Policy and Practice in Climate Change and Biodiversity Conservation

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CONTENTS

PREFACE

The Earth's biodiversity is a veritable gold mine, with innumerable interactions among living things sustaining human existence and benefiting civilization on a physical, cultural, recreational, and spiritual level. Some of the most important advantages, including access to clean water and food sources, as well as the control of diseases, pests and the climate, are at risk due to biodiversity loss. Biodiversity is impacted by a variety of climate change related factors, including rising temperature, shifting rainfall patterns, and extreme weather events. The significant and concerning rise in atmospheric carbon dioxide concentrations exacerbates the effects of climate change. In response to continuous climate change, many terrestrial, freshwater, and marine animals have changed their geographic ranges, seasonal activities, migration patterns, abundances and interactions with other species. It is imperative that the global community will make constant, coordinated efforts to countervail both climate change and the loss of biodiversity. At international and national levels, the response of policy to the reduction in biodiversity has been insufficient thus far. Targets on pollution, fragile ecosystems, species conservation and repairing damaged ecosystems where ongoing pressures and other problems have impeded progress have presented unique challenges on a global scale. Therefore, in order to implement practical and workable mitigation strategies, it is insistent that economic, political and societal norms be transformed. This includes international trade regulations, subsidies and incentives, as well as confirmation of the direction and effectiveness of interventions. Additionally, a significant shift in public opinion and lifestyles must be made. The book, '**Policy and Practice in Climate Change and Biodiversity Conservation'** adumbrated about climate change, global warming, emerging diseases, biodiversity conservation and practical policy imperatives for mitigating climate change impacts sustainably at grass root level. Positive feedback and insightful recommendations are appreciated.

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CHAPTER 1

CONSERVING BIODIVERSITY: A NOVEL APPROACH TOWARDS SUSTAINABLE DEVELOPMENT

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Abstract

Biodiversity conservation recognizes the interdependence of human wellbeing and ecological health. By integrating conservation into various sectors, a sustainable future can be created in harmony with nature, ensuring long-term prosperity of life on earth. Conserving biodiversity is crucial in maintaining ecosystem services that support ecological balance and sustainable development. Green infrastructure can create resilient urban environments by incorporating natural elements into city planning and design. Sustainable agricultural practices lead to ecosystem balance, long-term food security and environmental sustainability. Conservation efforts become more relevant by involving communities in decision-making and fostering a sense of ownership. Protected areas and ecological corridors balance the needs of the ecosystem ensuring a sustainable future. Technological innovations offer more accurate data collection, informed decision-making and effective strategies to safeguard the planet's natural heritage. The benefits of bioprospecting shared among stakeholders, contribute to both conservation and social well-being. Incentive mechanisms demand active participation and commitment from various stakeholders. Education and awareness efforts have its own role in creating a culture of conservation among human beings. Global collaboration recognizes the interconnectedness of ecosystems and enhances the effectiveness of conservation policies.

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Keywords: *Biodiversity, Ecosystem, Benefit Sharing, Resilience, Bioprospecting*

Introduction

Biodiversity plays a vital role in maintaining ecosystem stability, resilience and functionality and is directly linked to the economic, social and environmental components of sustainability (Niesenbaum, 2019). It promotes ecosystem services and functions provided by biodiversity that benefit humans, the connection between biodiversity and poverty reduction, biodiverse agriculture, issues surrounding indigenous knowledge and the development of indicators for biodiversity assessment. However, this diversity is increasingly threatened by anthropogenic activities such as urbanization, deforestation, crop land expansion and climate change such leading to habitat and species loss currently at a rate up to 1000 times the background rate of extinction (De Vos *et al.,* 2015).

Ecosystem services

Ecosystem services are defined as all the benefits that nature provides to humans and it plays a vital role in maintaining ecological balance and supporting life (Lindenmayer, 2000). Pollinators such as bees, butterflies, birds and bats facilitate the task of pollinating flowering plants, including both cash crops and food crops. Ecosystems provide shelter and life to these pollinators and their absence gradually compromises the production of fruits, vegetables, and nuts, impacting food security and agricultural economics. It also improves air and water quality by removing pollutants and absorbing excess nutrients, making them safe for human consumption and supporting a healthier environment.

Terrestrial and marine ecosystems mitigate the effects of climate change as plants can incorporate carbon dioxide with photosynthetic pathways. They also interfere with the overall stability of weather systems, especially temperature regulation and precipitation patterns. The wetlands and mangroves are buffers that can absorb excess precipitation, thereby reducing the risk of flooding and giving protection to coastal communities from erosion/tidal prone areas. Biodiversity contributes to nutrient cycling by decomposing organic matter and making nutrients like nitrogen, phosphorus, and potassium available to plants. This process sustains soil productivity and supports agricultural activities.

Conserving biodiversity is pivotal as many of the plants are potential sources of compounds with medicinal properties, it forms the base for indigenous and traditional knowledge, it maintains cultural heritage, and it provides aesthetic value and space for recreation and spiritual connection. Biomass production, including forest products and marine wealth, supports industries, livelihoods and economics around the world to a great extent. Pest populations can be checked by predation and competition which reduces the need for chemical pesticides and also contributes to sustainable agricultural practices. Genetic variation among species helps to develop resilient crops, livestock and other organisms, which can adapt better to environmental fluctuations. The rapid decline in biodiversity poses a severe threat to ecosystem functions and services (Cardinale, 2011). There is great need for scientifically validated information on trends, and service of biodiversity and on identifying priorities and recommendations for biodiversity protection (Larigauderie and Mooney, 2010).

Green Infrastructure

The range of impact on green infrastructure varies from the design and management of nearby built lots to human behaviours and uses that degrade natural areas (Hostetler and Drake, 2009). Green infrastructure is an innovative approach which recognizes the significance of biodiversity in addressing strategic planning, design and implementation of natural features. Parks, green roofs, street trees and urban wetlands provide habitats and interconnected networks of these spaces facilitate the movement of species between different areas. Incorporation of native plants adapted to the local ecosystem enhances biological richness. Pollinator-friendly plants attract bees, butterflies and other insects, contributing to overall ecosystem health. Permeable pavements, bioswales and retention ponds help manage stormwater runoff which can reduce flooding, erosion and water pollution. Vegetation covers filters and absorbs pollutants, leading to improved air quality in urban areas. Trees and vegetation in green infrastructure helps in cooling urban areas, mitigating the heat island effect and enhancing climate resilience.

Green spaces offer aesthetic and recreational value and foster a connection to biodiversity by interactions. Vegetation cover can act as buffers, reducing noise and visual pollution, creating more pleasant urban environments. Green infrastructure projects give opportunities to community members in their planning and maintenance and fostering a sense of

effective conservation efforts. Well-designed green infrastructure develops tourism and business, increases property values and long-term economic benefits. Preservation of green spaces is recommended for wildlife and maintaining biodiversity hotspots.

Sustainable agriculture

Sustainable agriculture overcomes the challenges posed by traditional agriculture and ensures food security, livelihoods and environmental stewardship. Agroecology emphasizes crop diversification, intercropping, the integration of trees and other vegetation promotes farming practices imitating natural ecosystems. Unpredictable climatic conditions pose a number of problems for farmers such as increased drought and longer dry seasons, greater intensity of rain in wet seasons and overall warmer temperatures (Manandhar, 2011). Adaptation of farming practices to these changes must be a priority including crop diversification and the development of new varieties. Crop diversity can make crops more resilient to pests, diseases and changing climate. Native areas act as refuges for species, including pollinators and natural predators of pests.

Limiting the use of synthetic fertilizers and pesticides and encouraging integrated pest management practices reduces the negative impacts of agricultural chemicals on both target and non-target species. Reduced or no-tillage practices maintain soil structure, which benefits soil dwelling organisms and supports healthy ecosystems. Efficient irrigation practices conserve water resources, reducing stress on aquatic ecosystems and water-dependent species. Integration of indigenous and traditional farming practices into modern agriculture enhances a deep understanding of local ecosystems. Various certification programmes and ongoing research promotes sustainable farming practices considering environmental impacts.

Community involvement

Indigenous and local communities hold valuable knowledge about their ecosystems, perspectives and stewardship practices that greatly contribute to effective conservation efforts and cultural preservation. They develop a sense of ownership and responsibility for the natural resources in their vicinity. Working with indigenous communities to help them explore historical and contemporary land use and territory in conjunction with documenting their vast historical and cultural knowledge has helped both support those communities and the conservation of biodiversity (Agarwal,

1995). By involving stakeholders in decision-making, communities help address potential conflicts between conservation goals and local resource use. Involving communities empowers individuals and groups to participate in decision making processes that affect their environment. It provides opportunities for education and raising awareness about biodiversity and its significance. Many indigenous and local cultures are closely tied to the land based on cultural practices, languages and traditions. Collaborating with local communities fosters partnerships that can leverage their resources for effective conservation outcomes. Ecotourism and sustainable resource management can generate income for local communities, encouraging them to protect biodiversity. Including marginalized groups in conservation initiatives ensures that their voices are heard and needs are addressed. Collaborative conservation efforts can foster social cohesion within communities, leading to stronger bonds and shared goals. Community involvement builds a foundation for long-term conservation efforts that outlast external interventions.

Protected areas and corridors

Nature is considered as sacred and human as intruders which led to a dominant approach to conservation that established protected areas from which people were excluded or displaced (Hutton *et al.,* 2005). Establishment of protected areas and corridors is a fundamental strategy to safeguard ecosystems, genetic and species level diversity. These areas serve as havens for undisturbed establishment of diverse natural populations, allowing new species to thrive and lost ecosystems to recover. They are designated to conserve specific habitats and provide refuge for a wide range of flora and fauna, including RET species. It is assumed that an area with high habitat quality can better support biodiversity at all levels, and that a decline in habitat quality will lead to decreases in sustainability and resilience. (Saidi and Spray, 2018). Protected areas mainly focus on conserving species which are critically endangered, maintaining viable populations and promoting genetic diversity within species. They also contribute to essential ecosystem services like clean air and water, climate regulation, pollination and soil fertility, critical for sustainable development.

Biodiversity hotspots are the prime protective areas with species richness and are at high risk of habitat loss. Many protected areas harbour endemic species, especially vulnerable to extinction and protecting their habitats is crucial for their survival. By allowing degraded habitats to regenerate naturally, protected areas contribute to rehabilitation of ecosystems and the

species they support. They offer insights into natural processes, biodiversity dynamics, and ecosystem functioning, as well as opportunities for public awareness and education. They can be linked through ecological corridors - strips of habitat that connect isolated areas, promoting genetic diversity among populations. These areas allow species that are displaced by the impacts of climate change to migrate and adapt to changing environmental conditions. Well-managed protected areas can support sustainable tourism, raise funds for conservation initiatives and maintain collaboration between governments, NGOs and communities, facilitating the exchange of knowledge and resources for better conservation outcomes.

Incentive mechanisms

Incentive mechanisms provide concrete benefits to those who participate in conservation efforts, fostering a sense of ownership and stewardship. Payment for ecosystems provide financial incentives to landowners or communities in exchange for specific ecosystem services, such as habitat preservation, water quality improvement or carbon sequestration. This approach helps bridge the gap between the public benefits of ecosystems and the costs of conservation, encouraging sustainable land management practices. Developing ecotourism activities in or near protected areas can generate revenue for local communities; a portion of these funds can be reinvested in conservation initiatives. Biodiversity offset programmes allow developers to compensate for the environmental impact of their projects by investing in conservation efforts. Landowners can enter into agreements with conservation organizations or governments to protect biodiversity on their properties in exchange of financial incentives, technical support, or legal assurances. Sustainable practices in agriculture, forestry and other sectors can be rewarded through certification programs (eg., organic, fair trade) as these labels indicate that the products were produced eco-friendly. Carbon trading mechanisms, such as carbon credits can incentivize landowners to adopt practices that enhance carbon sequestration. Contributions of indigenous communities through fair benefit-sharing agreements can be rewarded by economic incentives for preserving traditional knowledge and practices. Auctions can be organized to allocate funds to conservation projects and governments can offer tax benefits or deductions to individuals or organizations that contribute to biodiversity conservation. Corporate businesses can demonstrate their commitment to biodiversity conservation by funding conservation projects or implementing sustainable practices.

Bioprospecting and traditional knowledge

Recognizing the value of natural resources found within ecosystems and insights of indigenous and local communities possessing these resources is essential. Bioprospecting refers to the search for valuable compounds and genetic materials from living organisms, often for use in pharmaceuticals, agriculture and other industries. It encourages the sustainable use of biodiversity by promoting the value of intact ecosystems and leads to the discovery of novel bioactive compounds with potential applications in medicine, agriculture, cosmetics and other fields. Incorporating traditional knowledge into bioprospecting initiatives and fair benefit-sharing agreements ensure that communities receive compensation for their contributions.

Bioprospecting can create economic opportunities for indigenous communities, contributing to poverty alleviation and sustainable development. It involves the collaboration between scientists and indigenous communities, fostering learning and mutual respect. It respects the cultural significance of certain species or areas to indigenous communities and encourages its conservation. It can drive the adoption of ethical and sustainable practices to ensure the long-term viability of valuable species. Sharing the benefits of bioprospecting with indigenous communities lead to international discussions on equitable access and benefit sharing related to genetic resources. Technology transfer and improvements in capacity may contribute to sustainable development in biodiversity-rich countries, although the assumption has been questioned (Castree, 2003).

Education and awareness

Public can be inspired and promote a sense of responsibility towards the environment by education and awareness programmes. Education helps people to grasp the concept of biodiversity, its components and significance in maintaining healthy ecosystems. Giving awareness of threats to biodiversity such as habitat loss, climate change, pollution and overexploitation highlights the urgent need for conservation efforts. Education can lead to behaviour changes and adopt ecofriendly practices such as reducing waste, supporting sustainable products, clean-up events, planting trees and supporting conservation organizations etc. Educating young people instils a sense of responsibility for the environment and enhances their ability to critically evaluate conservation initiatives and policies from an early age.

Education can help communities understand the importance of biodiversity and the role it plays in their traditions and well-being. Raising awareness on sustainable agricultural, fishing, and forestry practices ensures resource availability. Awareness campaigns can generate funds which support conservation efforts while providing educational experiences for visitors. These initiatives foster communication and collaboration between governments, NGOs, scientists and communities, leading to more effective conservation strategies. Social media, online platforms and digital tools offer new approaches for spreading information and attract a wide audience in biodiversity conservation. Knowledge sharing brings together people from diverse backgrounds, creating opportunities to share ideas, experiences and solutions for conservation challenges. Educating current and future generations ensures that the values and practices of biodiversity conservation are perpetuated over time.

Technological innovations

Technological innovations enhance our understanding of ecosystems, monitor species and develop solutions for biodiversity conservation. Remote sensing technologies, such as satellite imagery and aerial drones, allows to monitor changes in land use, habitat loss, deforestation and other environmental changes (Norouzzadeh *et al.,* 2018) . Mobile apps enable citizens and researchers to collect data on species sightings, habitats and environmental conditions and this information contributes to biodiversity databases and helps to identify trends and threats. DNA barcoding aids in identifying unknown species, detecting invasive species and tracking genetic diversity within populations. Collecting and analysing genetic material shed by organisms into the environment, such as water or soil, which detects the presence of species even when they are not visually observed. Geographic Information Systems integrates spatial data to create maps, analyse patterns and to identify important habitats.

Artificial Intelligence can analyse large datasets to identify patterns and trends in biodiversity, track species movements and even predict ecological changes based on historical data (Sutherland *et al.,* 2016). Camera traps and audio recorders capture images and sounds of wildlife in their natural habitats. Acoustic monitoring helps researchers to study behaviour, distribution and population dynamics of various species. Blockchain technology can enhance transparency and traceability in wildlife trade, ensuring products are legally sourced and prevents illegal wildlife trafficking. Advanced sensors can monitor various environmental

parameters like temperature, humidity, and pollution levels and it provides real-time data for assessing the health of ecosystems. Data-driven models enable better decision-making in land use planning, habitat restoration and conservation management. Innovations like aquatic drones and remotely operated vehicles allow exploring underwater ecosystems, monitoring marine life and assessing the health of coral reefs. Bioacoustic technology records and analyses sounds from ecosystems, helping researchers track species presence and behaviour, especially in challenging environments.

Technological tools can help identify areas and species vulnerable to climate change and novel tools like artificial reefs, 3D-printed habitats and assisted migration strategies contribute to the protection and restoration of ecosystems. Online platforms facilitate the sharing of research findings, conservation best practices and community engagement, creating a global network of conservationists.

Policy integration

Policy integration involves recognizing the interconnectedness of biodiversity with other sectors, such as agriculture, forestry, urban planning, energy and more. By integrating biodiversity considerations into different policies and sectors, countries can better address the complex challenges associated with biodiversity loss and promote sustainable development. By integrating biodiversity considerations into policies that govern different sectors, countries can ensure tit as a mainstream concern rather than a separate issue. Policy integration seeks to identify opportunities for synergies such as poverty reduction, climate change mitigation and sustainable resource management.

Integrating biodiversity into policies improves the quality of decision-making and encourages collaboration and dialogue between government agencies, sectors and stakeholders. Integration of aligns policy encourages sustainable agricultural practices that can reduce habitat destruction and pesticide use. Policy integration requires training and capacity building among policymakers, government officials and stakeholders to understand the relevance of biodiversity studies and how to integrate it effectively. Many countries are signatories to international agreements which helps them to meet their commitments under these agreements eg. Convention on Biological Diversity (CBD).

Global collaboration

Global collaboration is a critical component of conserving biodiversity, as many ecological challenges transcend national boundaries and require coordinated efforts across countries, regions and continents. It is a shared responsibility that necessitates collaboration among governments, international organizations, NGOs, researchers, communities, and other stakeholders. Many species migrate across borders and collaborative efforts can involve protecting critical habitats and creating migration corridors. Different regions have unique biodiversity and traditional knowledge. Collaboration facilitates the exchange of cross-cultural knowledge, techniques, and best practices for conservation. Global collaboration is crucial for combating illegal wildlife trade and cooperation can involve law enforcement, intelligence sharing and demand reduction strategies. It helps countries share strategies for reducing emissions, enhancing carbon sinks and protecting vulnerable ecosystems.

Collaborative initiatives can pool resources from multiple countries and organizations to fund large-scale conservation projects that benefit multiple nations. International networks of organizations and institutions work together to share knowledge, set priorities, and coordinate conservation efforts. The efforts bring together scientific expertise around the world to collectively address complex biodiversity challenges. Also, the efforts can influence international policies, regulations, and funding mechanisms that impact biodiversity conservation.

Conclusion

Biodiversity is critical for ecosystem function and services on which humans depend and is pivotal for achieving sustainable development in the current scenario. Integrating the value of ecosystem services such as clean air and water, pollination of crops, regulation of climate and disease control into economic models will be beneficial to human wellbeing. The introduction of green infrastructure into urban planning can enhance resilience against climate change, reduce the impact of natural disasters and ensure quality life for people. Sustainable agriculture by promoting agroecological practices, crop rotation, polyculture and reduced chemical inputs help maintain soil health and prevent the loss of native species. Indigenous people often possess valuable insights about sustainable resource management and these community involvements can contribute much in conservation programmes. Fair benefit sharing agreements

between scientists and indigenous communities can protect traditional knowledge and support conservation efforts. Effective management of protected areas safeguard habitats and enable species to move and adapt in response to environmental changes. Governments can initiate economic incentives for ecosystem services, rewards landowners for conserving natural habitats. Technological innovations like remote sensing, DNA barcoding and predictive modelling assist in monitoring and understanding biodiversity patterns and changes. To nurture a culture of conservation by raising public awareness programmes like education campaigns, citizen science initiatives and nature-based tourism can contribute to this goal. Governments can implement various strategies and policies such as land-use planning, trade regulations and environmental impact assessments, ensuring conservation of ecologically sensitised areas and biodiversity. Currently, biodiversity is a global issue and international collaborations can help for setting common goals, sharing knowledge and implementing effective conservation strategies.

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CHAPTER 2

NEED FOR INTEGRATED ENVIRONMENTAL LAWS AND THEIR EFFECTIVE IMPLEMENTATION IN BANGLADESH: ANALYSIS OF EXISTING LAWS AND RECOMMENDATIONS

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Abstract

This paper attempts to identify the need for integrated environmental laws and their effective implementing approach in Bangladesh. The study is supported by secondary data. Information gathered from documents about the pertinent aspects of Bangladesh's environmental laws is public and searchable on government websites and electronic databases. The study tries to evaluate some of Bangladesh's environmental legislation through the lens of climate change to ascertain how well these laws have addressed the environmental vulnerabilities. After a thorough analysis of the data, major findings emerged from which conclusions were drawn in that the environmental lacked adequate challenges to enforce. Given a short critical review, this study recommends the need for an integrated environmental law with enough institutional support and administration to ensure successful implementation.

Keywords*: Environmental Law, Integrated Environmental Law (IEL), Climate Change, Bangladesh*

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Introduction

The approach of Integrated Environmental Law (EIL) is a critical component of the development process. It advocates for a holistic and goal-oriented approach to environmental law and management that addresses interconnections through a strategic approach. Scholars have defined integrating legislation and an integrated environmental approach in a variety of ways. According to Sussman (1997), an integrating statute is a law that makes cross-cutting improvements to existing laws but does not repeal or replace them. It adds flexibility to the rigid mechanisms of existing laws in order to manage programs more flexibly and effectively, but it does not repeal or alter any of the existing laws. According to him, an integrating statute provides the ability to evolve into a new environmental management system, to make change in a creative but cautious manner, to be evolutionary rather than revolutionary, and to allow people to move forward together rather than pitting them against each other. According to Fuggle (1999), an integrated environmental approach involves the selection, design, and implementation of mutually beneficial activities that contribute to the resolution of a specific problem.

The Integrated Environmental Management Approach (IEM) is defined by Chiwandambira (2000) as a productive or preventive measure that keeps the environment in good condition for a variety of long-term sustainable uses. IEL is a concept that ensures that environmental concerns are fully considered in a country's decision-making process. It has been a requirement of the European Commission (EC) Treaty since 1997. According to Article 6 of the Treaty, "environmental protection requirements must be integrated into the implementation of community policies, particularly in order to promote sustainable development." The Sixth Environment Action Program reaffirms the importance of integration, stating that "integration of environmental concerns into other policies must be deepened" in order to move toward sustainable development. Many more environmental laws, acts, and policies have existed in Bangladesh since the 19th century with the goal of conservation and protection of the environment and ecology; however, they have largely remained unenforced or were inaccurately known to the people. Despite these laws and policies, the environment in Bangladesh is under threat from various forms of pollution and activities. The researcher discovered that the major barriers to implementing environmental laws are insufficient information, a lack of environmental advocacy and leadership, a lack of environmental rule of law, environmental governance, political interference, a lack of resources, and so on. In this environment, Bangladesh requires an integrated environmental policy to

keep up with current demand. As a result, the study attempted to demonstrate that IEL is in desperate need. In this paper, the researcher conceptualized what actually integrated laws are in order to understand the overall outlook of the topic from the perspective of Bangladesh, sketched some of the major legislation that addresses environmental concerns, identified the underlying factors that impede the proper implementation of environmental laws, and emphasized the need for integrated environmental law in the current context.

Major Environmental Issues in Bangladesh

There are numerous environmental issues in Bangladesh, including high temperatures, sea level rise, pollution, floods, cyclones, salinity, tornadoes, and climate change, which are increasing people's vulnerability, forcing migration, and causing the loss of livelihoods. Among these, it is important to highlight one important feature that is representative of environmental issues in the context of Bangladesh, where climate change plays a role in many ways.

Climate Change

Bangladesh is located at the confluence of three major rivers: The Ganges, the Brahmaputra, and the Meghna. Almost a quarter of Bangladesh is under seven feet above sea level. Climate Change predicts that the Earth's temperature will rise by 2 to 4.5 degrees Celsius by the end of the century. If current actions are not fully implemented, a 4°C warming could occur as early as the 2060s. Further warming to levels above 6°C would most likely take centuries (Impacts of a 4°C global warming, n.d.). According to the Intergovernmental Panel on Climate Change (IPCC), a 45 cm sea-level rise will inundate nearly 10.9% of Bangladesh's territory and displace 5.5 million coastal residents (Cited in Views of Bangladesh on Climate Change and its possible Security Implications, n.d. p-2). In Bangladesh, 40% of productive land is expected to be lost in the southern region if sea levels rise by 65cm by the 2080s (Ahmed, 2020). Flood areas in Bangladesh could increase by up to 29% if temperatures rise by 2.5°C (Cited in Warming Climate to Hit Bangladesh Hard with Sea Level Rise, 2013). With a one-meter rise in sea level, Bangladesh could lose up to 15% of its land area to sea water, and approximately 30 million people living in Bangladesh's coastal areas could become refugees as a result of Climate Change impacts (ibid). Water stress caused by climate change is expected to affect between 500 and 750 million people worldwide by

2020. The sea level will rise by 2% in 2020, 4% by 2050, and 17.5% by 2100. (Global Climate Risk Index 2021). It will have an impact on agriculture, hampered food security, created a health risk, and exacerbated poverty. Greenhouse Gas (GHG) emissions must be reduced by 40% - 45% by 2020, and 90-95% by 2050. (ibid).

No.	Country	CRI Score	Fatalities	Losses per unit GDP in %
1	Puerto Rico	7.17	149.85	3.66
2	Myanmar	10.00	7056.45	0.8
3	Haiti	13.67	274.05	2.3
4	Philippines	18.17	859.35	0.54
5	Mozambique	25.83	125.40	1.33
6	The Bahamas	27.67	5.35	3.81
7	**Bangladesh**	**28.33**	**572.50**	**0.41**
8	Pakistan	29.00	502.45	0.52
9	Thailand	29.83	137.75	0.82
10	Nepal	31.33	217.15	0.39

Table 1: The Long-Term Climate Risk Index (CRI): The 10 countries most affected from 2000 to 2019 (annual averages)

Bangladesh is the most vulnerable to the effects of climate change in the coming decades. Bangladesh ranked seventh in both the 2020 and 2021 reports for climate risk (Global Climate Risk Index, 2021). According to a report by the Environmental Justice Foundation (EJF), Bangladesh is expected to lose approximately 11% of its land by 2050 due to a projected 50 cm rise in sea levels, and one in every seven people (up to 18 million) may be forced to relocate as a result of climate change (cited in How the Climate Crisis Is Impacting Bangladesh, 2021).

According to the UN High Commissioner for Human Rights and the Environmental Justice Foundation, rising sea levels will submerge approximately 16330.6 to 25238.2 square kilometers of Bangladesh by 2050, particularly in low-lying coastal regions (The Impact of Climate Change on Bangladesh, Part I: Land, 2022). Environmentalists and geologists warn that if sea levels rise by just one meter, 70% of the Sundarbans will be submerged. Coastal erosion, rising sea levels, flooding of low-lying deltas, and soil acidification are all threatening the Sundarbans, the livelihoods of its residents, and the biodiversity of the area (Cited in Rising Sea Levels Threaten Sundarbans Forests, n. d.).

According to the United Nations Children's Fund's 2021 Children's Climate Risk Index, the climate risk to children in Bangladesh is "extremely high." "Around 12 million of the children most affected [by climate change] live in and around the powerful river systems," according to UNICEF. According to one estimate, up to 50% of those now living in Bangladesh's urban slums may have been forced to flee their rural homes due to riverbank flooding.

Natural disasters have displaced nearly 700,000 Bangladeshis each year over the last decade, according to the Internal Displacement Monitoring Centre (cited in How the Climate Crisis Is Impacting Bangladesh, 2021). The annual number spikes during years with powerful cyclones, such as in 2007, when Cyclone Sidr struck the country's coast with wind speeds of up to 149 miles (240 km) per hour, claiming 3,406 lives; in 2009, Cyclone Aila affected millions of people, claiming the lives of approximately 190, and leaving approximately 200,000 homeless; and in 2016, when Cyclone Roanu caused disastrous landslides and submerged villages, leaving thousands homeless, in 2019, Cyclone Bulbul swept through the country, forcing over 2 million people into cyclone shelters; in 2020, Cyclone Amphan killed ten people in Bangladesh (and 70 others in India), displaced thousands, and destroyed at least 176,007 hectares of agricultural land in 17 coastal districts; and in 2021, Cyclone Yaas made landfall with winds of 93 miles (about 150 kilometers) per hour (ibid). In this context, Bangladesh appears to be one of the nations that is particularly vulnerable to environmental issues, which has increased the country's risk of dire circumstances.

Development of Environmental Laws and Policies in Bangladesh

Bangladesh has been particularly concerned about the environment ever since gaining its independence in 1971. This is reflected in Article 18A of the Constitution, which mandates that the state make efforts to safeguard the natural resources, biodiversity, wetlands, forests, and wildlife for the benefit of current and future citizens, as well as to protect and develop the environment. The essential "right to life," which includes environmental protection and preservation, ecological balance free from air and water pollution, and sanitation- without which life can rarely be enjoyed- is protected by Articles 31 and 32 taken together. The Constitution (Fifteen Amendment) Act of 2011 in Bangladesh further established the state's fundamental obligation to maintain and defend natural resources as well as

to protect and develop the environment. As a result, the constitutional clause highlights how important environmental protection is in Bangladesh.

Additionally, the government has taken certain efforts to address environmental challenges. For instance, the Bangladeshi government passed the Bangladesh Wildlife (Preservation) Order, 1973; the Bangladesh Wildlife (Preservation) (Amendment) Act, 1974; the Department of Pollution Control Ordinance, 1985; the Pesticide Rules, 1985; the Environmental Policy, 1992; the Environment Action Plan; the Wetland Protection Act; the Forest Act, 1927 (as amended up to 2002); and the Marine Fisheries Ordinance, 1983, etc. Later, the Environmental Pollution Control Ordinance of 1977, the Bangladesh Environment Conservation Rule of 1997, the Court Act of 2000, the Brick Making and Burning (Control) Act of 2013, and other laws were repealed in order to properly implement and execute the Bangladesh Environment Conservation Act of 1995 and as a result of its shortcomings.

The National Forest Policy of 1994, the National Energy Policy of 1995, the New Agriculture Extension Policy of 1995, and the Energy Policy are some other policies and plans that the government of Bangladesh has established (1995). The National Policy for Safe Water Supply and Sanitation (1998), the National Fisheries Policy (1998), the Water Policy (1998), the National Agriculture Policy (1999), NEMAP 1995, and the National Environment Management Action Plan, etc. In addition to these sector-specific policies, action plans for addressing environmental problems and advancing sustainable development have been developed as part of the National Conservation Strategy (NCS), the National Environment Management Action Plan, 1995 (NEMAP), and the second Poverty Reduction Strategy Program (PRSP).

In addition, Bangladesh is a signatory country of almost all the treaties, acts and agreements relating to environment such as: the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal in 1989, the Vienna Convention for the Protection of the Ozone Layer in 1985, the Montreal Protocol on Substances that Deplete the Ozone Layer in 1987, the Water Boundary Treaty in 1909, the UN Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, and the United Nations Framework Convention on Climate Change (UN Convention on Non-Navigational Uses of International Watercourses, Paris Agreement, Nagoya Protocol, Cartagena Protocol, Convention on Biological Diversity, etc.

A Summary of Bangladesh's Key Environmental Laws

The Environment Conservation Act 1995: The Act outlines the execution of the environment impact assessment, the identification of ecologically critical areas (ECA), and the criteria for the air, water, and other elements of the environment. The Act has been criticised for giving the DG a disproportionate amount of authority, for leaving the "national interest" and "good faith" loopholes open, and for failing to specify the technical qualifications of relevant employees.

The Environment Court Act 2010: The Act attempts to hasten the resolution of instances involving environmental harm. The Act's mandate to establish an environmental court in every district has generally not been carried out. Environmental justice has been hampered by this and the failure to ensure that the officers of the environment court are adequately informed of the necessary information.

The Wildlife (Conservation and Security) Act 2012: The Act specifies the permitted activities within sanctuaries, national parks, and community conservation zones and permits their declaration. The Act's recognition of national heritage, memorial trees, and sacred trees while upholding local customs and cultural norms is one of its most striking features. This is a significant advancement in the acknowledgement of indigenous communities' rights.

The Brick Manufacturing and Brick Kilns Establishment (Control) Act 2013: The Act imposes numerous limits on the locations close to which brick kilns can be built. The Act also lists restrictions on using raw materials obtained from places like agricultural land, hills, or hillocks, as well as using wood as fuel. Sadly, reality shows that these provisions are rarely followed.

The Bangladesh Biodiversity Act 2017: The Act regulates who may have access to biological resources and traditional knowledge and how such resources and knowledge may be lawfully transferred. It assigns the National Biodiversity Committee, which will also decide on the equitable distribution of benefits derived from biodiversity, biological resources, and traditional knowledge, the responsibility for granting permission for such access.

In addition to these acts, there are other laws that cover environmental issues subtly. For instance, the 2009 Consumer Rights Protection Act, the Animal Welfare Bill, the Playgrounds, Open Spaces, Parks, and Natural

Reservoirs and Preservation Act 2000, the Clean Air Bill, the Bangladesh Water Act 2013, and so on.

Challenges toward Implementation of Environmental Laws

Although Bangladesh has several environmental laws and policies, none of them are successfully implemented. The study concentrated on a few significant obstacles to environmental law implementation. The difficulties Bangladesh has had applying environmental regulations are listed below:

Outdated and Ineffective Laws: The great majority of environmental laws were enacted when population growth and industrial development were under very different circumstances. Many laws have not been updated or have only recently undergone changes. For instance, no changes have been made to the Environmental Pollution Control Ordinance of 1970, the National Environmental Policy of 1992, or the National Environmental Management Plan of 1995. These outdated rules do not meet the needs of the nation today or the altered environmental conditions around the world. A law passed a few years or decades ago cannot effectively address environmental degradation in modern Bangladesh. (Islam, 1993). The Aarhus Convention (Convention on Access to Information, Public Participation in Decision Making, and Access to Justice in Environmental Matters), the Espoo Convention (Convention on Environmental Impact Assessment in a Transboundary Context), the London Convention, and other international conventions, treaties, and protocols all pertain to the conservation and protection of the environment and ecology but have not yet been ratified (Sarwar, 2021).

Fragmentation and Unenforceable Laws: The inconsistent application of environmental laws and regulations has been a problem in Bangladesh. There are one or more laws that address the same topic, but none of them are enforced in tandem with the others. Many environmental regulations lack the concept of using power responsibly and are poorly written in terms of their content (Sarwar, 2021). As a result, law enforcement becomes inefficient and insensitive to the passing of time (Hossain, 2022). Few action programs are in place under the majority of laws and policies to ensure that developments in the public and commercial sectors adequately address environmental issues. Due to the lack of clarity in the implementation mechanism and the poorly defined responsibilities of the implementing body, the majority of environmental laws are ineffective and