3 Environmental Governance and Sustainability Challenges in India

Dr. Debansu Chatterjee[1], Dr. Debasri Dey[2*], Dr. Moumita Saha[3], Dr. Manish Mittal[4] & Ms. Simran Sheikh[5]

[1]Associate Professor, Department of Business Administration, Swami Vivekananda Institute of Modern Science, Makaut

[2,3]Associate Professor, Department of Management, Brainware University

[4]Assistant Professor, Department of Management, Brainware University

[5]Assistant Professor, Department of Business Administration, Swami Vivekananda Institute of Modern Science, Makaut

*Corresponding Author: debasri4student@gmail.com

Abstract

Environmental degradation has emerged as one of the most critical challenges confronting India in the twenty-first century. Rapid industrialization, urbanization, and population growth have exerted unprecedented pressure on natural resources, leading to air and water pollution, deforestation, biodiversity loss, and climate change impacts (IPCC, 2021; UNEP, 2022). This chapter examines the major environmental challenges in India and evaluates the constitutional, legal, and policy frameworks designed to address them. Drawing upon recent literature (2020–2025), the chapter highlights gaps in policy implementation, weak enforcement mechanisms, and limited public participation (MoEFCC, 2022). It further explores case studies such as air pollution in Delhi and river pollution in the Ganga basin to illustrate real-world implications. The chapter argues for a multidimensional and integrated approach to environmental governance, combining institutional strengthening, technological innovation, and community engagement. It concludes that sustainable environmental management in India requires collaborative efforts among government, industry, and civil society to achieve long-term ecological balance and inclusive development (World Bank, 2023).

Keywords: Climate Change, Environmental Degradation, Governance, Sustainability, Urbanization.

Introduction

The global community is increasingly witnessing the adverse consequences of climate change, alongside a range of environmental challenges that continue to threaten ecosystems worldwide (IPCC, 2021). The environment is not merely a

shared resource but a vital heritage of humanity that must be preserved for present and future generations (UNEP, 2022). The conservation, protection, and sustainable management of environmental resources have therefore become critical global priorities. The human environment, consisting of both physical and biological components, is significantly affected by factors such as rapid industrialization, urban expansion, population growth, overexploitation of natural resources, ecological imbalances, and the loss of biodiversity. Collectively, these forces have accelerated the process of environmental degradation (World Bank, 2023).

A major milestone in the global environmental movement was the Stockholm Declaration of 1972, which represented the first coordinated international effort to address environmental protection and promote sustainable development (UNEP, 2022). This declaration encouraged nations, including India, to adopt legislative and policy measures to improve environmental conditions. In response, India incorporated environmental protection into its constitutional framework through the 42nd Amendment Act of 1976, introducing Articles 48A and 51A. Article 48A directs the state to take necessary steps for protecting and improving the environment, as well as safeguarding forests and wildlife, while Article 51A(g) imposes a fundamental duty on citizens to protect and preserve the natural environment (Government of India, 1976).

To further strengthen environmental governance, India established the National Council for Environmental Policy and Planning in 1972 under the Department of Science and Technology. Influenced by international developments, particularly the Stockholm Declaration, this body later evolved into the Ministry of Environment and Forests in 1985, now known as the Ministry of Environment, Forest and Climate Change (MoEFCC). This institution serves as the apex authority responsible for formulating and implementing environmental policies in the country (MoEFCC, 2022). Over time, the Indian government has developed a comprehensive legal and institutional framework aligned with global environmental standards and principles of sustainable development.

The Indian Constitution clearly underscores the shared responsibility of both the state and its citizens in environmental protection. The state is entrusted with the duty of conserving natural resources, including forests, rivers, wildlife, and biodiversity, while citizens are expected to actively contribute to preserving and enhancing the environment. Through legislative initiatives, institutional mechanisms, and growing public awareness, India continues to strengthen its commitment to environmental sustainability. However, the increasing intensity of climate change and environmental degradation highlights the urgent need for more effective implementation, stronger governance, and collective action to ensure ecological balance and long-term sustainable development (IPCC, 2021).

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Conceptual Framework of Environmental Governance

Environmental governance refers to the system of rules, practices, policies, and institutions through which environmental resources are managed, protected, and regulated (UNEP, 2022). It encompasses a wide spectrum of mechanisms, including legislative frameworks, administrative structures, market-based instruments, and participatory approaches that collectively aim to address environmental challenges. In essence, environmental governance integrates ecological concerns into decision-making processes at local, national, and global levels.

The concept has evolved significantly over time, moving beyond traditional state-centric regulation to include a broader range of stakeholders such as private sector entities, non-governmental organizations (NGOs), civil society groups, and local communities. This shift reflects the growing recognition that environmental issues are complex, transboundary, and multidimensional, requiring collaborative and inclusive governance approaches (OECD, 2020).

In the Indian context, environmental governance is shaped by constitutional mandates, statutory provisions, judicial interventions, and international commitments. Institutions such as the Ministry of Environment, Forest and Climate Change (MoEFCC), Central Pollution Control Board (CPCB), and National Green Tribunal (NGT) play crucial roles in implementing environmental policies (MoEFCC, 2022). Additionally, public participation and judicial activism, particularly through Public Interest Litigations (PILs), have significantly strengthened environmental accountability and transparency.

Environmental governance also involves balancing economic development with ecological sustainability. As developing economies like India strive for growth, the challenge lies in ensuring that developmental activities do not compromise environmental integrity. Therefore, the conceptual framework of environmental governance is closely linked with the broader paradigm of sustainable development (WCED, 1987).

- **Principles of Environmental Governance:** The foundation of environmental governance is built upon several key principles that guide policy formulation, legal frameworks, and decision-making processes. These principles are widely recognized in international environmental law and have been incorporated into national legal systems, including India.
- **Precautionary Principle:** The precautionary principle emphasizes the need to take preventive action in the face of environmental uncertainty. It suggests that the absence of complete scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (IPCC, 2021). This principle is particularly relevant in addressing emerging environmental risks such as climate change, biodiversity loss, and pollution.

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In India, the judiciary has actively applied this principle in environmental cases to ensure proactive environmental protection.

- **Polluter Pays Principle:** The polluter pays principle holds that those who cause environmental damage should bear the costs of managing and mitigating that damage (OECD, 2020). This principle promotes accountability and encourages industries and individuals to adopt environmentally responsible practices. It is widely used in environmental regulation to impose penalties, compensation, and remediation costs on polluters. In India, this principle has been reinforced through judicial decisions and environmental legislation.
- **Intergenerational Equity:** Intergenerational equity is based on the idea that present generations have a responsibility to preserve the environment for future generations (WCED, 1987). It emphasizes the sustainable use of natural resources so that ecological balance is maintained over time. This principle is closely linked with sustainable development and has been recognized in various international declarations and national policies.
- **Sustainable Development:** Sustainable development is a core principle of environmental governance, focusing on meeting present needs without compromising the ability of future generations to meet their own needs (WCED, 1987). It requires the integration of environmental, economic, and social considerations into development planning. In India, sustainable development has been incorporated into policy frameworks and judicial interpretations, particularly under Article 21 of the Constitution.
- **Public Participation:** Public participation is a critical component of effective environmental governance. It ensures that citizens, communities, and stakeholders have a voice in environmental decision-making processes (UNEP, 2022). Participation enhances transparency, accountability, and inclusiveness, leading to more effective and equitable environmental outcomes. Mechanisms such as public hearings, environmental impact assessments (EIA), and community-based resource management reflect this principle in practice.
- **Closing Note for this Section:** These principles collectively form the backbone of environmental governance systems worldwide. In India, their increasing integration into legal frameworks, policy initiatives, and judicial interpretations reflects a growing commitment to sustainable and inclusive environmental management. However, effective implementation of these principles remains a challenge, requiring stronger institutional capacity, public awareness, and enforcement mechanisms (MoEFCC, 2022).

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Constitutional and Legal Framework in India

India has developed a strong constitutional and legal framework for environmental protection, reflecting its commitment to sustainable development and ecological conservation (MoEFCC, 2022). This framework integrates constitutional provisions, statutory laws, and judicial interventions to address environmental challenges.

- **Constitutional Provisions:** The Indian Constitution provides a solid foundation for environmental governance through the following provisions:
  - **Article 48A:** Directs the state to protect and improve the environment and safeguard forests and wildlife (Government of India, 1976)
  - **Article 51A(g):** Imposes a fundamental duty on citizens to protect and preserve the natural environment (Government of India, 1976)
  - **Article 21:** Guarantees the right to life, which has been judicially interpreted to include the right to a clean and healthy environment
  - **Article 47:** Emphasizes the duty of the state to improve public health

These provisions collectively highlight the shared responsibility of the state and citizens in environmental protection (MoEFCC, 2022).

- **Major Environmental Legislations:** India has enacted several key environmental laws to regulate pollution and conserve natural resources:

Act	Year	Objective
Environment Protection Act	1986	Overall environmental protection
Water Act	1974	Water pollution control
Air Act	1981	Air pollution control
Wildlife Protection Act	1972	Biodiversity conservation
Biological Diversity Act	2002	Sustainable biodiversity use
NGT Act	2010	Environmental justice

These legislations form the backbone of India's environmental regulatory framework and are supported by institutional mechanisms for enforcement (MoEFCC, 2022).

Major Environmental Challenges in India

India is currently facing a wide range of environmental challenges that pose serious threats to ecological balance, public health, and sustainable development. These challenges are largely driven by rapid industrialization, urbanization, population growth, and unsustainable resource utilization (World Bank, 2023). The complexity and interlinkages among these issues further intensify their impact, making environmental governance a critical necessity.

- **Air Pollution:** Air pollution has emerged as one of the most critical environmental problems in India, particularly in urban and industrial regions.

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Major sources of air pollution include vehicular emissions, industrial discharges, construction activities, burning of fossil fuels, and agricultural practices such as stubble burning. Additionally, the use of biomass fuels for cooking in rural areas contributes significantly to indoor air pollution.

India is home to several of the world's most polluted cities, where particulate matter (PM2.5 and PM10) levels frequently exceed safe limits (WHO, 2023). The consequences of poor air quality are severe, leading to respiratory diseases such as asthma, bronchitis, and chronic obstructive pulmonary disease (COPD), as well as cardiovascular disorders and premature deaths (Kumar & Singh, 2022). Children and the elderly are particularly vulnerable to the adverse effects of air pollution.

Furthermore, air pollution has broader environmental implications, including acid rain, reduced agricultural productivity, and contribution to global climate change (IPCC, 2021). Despite initiatives such as the National Clean Air Programme (NCAP), challenges such as weak enforcement, lack of coordination among agencies, and insufficient monitoring systems continue to hinder effective mitigation (MoEFCC, 2022).

- **Water Pollution:** Water pollution is another major environmental concern in India, affecting both surface and groundwater resources. Rivers, lakes, and other water bodies are heavily polluted due to the discharge of untreated industrial effluents, domestic sewage, and agricultural runoff containing fertilizers and pesticides (World Bank, 2010).

Major rivers such as the Ganga and Yamuna are severely contaminated, posing serious risks to human health and aquatic ecosystems (Gupta & Pahl-Wostl, 2020). Contaminated water leads to waterborne diseases such as cholera, dysentery, and typhoid, which remain prevalent in many parts of the country.

Groundwater contamination due to excessive use of chemicals and improper waste disposal further exacerbates the problem. In rural areas, lack of access to clean drinking water remains a significant challenge. Although initiatives like the Namami Gange Programme and Jal Jeevan Mission aim to improve water quality and accessibility, issues related to implementation and infrastructure gaps persist (UNEP, 2022).

- **Deforestation and Biodiversity Loss:** Deforestation and biodiversity loss are critical environmental issues resulting from human activities such as agricultural expansion, urban development, mining, and infrastructure projects. Forests play a vital role in maintaining ecological balance, regulating climate, conserving biodiversity, and supporting livelihoods.

The loss of forest cover leads to habitat destruction, threatening the survival of numerous plant and animal species (Verma & Raghubanshi, 2020). India, being one of the world's biodiversity hotspots, is particularly vulnerable to species

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extinction. The decline in biodiversity not only affects ecological stability but also disrupts ecosystem services such as pollination, water purification, and carbon sequestration.

Illegal logging, encroachment, and shifting cultivation practices further contribute to deforestation. Although conservation efforts such as the Wildlife Protection Act (1972) and initiatives like Project Tiger have shown positive results, challenges such as human-wildlife conflict and habitat fragmentation continue to persist (MoEFCC, 2022).

- **Climate Change:** Climate change represents a long-term and pervasive environmental challenge with far-reaching consequences. India is highly vulnerable to climate change due to its diverse geography and dependence on climate-sensitive sectors such as agriculture (IPCC, 2021).

The impacts of climate change in India include rising temperatures, erratic monsoon patterns, melting glaciers, sea-level rise, and increased frequency of extreme weather events such as floods, droughts, and cyclones. These changes have significant implications for food security, water availability, and livelihoods, particularly for vulnerable populations (Singh & Chaturvedi, 2021).

Agriculture, which employs a large portion of the population, is especially affected by climate variability. Changes in rainfall patterns and temperature can reduce crop yields and increase the risk of crop failure. Coastal regions are also at risk due to rising sea levels and increased salinity.

India has taken several steps to address climate change through policies such as the National Action Plan on Climate Change (NAPCC). However, the scale and complexity of the problem require stronger mitigation and adaptation strategies (Government of India, 2008).

- **Waste Management:** The rapid pace of urbanization and industrialization has led to a significant increase in waste generation in India. Municipal solid waste, plastic waste, electronic waste (e-waste), and biomedical waste pose serious environmental and health risks when not managed properly (Sharma & Kumar, 2023).

In many cities, waste management systems are inadequate, leading to open dumping, landfill overflows, and improper disposal practices. Plastic waste, in particular, has become a major concern due to its non-biodegradable nature and harmful impact on ecosystems, especially marine life.

E-waste is another emerging challenge, driven by increasing consumption of electronic devices. Improper recycling and disposal of e-waste release toxic substances such as lead, mercury, and cadmium into the environment.

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The government has introduced various rules and initiatives, such as the Solid Waste Management Rules (2016) and Plastic Waste Management Rules, to address these issues. However, effective implementation, public awareness, and infrastructure development remain key challenges (MoEFCC, 2022).

- **Land Degradation:** Land degradation is a significant environmental problem affecting agricultural productivity and food security in India. It is caused by factors such as soil erosion, deforestation, overgrazing, excessive use of chemical fertilizers, and unsustainable agricultural practices (FAO, 2021).

Desertification, particularly in arid and semi-arid regions, further exacerbates land degradation. Loss of soil fertility reduces crop yields and increases vulnerability to food shortages. Additionally, land degradation contributes to poverty and rural distress by affecting livelihoods dependent on agriculture.

Waterlogging, salinization, and mining activities also contribute to the degradation of land resources. Addressing land degradation requires sustainable land management practices, afforestation, and soil conservation measures.

These environmental challenges are deeply interconnected and require a comprehensive and integrated approach for effective management. Addressing them necessitates strong policy implementation, technological innovation, institutional coordination, and active public participation (UNEP, 2022). Without timely and effective intervention, these issues could significantly hinder India's path toward sustainable development (World Bank, 2023).

Case Studies

Case studies provide practical insights into the complexities of environmental challenges and the effectiveness of policy interventions. In the Indian context, issues such as air pollution and river pollution illustrate the multifaceted nature of environmental degradation and governance challenges (MoEFCC, 2022).

- **Air Pollution in Delhi:** Delhi, the capital city of India, is frequently ranked among the most polluted cities in the world (WHO, 2023). The city's air quality deteriorates significantly, particularly during the winter months, when meteorological conditions such as low wind speed and temperature inversion trap pollutants close to the ground.

The primary sources of air pollution in Delhi include vehicular emissions, industrial activities, construction dust, and the burning of fossil fuels. Additionally, seasonal agricultural practices, particularly stubble burning in neighboring states such as Punjab and Haryana, contribute significantly to the spike in particulate matter levels (Kumar & Singh, 2022). The concentration of fine particulate matter (PM2.5) often exceeds permissible limits set by national and international agencies, posing severe health risks.

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The health impacts of air pollution in Delhi are profound. Residents are exposed to increased risks of respiratory illnesses, cardiovascular diseases, lung cancer, and premature mortality (WHO, 2023). Vulnerable groups such as children, the elderly, and individuals with pre-existing health conditions are particularly affected.

To address this crisis, several measures have been implemented, including the Odd-Even vehicle scheme, promotion of electric vehicles, expansion of public transport, and the Graded Response Action Plan (GRAP) (MoEFCC, 2022). However, these measures have yielded limited success due to fragmented implementation, lack of regional coordination, and inadequate enforcement.

This case highlights the need for an integrated, multi-sectoral approach involving coordination among different states, stricter emission norms, and long-term sustainable urban planning (World Bank, 2023).

- **Ganga River Pollution:** The Ganga River, one of the most sacred and economically significant rivers in India, is facing severe pollution challenges. It supports millions of people by providing water for drinking, agriculture, and industry, yet it remains heavily contaminated (World Bank, 2010).

The primary sources of pollution in the Ganga include untreated domestic sewage, industrial effluents, agricultural runoff, and religious activities (Gupta & Pahl-Wostl, 2020). Rapid urbanization along the riverbanks has increased the volume of waste discharged into the river, overwhelming existing treatment infrastructure.

Despite the launch of ambitious initiatives such as the Namami Gange Programme, which aims to rejuvenate the river through improved sewage treatment, riverfront development, and afforestation, progress has been uneven (MoEFCC, 2022). While some improvements have been observed in specific stretches, overall water quality remains below acceptable standards in many areas.

Institutional challenges, including inadequate coordination among central, state, and local authorities, delays in project implementation, and insufficient monitoring, have limited the effectiveness of these initiatives.

The Ganga case study underscores the importance of integrated river basin management, technological innovation in wastewater treatment, and active community participation in achieving sustainable outcomes (UNEP, 2022).

Government Policies and Initiatives

The Government of India has introduced a range of policies and programs to address environmental challenges and promote sustainable development. These initiatives aim to balance economic growth with ecological conservation (Government of India, 2008).

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- **National Action Plan on Climate Change (NAPCC):** The National Action Plan on Climate Change (NAPCC) is a comprehensive policy framework aimed at addressing climate change through both mitigation and adaptation strategies (Government of India, 2008). It comprises eight national missions, including the National Solar Mission, National Water Mission, and National Mission for Sustainable Agriculture.

The plan emphasizes the promotion of renewable energy, energy efficiency, water conservation, and climate-resilient agriculture. While significant progress has been made in expanding solar energy capacity, challenges remain in terms of financing, technology adoption, and implementation at the grassroots level (IPCC, 2021).

- **National Clean Air Programme (NCAP):** The National Clean Air Programme (NCAP) was launched to reduce air pollution levels in major cities across India (MoEFCC, 2022). It focuses on improving air quality monitoring, strengthening regulatory frameworks, and promoting cleaner technologies.

The program aims to achieve a significant reduction in particulate matter concentrations over a defined period. However, its success depends on effective coordination among multiple agencies, adequate funding, and strict enforcement of pollution control measures (WHO, 2023).

- **Swachh Bharat Mission:** The Swachh Bharat Mission is a nationwide campaign aimed at improving sanitation, waste management, and cleanliness (Government of India, 2014). It has made significant progress in increasing access to toilets and reducing open defecation.

In urban areas, the mission also focuses on solid waste management, including segregation, collection, and disposal. Despite these achievements, challenges such as waste segregation at source, recycling infrastructure, and behavioral change remain critical (Sharma & Kumar, 2023).

- **Biodiversity Conservation Programs:** India has implemented several biodiversity conservation initiatives, including Project Tiger and Project Elephant, to protect endangered species and their habitats (MoEFCC, 2022). These programs have contributed to an increase in wildlife populations and improved conservation awareness.

Additionally, legal frameworks such as the Wildlife Protection Act (1972) and the Biological Diversity Act (2002) support conservation efforts. However, issues such as habitat fragmentation, human-wildlife conflict, and illegal poaching continue to pose challenges (Verma & Raghubanshi, 2020).

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Institutional Mechanisms

Environmental governance in India is supported by a network of institutions responsible for policy formulation, implementation, monitoring, and enforcement:

- **Ministry of Environment, Forest and Climate Change (MoEFCC):** Apex body for environmental policy (MoEFCC, 2022)
- **Central Pollution Control Board (CPCB):** Monitors and regulates pollution at the national level
- **State Pollution Control Boards (SPCBs):** Implement pollution control measures at the state level
- **National Green Tribunal (NGT):** Provides a specialized forum for environmental dispute resolution

These institutions play a vital role in environmental management. However, challenges such as overlapping responsibilities, limited resources, bureaucratic inefficiencies, and lack of coordination often reduce their effectiveness (UNEP, 2022).

Challenges In Environmental Governance

Despite the existence of a comprehensive framework, environmental governance in India faces several persistent challenges:

- **Weak Enforcement of Laws:** Inadequate monitoring and accountability (MoEFCC, 2022)
- **Lack of Public Awareness:** Limits citizen participation (UNEP, 2022)
- **Institutional Inefficiencies:** Bureaucratic delays hinder implementation
- **Limited Financial and Technical Resources:** Constrain environmental initiatives
- **Policy Implementation Gaps:** Disconnect between policy and execution

These challenges highlight the need for systemic reforms and capacity building (World Bank, 2023).

- **Strategies for Sustainable Environmental Management:** Achieving sustainable environmental management requires a comprehensive and integrated approach involving multiple stakeholders:
  - **Strengthening Institutional Frameworks:** Improving coordination and capacity (MoEFCC, 2022)
  - **Promoting Renewable Energy:** Reducing dependence on fossil fuels (IPCC, 2021)
  - **Encouraging Public Participation:** Enhancing accountability (UNEP, 2022)

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- **Enhancing Environmental Education:** Building awareness and responsibility
- **Adopting Green Technologies:** Supporting sustainable innovation
- **Improving Monitoring Systems:** Using advanced technologies for data-driven governance

A holistic and participatory approach is essential to address environmental challenges effectively and ensure long-term sustainability (World Bank, 2023).

Conclusion

Environmental sustainability is a fundamental prerequisite for achieving long-term economic growth, social well-being, and ecological balance. In a country like India, where rapid industrialization and population growth place immense pressure on natural resources, the need for sustainable environmental management becomes even more critical. Over the years, India has developed a comprehensive legal, constitutional, and policy framework aimed at addressing environmental challenges. Provisions within the Constitution, along with key legislations and national initiatives, reflect a strong commitment to environmental protection and sustainable development.

However, despite the existence of these robust frameworks, significant challenges persist in their effective implementation. Weak enforcement of environmental laws, inadequate institutional coordination, limited financial and technical resources, and gaps between policy formulation and ground-level execution continue to undermine environmental governance. Additionally, issues such as lack of public awareness, insufficient community participation, and competing developmental priorities further complicate the situation.

To effectively address these challenges, a collaborative and integrated approach is essential. Environmental sustainability cannot be achieved through isolated efforts; rather, it requires coordinated action across multiple sectors and stakeholders. The government must strengthen regulatory mechanisms, ensure strict enforcement of environmental laws, and promote transparency and accountability in governance. At the same time, industries must adopt environmentally responsible practices, invest in cleaner technologies, and adhere to sustainable production methods.

Equally important is the role of civil society and local communities in environmental conservation. Public participation, awareness, and behavioral change are critical components of sustainable environmental management. Educational institutions and media also have a vital role in promoting environmental consciousness and fostering a culture of sustainability.

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Furthermore, the integration of technological innovation with environmental governance can significantly enhance monitoring, resource management, and policy implementation. The use of data-driven approaches, renewable energy technologies, and sustainable infrastructure can contribute to reducing environmental degradation while supporting economic growth.

In conclusion, achieving sustainable development in India requires a balanced and holistic approach that harmonizes economic advancement with environmental protection. It demands the collective responsibility and active participation of government, industry, and society. Only through sustained efforts, strong institutional frameworks, and inclusive governance can India ensure environmental sustainability for present and future generations, thereby fulfilling its commitment to global environmental goals and intergenerational equity.

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