a rising number of extremely hot days.
- Spread of infectious diseases like Dengue, Zika, and Malaria.
- Rise in respiratory and skin-related diseases.

India's Efforts to Mitigate Climate Change

Inspired by the ancient, sacred ethos of "Vasudhaiva Kutumbakam" (the world is one family) and "Mata Bhumi Putro Aham Prithivya" (Earth is my mother, I am her son), India has been proactive in environmental protection and mitigating climate change since ancient times. Our proud, ancient environment-preserving traditions help guide this direction through:

- Worship of nature and belief in its sanctity.
- The concept of Panchamahabhutas (the five core elements: Water, Earth, Space, Wind, and Fire).
- Traditional water conservation structures like ponds (Talab), Nadi, and stepwells (Bawari).
- Adoption of climate-compatible lifestyles.
- Conservation of forests and water through sacred groves like Agor and Oran.
- The spirit of co-existence with nature instead of attempting to conquer it.

1. Environmental Protection Provisions in the Indian Constitution

The makers of the Indian Constitution, through their sharp intellect and far-sighted vision, embedded environmental protection into various provisions of the Constitution, establishing a strong foundation for future policymaking.[9]

- **Part III (Fundamental Rights) - Article 21:** Although environmental protection is not explicitly mentioned under the "Right to Life and Personal Liberty," the Honorable Supreme Court through its timely and liberal interpretations has recognized environmental rights—such as clean air, clean water, and a pollution-free environment—as integral components of a dignified life, making them a functional part of Article 21.
- **Part IV (Directive Principles of State Policy) - Article 48 & 48-A:** Dedicates provisions explicitly mandating the protection and improvement of the environment, forests, and wildlife.
- **Part IV-A (Fundamental Duties) - Article 51-A(g):** Formulates that it shall be the duty of every citizen of India to "protect and improve the natural environment including forests, lakes, rivers, and wildlife, and to have compassion for living creatures."
- **Part XI & 7th Schedule (Concurrent List):** Places "Forests" and "Protection of wild animals and birds" on the Concurrent List, empowering both the Union and State governments to legislate on them.
- **Articles 252 & 253:** Grants Parliament the power to enact laws to give effect to international environmental agreements, treaties, and conventions.

2. Laws Enacted by the Indian Parliament

Over the past decades, the Indian Parliament has passed various robust acts for environmental protection, including.

- Wildlife (Protection) Act, 1972.[10]
- Water (Prevention and Control of Pollution) Act, 1974.[11]
- Forest Conservation Act, 1980.[12]
- Air (Prevention and Control of Pollution) Act, 1981.[13]
- Environment Protection Act, 1986.[14]
- Hazardous Waste Management and Handling Rules, 1979
- Noise Pollution (Regulation and Control) Rules, 2000.[15]
- Biological Diversity Act, 2002.[16]

3. International Laws and Conventions Adopted by India

Playing an active role in global environmental governance, India has not only adopted various international agreements and conventions but has also taken concrete actions to comply with them:

- Ramsar Convention, 1971 (Approval by India in 1982)[17]
- Montreal Protocol, 1987 (Approval by India in 1992)
- Kyoto Protocol, 1997 (Approval by India in 2002)
- Minamata Convention on Mercury, 2013 (Approval by India in 2018)
- Stockholm Convention, 2001 (Approval by India in 2006)
- UNFCCC, 1992(Approval by India in 1993)
- UNCDD, 1992 (Approval by India in 1996)

India's Policy Actions to Combat Climate Change

India has been an active participant in forums like the IPCC (established in 1988) and the UNFCCC (established in 1992). It has played a vocal role across the various Conferences of the Parties (COP), championing the cause of climate action. In compliance with the decisions taken at COP 19 and COP 20, India submitted its initial "Nationally Determined Contributions" (INDC) targets on October 2, 2015, which primarily included.[18]

- To promote a healthy and sustainable way of living based on traditions and values of conservation and moderation.
- To adopt a climate-friendly and cleaner path than the one followed by others at matching levels of economic development.
- To reduce the emissions intensity of its GDP by 33% to 35% by 2030 from the 2005 level.

- To achieve about 40% cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030.
- To create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030.
- To better adapt to climate change by enhancing investments in development programs in vulnerable sectors (agriculture, water resources, Himalayan region, coastal regions, health, and disaster management).
- To mobilize domestic and new/additional funds from developed countries to implement mitigation and adaptation actions.
- To build capacities and create a domestic framework for the rapid diffusion of cutting-edge climate technology.

✧ **Recalibrated "Nationally Determined Contributions" (INDC 2031-2035)**

According to the updated NDC communicated to the UNFCCC, India has enhanced its climate targets.[19]

- **Emissions Intensity:** India aims to reduce the emissions intensity of its GDP by 47% by 2035 from the 2005 level.
- **Non-Fossil Energy:** To achieve about 60 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2035.
- **Mission LiFE:** To forward and propagate healthy and sustainable ways of living based on traditions, conservation, and moderation, utilizing the mass movement 'LiFE' – 'Lifestyle for Environment' as a key to tackling climate change.
- **Carbon Sink:** To create a carbon sink of 3.5 to 4.0 billion tonnes of CO2 equivalent through afforestation and enhanced forest cover by the year 2035.
- **Net Zero Target:** To firmly achieve the target of Net Zero (zero carbon emissions) by 2070.

✧ **Progress StatusReport on Nationally Determined Contributions**

India is playing a leading role globally in tackling climate change, making remarkable progress toward its Paris Agreement goals.[20]

- As of June 2025, India's total installed power capacity reached approximately 484.8 GW, out of which 242.8 GW capacity was sourced from non-fossil fuel sources.
- By February 2026, the share of non-fossil sources in India's total installed power capacity successfully reached approximately 52.6%.[21]
- India registered a reduction of more than 36% in its emission intensity by 2023 compared to 2005 levels, consistently outpacing its baseline timeline toward 2030.
- Through 'Mission LiFE', eco-friendly lifestyles have been effectively turned into a popular mass movement, receiving widespread global support.
- Through the National Green Hydrogen Mission, India is taking decisive steps toward building a clean energy economy.

Furthermore, India has prominently raised issues of climate finance, technology transfer, and climate justice at the COP-28 and COP-29 conferences. To accelerate the energy transition, the country is actively running several programs like the National Solar Mission, PM-KUSUM scheme, energy efficiency programs, and electric vehicle policies.

Conclusion

India is not only moving ahead fast toward achieving its national targets but is also playing a responsible and leadership role in global climate governance. As an active, positive contributor to global efforts to limit the adverse consequences of climate change, India's constructive endeavors continue consistently. It is highly anticipated that the outcomes of these continuous efforts will bring welfare not just to India, but to the entirety of human civilization.

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