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FOREWORD

I am delighted to present Volume II Issue II of the *Journal of the Centre for Environmental Law*, dedicated to the theme "Climate Change in the Post-COVID Era." The Journal, along with its forthcoming issues, seeks to engage with a wide range of perspectives on this pressing subject, exploring diverse and interdisciplinary dimensions of climate change.

We were delighted to receive an overwhelming number of insightful and cross-sectoral contributions from scholars and practitioners. I extend my sincere gratitude to all the authors for their valuable work, experts, in-house and student editorial team for their dedication and rigorous efforts in bringing this Volume to fruition.

It is our hope that this and the subsequent issues of the Journal will serve as meaningful contributions to the growing body of literature on climate change and related concerns, and will provide useful insights to researchers, policymakers, and all those invested in the discourse on environmental law.

Prof. (Dr.) Madhuri Parikh
Patron-in-Chief
Director & Dean
Institute of Law, Nirma University

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Climate Governance in SAARC: A Regional Analysis

Vaibhav Gaur[*]
Dr. Ankita Yadav[**]

Abstract

The increasing impacts and effects of climate change underlines the urgency for stronger and better coordinated structures of governance at local, regional, and global levels. The gap between national actions/initiatives and a global framework of climate governance needs to be filled by regional organizations by fostering data sharing, collaboration, cooperation, resource sharing, and addressing region-specific issues. Our paper explores the role of regional organizations in climate governance. Special focus will be on the South Asian Association for Regional Cooperation (SAARC) and its member states. Whether it's the fear of increasing sea levels, harsh weather, water security, or food security, South Asia is among the most susceptible regions to climate change. Despite these emerging weaknesses, SAARC's attempt at climate governance has been thwarted by growing political acrimony and hostility, funding crunch, and limited institutional capacity.

This paper discusses SAARC's efforts towards climate related endeavors, such as the SAARC Action Plan on Climate Change and the SAARC Disaster Management Centre, SCCI, which analyses the same in terms of effectiveness in promoting cooperation for regional and climate adaptation and mitigation strategies. Individual member-state roles and actions along with efforts to achieve national policy alignment with regional goals are considered for the analysis. Building on case studies and comparative analyses of other regional organizations, such as the European Union (EU) and the Association of Southeast Asian Nations (ASEAN), this paper identifies best practices by

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which SAARC can enhance its contributions to climate governance. Findings indicated that the most significant leverage belonged to making the institutional frameworks stronger, further investment in finances, and lowering geopolitical barriers to unlock the potential of SAARC for climate change mitigation and adaptation activities. This paper attempts to suggest that mobilizing regional synergies and cooperative approaches can be an important pathway whereby SAARC and its member states can play a transformative role in enhancing climate resilience and sustainable development in South Asia.

I. Introduction

Today, climate change is a global problem that needs immediate attention from multiple fronts. Even when the issue is global, there are regions where the problem hits more severely, given the vulnerability to extreme weather events, and South Asia is one such region housing nearly a quarter of the global population. The region faces interrelated risks, from food and water insecurity to increased frequency of natural hazards and displacement of vulnerable communities. However, the efforts to mitigate climate change have been siloed rather than regional.

The year 1985 saw the formation of the South Asian Association for Regional Cooperation (SAARC) as a regional body to collectively deal with the challenges that affect the region as a whole and promote cooperation. Although the focus was not on climate governance at its inception, the mandate saw expansion through the inclusion of disaster management and forestry gradually. [1] The Comprehensive Framework on Disaster

[1]Florian Krampe and Ashok Swain, "Is SAARC Prepared to Combat Climate Change and its Security Risks?", *Dialogue Earth*, Sept. 06, 2018. Available at<

Management[2], stands as the regional response to climate threats. The SAARC Disaster Management Centre expanded in 2016. It merged the SDMC, SMRC, SFC, and SCZMC to extend support for disaster risk reduction initiatives by the member states.[3] Despite the presence of several declarations to tackle climate change and associated risks, many resultant policies are yet not operational, and others are yet to be ratified.[4] The climate change crisis are exacerbated by the information crisis as well as the reluctance of problem acknowledgement by the key stakeholders.[5]

The paper aims to discuss climate governance in SAARC, assess SAARC's effectiveness in addressing the issue, and discuss the regional framework for promoting cooperation and the climate commitments and actions of its member states. As such, despite being an important regional platform for cooperation and dialogue, the SAARC today stands almost ineffective and lacks enforcement and coordination that links regional goals with national priorities. Member states are taking individual actions on climate change, but regional cooperation remains lacking. The paper examines the challenges and

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https://dialogue.earth/en/climate/is-saarc-prepared-to-combat-climate-change-and-its-security-risks/ > (last visited Dec 15, 2024).

[2]SAARC, "SAARC Comprehensive Framework on Disaster Management", *United Nations Network on Migration.* Available at< https://migrationnetwork.un.org/policy-repository/saarc-comprehensive-framework-disaster-management > (last visited Dec 15, 2024).

[3]SAARC, SAARC Regional Centres, Available at< https://saarc-sec.org/index.php/regional-centres#:~:text=This%20Centre%20was%20re-established%20in%20November%202016%20for,SAARC%20Forestry%20Centre%20%28SFC%20%E2%80%93%20Thimphu%2C%20Bhutan%29%3B%20%284 > (last visited Dec 17, 2024).

[4]Florian Krampe and Ashok Swain, "Is SAARC Prepared to Combat Climate Change and its Security Risks?", *Dialogue Earth*, Sept. 06, 2018. Available at< https://dialogue.earth/en/climate/is-saarc-prepared-to-combat-climate-change-and-its-security-risks/ > (last visited Dec 15, 2024).

[5]Habib Zafarullah and Ahmed Shafiqul Huque, "Climate Change, Regulatory Policies and Regional Cooperation in South Asia" 21(1) *Public Administration and Policy: An Asia-Pacific Journal* 22-35 (2018). Available at< https://doi.org/10.1108/PAP-06-2018-001 > (last visited Dec 18, 2024).

proposes recommendations for effective climate governance in the SAARC. The paper delves into the potential of SAARC as a cohesive force for climate governance in the region.

The central argument in this paper is that, though SAARC's role in climate governance is fundamental, it is limited to the primacy of national interests over regional solidarity. Aspirational goals set by the member states are met with varying degrees of commitment. The paper underscores the paradox of regional climate governance in South Asia: the shared vulnerabilities of member states necessitate collective action, yet the realities of national interests and political dynamics often hinder meaningful collaboration.

This paper looks at the global issue through a regional lens by critically examining SAARC's institutional mechanisms, the interplay of regional and national policies, and the broader implications for the resilience of South Asia against climate change. This study explores the successes and shortcomings of SAARC's climate initiatives and the commitments of its member states to understand how regional frameworks can be made stronger to bridge the gap between policy dialogue and actionable outcomes.

II. Regionalism and Climate Governance

Regionalism is defined as the tendency and political commitment to organize the world in terms of region; more narrowly, the concept refers to a specific regional project. [6]Faced with the compounding environmental and climate crisis, regional cooperation emerges as an accepted strategy for coordinating

[6] Bjorn Hettne, "Beyond the 'New' Regionalism" 10(4) *New Political Economy* 543-571 (2005). Available at< https://doi.org/10.1080/13563460500344484 > (last visited Dec 18, 2024).

collective actions among multi-territorial stakeholders. [7] Environmental Regionalism in SAARC aligns with both liberal institutionalism as well as functionalism as shared vulnerabilities to climate change theoretically necessitate regional cooperation, even as political and economic divergences complicate such efforts. However, SAARC's governance model aligns more with the "soft regionalism" paradigm of non-binding agreements, without any enforcement mechanisms, and relying on voluntary cooperation. Helpful in discussing climate governance, the drawbacks of the approach are visible in the absence of major regional projects and measurable outcomes, which raises questions about the capacity of regional organizations like SAARC to address complex, transboundary environmental issues in a politically fractured landscape.

The existing literature on SAARC's role in climate governance portrays a mixed picture of intent and execution from regional declarations like the SAARC Action Plan on Climate Change, which merely symbolizes failure to convert environmental acknowledgments into policy action. SAARC Disaster Management Centre [SDMC] has played a role in coordinating disaster risk reduction, yet with no independent financing, and its impact is limited and curtailed. At the same time, the SAARC Development Fund's limited scope, coupled with uneven resource distribution, poses a limitation. Moreover, the preference for bilateral engagements over multilateral cooperation at the regional level and the geopolitical tensions amongst the members have played their role in weakening the SAARC and shifting the attention away from climate governance.

[7]Xianchun Zhang, Yucheng Zou, *et.al.*, "Understanding the Role of Regional Cooperation in Mitigating Ecological Footprint: An Empirical Analysis of the Guangdong-Hong Kong-Macao Greater Bay Area" 167 *Applied Geography* (2024). Available at< https://doi.org/10.1016/j.apgeog.2024.103292 > (last visited Dec 15, 2024).

SAARC's climate governance is of immense relevance, and given the vulnerabilities that South Asia shares in terms of climate, some glaring gaps also gain visibility. The biggest gap in SAARC Climate Governance is the absence of operational effectiveness of climate policies and frameworks. Furthermore, the convergence/divergence of national policies with the regional goals of SAARC often skips elaborate discussions and analysis. Comparative studies that quantitatively compare the regional performance on climate agenda with other regional mechanisms remain missing. Since SAARC lacks resources, understanding whether or how civil society engagement supplements state-led efforts toward regional goals on climate change is extremely important. Moreover, the cross-sectional integration of climate with other regional priorities remains inadequately addressed in the literature.

For any possible work at the regional level, it is a must to look at climate change through the intersection with other issues and have a regional understanding that focuses on an interdisciplinary approach to offer a more holistic analysis of the challenges of climate governance in the region.

III. Climate Change in SAARC

Climate change presents an absolute threat to South Asia and SAARC, the most vulnerable region in the world, from a geographic, socioeconomic, and ecological point of view. Despite the region's common vulnerabilities, addressing climate change has been a difficult task because of uneven preparedness, resource constraints, and political tensions. Varied climatic zones in South Asia add to the biodiversity and make the region highly prone

to climate-related risks. In terms of economic losses, it is estimated that by 2030, damages would be, on average, 160 Mn $ in the region.[8]

The region experiences varied climatic zones, from the Himalayan glaciers to the tropical coasts of South Asia. Such diversification has made the area very prone to climate-related risks. The accelerating melting of Himalayan glaciers threatens the water supplies in South Asia.[9] It has been predicted that the Himalayas could lose up to 75% of their glaciers with continued melting rates.[10]Rising sea levels threaten low-lying countries such as the Maldives to the level of existential crisis.[11]Similarly, coastal areas of Bangladesh are prone to flooding, salinization of farmlands, and displacing communities. The low-lying coastal regions in India and Bangladesh have been struggling with greater exposure to extreme weather events.[12] Super Cyclone Amphan in 2020 caused over 13Bn USD in damages across India, Bangladesh, and Sri Lanka.[13]

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[8] World Bank Group, South Asia Climate Roadmap, 28 Oct 2021. Available at< https://www.worldbank.org/en/region/sar/publication/south-asia-climate-roadmap > (last visited Dec 12, 2024).

[9] University of Leeds. "Himalayan glaciers melting at 'exceptional rate'." ScienceDaily. ScienceDaily, 20 December 2021. Available at< https://www.sciencedaily.com/releases/2021/12/211220083104.htm > (last visited Dec 12, 2024).

[10]"Himalayan Glaciers May Lose 75 Percent of Ice by 2100: Report", *Al Jazeera*, June 20, 2023. Available at< https://www.aljazeera.com/news/2023/6/20/himalayan-glaciers-may-lose-75-percent-of-ice-by-2100-report#:~:text=Glaciers%20in%20Asia%E2%80%99s%20Hindu%20Kush%20Himalayas%20are%20melting,downstream%20of%20the%20rivers%20that%20originate%20in > (last visited Dec. 20, 2024).

[11]World Bank Group, "Country Climate and Development Report- Maldives" (2024). Available at< https://openknowledge.worldbank.org/server/api/core/bitstreams/ff0d23ef-4786-4c3d-9a47-520e13e677ce/content > (last visited Dec 18, 2024).

[12]Jack O'Connor, Caitlyn Eberle, *et.al.*, "Interconnected Disaster Risks 2020/2021: Cyclone Amphan" (2021) Technical Report, United Nations University. Available at< https://s3.eu-central-1.amazonaws.com/interconnectedrisks/reports/Research/Cyclone_Amphan_TR_210906.pdf > (last visited Dec 15, 2024).

[13]World Meteorological Organization, "State of the Global Climate 2020. WMO-No. 1264" (2021). Available at< https://library.wmo.int/viewer/56247/download?file=1264_Statement_2020_en.pdf&type=pdf&navigator=1 > (last visited Dec 12, 2024).

The heavy flooding in Pakistan in 2022 caused losses estimated to be 30 billion USD, which is yet another manifestation of the growing impacts of climate variability.[14]

Climate Change not only has a more severe form in the SAARC region, but its socioeconomic impacts are immense, exacerbating existing vulnerabilities and inequalities. Climatic events affect the very bedrock of the South Asian economy and livelihoods, i.e., Agriculture, and thereby pose a threat to food security. For example, India's wheat production dropped by 10% due to the 2015 heatwave. [15] Water-related issues are emerging as regional and transboundary issues in the SAARC region, heightening existing tensions. The existing agreements on transboundary rivers face tensions over water rights.[16] Climate Change is inducing migration, and S. Asia is estimated to face a crisis of 50 Mn climate refugees annually by 2050.[17]

Despite the shared vulnerabilities, effective regional action on climate change remains missing. Fragmented policy responses of member states, (emerging) geopolitical challenges, financial constraints, etc., obstruct the paths to having

[14]World Meteorological Organization, "The State of the Global Climate 2022. WMO-No. 1316" (2023). Available at< https://library.wmo.int/viewer/66214/download?file=Statement_2022.pdf&type=pdf&navigator=1 > (last visited Dec 15, 2024).

[15] IPCC. "Climate Change 2021: The Physical Science Basis" (2021). Available at< https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport.pdf> (last visited Dec 17, 2024).

[16] Subir Gokarn and Anuradha Sajjanhar, "Turning Water Challenges into Opportunities", *Brookings*, Nov. 20, 2014. Available at <https://www.brookings.edu/articles/turning-water-challenges-into-opportunities/#:~:text=Water%20disputes%20amongst%20the%20SAARC%20member%20nations%2C%20then%2C,water%2C%20there%20have%20been%20efforts%20at%20regional%20cooperation > (last visited Dec. 19, 2024).

[17]Mahika Khosla, "Why South Asia Should Embrace Climate Migration", *The DIPLOMAT*, Feb. 07, 2023. Available at< https://thediplomat.com/2023/02/why-south-asia-should-embrace-climate-migration/ >(last visited Dec. 20, 2024).

an effective regional-level climate governance. This limits innovation and grassroots-level implementation of climate solutions.

With the challenges being multilayered in the region, there also exist several avenues of opportunities. Being a natural beneficiary of solar, wind, and hydropower potential, there exists enormous potential for renewable energy collaborations across the SAARC region. Enhancing regional institutional capacity and technology to address climate change challenges stands as a promising avenue of collaboration.

Thus, with climate change already causing problems that are bound to escalate in the future, there is a need for regional-level coordinated action across SAARC. While there is diversity in terms of climate change impacts across the SAARC member states, their interdependence underscores the need for a unified regional response. Through enhanced cooperation and innovative approaches, the region can transform shared vulnerabilities into opportunities for resilience and sustainable development.

IV. SAARC's Climate Governance Framework

Climate change stands as a significant threat to the marginalized and vulnerable communities in the entire SAARC region, thereby threatening their existence with heightened climate risks and affecting their quality of life across various domains. SAARC as a platform and region must face the shared vulnerabilities and have a unified climate response. Several initiatives by SAARC in the past have had seen constraints due to several structural, political, and resource-related problems.

The SAARC Action Plan on Climate Change (2008) is a landmark policy framework to deal with the region's vulnerabilities against climate change by prioritizing adaptation and mitigation along with five other thematic areas.

The proposed action plan aimed at creating a more just, equitable, and sustainable South Asia with collective actions, and as such, collaboration would benefit all, particularly the most vulnerable.[18]Though wide-ranging, the Action Plan's implementation has been ad hoc with scarce positive output. It was disaster management that made the place and scope for climate change in the SAARC Agenda. The SDMC is one of the crucial initiatives that have been undertaken, offering technical assistance and training to member states in preparation for disasters, response, and recovery. However, regional integration remains limited to early warning systems. SAARC has supported renewable energy through initiatives such as the SAARC Energy Centre, which conducts research and policy dialogues on clean energy technologies, including solar and wind power. As a case in point, cross-border energy-sharing agreements are discussed but remain poorly developed due to political impediments.[19]

The SAARC Environment Ministers' meetings have been the most important institutional tool for regional climate governance, as has the IGEG.CC was a progressive step towards regional climate governance. However, since 2011, the Environment ministers have not met[20], thereby making the effort a far-fetched dream. The SAARC Development Fund (SDF) was formed in 2010 to finance regional projects, which include climate adaptation and disaster risk reduction. The social window of the fund is for projects dealing with climate

[18]SAARC Secretariat, The Fourteenth SAARC Summit on Climate Change, 2007. Available at< https://www.saarc-sec.org/index.php/resources/summit-declarations/12-fourteenth-saarc-summit-new-delhi-2007/file > (last visited Dec 14, 2024).
[19]Mirza Sadaqat Huda and Matt McDonald, "Regional Cooperation on Energy in South Asia: Unraveling the Political Challenges in Implementing Transnational Pipelines and Electricity Grids" 98 *Energy Policy* 73-83 (2016). Available at< https://doi.org/10.1016/j.enpol.2016.07.046 > (last visited Dec 20, 2024).
[20]SAARC, Areas of Cooperation: Environment Natural Disasters and Biotechnology (16 Jul 2020). Available at< https://www.saarc-sec.org/index.php/areas-of-cooperation/environment-natural-disasters-biotechnology > (last visited Dec 9, 2024).

resilience, poverty alleviation, and social development, but the resource constraints have rendered SDF unable to meet its objectives.

Given that it is well established of that regional cooperation in climate governance is not in sight/action, it becomes pertinent to look at the problems that hinder this regional cooperation. The geopolitical landscape of South Asia severely undermines SAARC's ability to function as a cohesive entity. The lack of trust among member states has hampered collaborative efforts in several SAARC initiatives. [21] Moreover, SAARC's climate governance framework relies heavily on voluntary cooperation and non-binding agreements. This soft governance approach limits the effectiveness of policies such as the SAARC Action Plan on Climate Change (Sharma, 2020). Many SAARC states suffer from under-resourced conditions and lack climate finance and technological know-how.

There is no doubt that SAARC did manage to conceptualize the need for climate governance at the regional level and came up with several initiatives as well. Still, to a large extent, its effectiveness is thwarted by politico-institutional and financial disabilities. The lack of institutional authority and geopolitical tensions have severely undermined all the efforts for regional climate governance to address shared vulnerabilities. To enhance its role in climate governance, SAARC must strengthen its institutional capacities, foster trust among member states, and align its policies with global frameworks such as the Paris Agreement and the SDGs.

[21] Hilal Ahmad Lone and Dr Neeraj Kumar Jah, "SAARC: Challenges and Solutions to Overcome" 2 *International Journal of Scientific Development and Research* 339-341 (2017). Available at< https://www.ijsdr.org/papers/IJSDR1704063.pdf > (last visited Dec 14, 2024).

V. National Perspectives: Climate Policies of Member State

The SAARC has heterogeneous member states that are dealing with different types of climate change issues and adopting different national policies in the process. Though there is a collective need for action against transboundary climate risks, individual member states tend to favor their domestic agenda over regional obligations.

Besides being the third-largest global emitter of greenhouse gases, India is one of the largest economies in the SAARC region. Through its NDCs submitted under the Paris Agreement, India committed to reducing emissions, transitioning to non-fossil fuel-based energy sources, and increasing the forest and tree cover.[22]India has seen rapid growth in its renewable energy sector, from initiatives like the International Solar Alliance (ISA) to ambitious targets of 500 GW of renewable energy capacity by 2030. However, national and international efforts often overshadow its commitments to regional frameworks, including SAARC's climate initiatives. Although the bilateral initiatives between India and its neighbors bring tangible benefits, they undermine the collective action envisioned under SAARC. Geopolitical tensions, particularly with Pakistan, also reduce India's engagement in regional SAARC climate governance.[23]

Bangladesh ranks among the most climate-vulnerable countries in the world, and millions of livelihoods are at risk because of climate-induced risks, including sea-level rise, cyclones, and salinity intrusion. To tackle such

[22] Government of India, Ministry of Environment, Forest, and Climate Change. Cabinet approves India's Updated Nationally Determined Contribution to be communicated to the United Nations Framework Convention on Climate Change (3 Aug 2022). Available at< https://www.pib.gov.in/PressReleasePage.aspx?PRID=1847813 > (last visited Dec 14, 2024).

[23] Dubash, Navroz K. (ed.), *India in a Warming World: Integrating Climate Change and Development* (Delhi, 2019; online edn, Oxford Academic, 19 Dec. 2019). Available at< https://doi.org/10.1093/oso/9780199498734.001.0001 > (last visited 19 Dec. 2024).

challenges, Bangladesh has implemented several proactive strategies, which include. The Bangladesh Climate Change Strategy and Action Plan (BCCSAP), focusing on climate resilience, adaptation, and mitigation, along with Investments in strong early warning systems on cyclones and flood protection structures have significantly reduced casualties caused by disasters. Mujib Climate Plan prioritizes climate resilience initiatives and the implementation of renewable energy.[24] Although Bangladesh is actively involved in regional and global climate initiatives, large amounts of international financing for domestic priorities leave little capacity for contributions to SAARC-led regional initiatives.

Nepal and **Bhutan,** being Himalayan states, are highly concerned about preserving the region's sensitive ecosystems. Both countries are experiencing impacts from glacier melting, unpredictable weather patterns, and biodiversity loss. Bhutan's Climate Change Policy aims for Carbon Neutrality and the GDP encapsulated well-being.[25]Nepal's National Climate Change Policy focuses on a resilient society and an environmentally sustainable economy while addressing existing inequalities.[26]Despite their ecological significance, Nepal and Bhutan have difficulty of reconciling with SAARC's overall climate

[24] AKM Monowar Hossain Akhand, "Mujib Climate Prosperity Plan for Bangladesh and CVF", *Energy&Power*, Sept. 19, 2021. Available at< https://ep-bd.com/view/details/article/NjU0Nw%3D%3D/title#:~:text=The%20Mujib%20plan%20is%20a%20strategy%20of%205,private%20sources%2C%20to%20contribute%20to%20the%20domestic%20economy > (last visited Dec. 19, 2024).

[25]Climate Change Policy of the Kingdom of Bhutan 2020, THINK BLUE DATA, Available at< https://policy.thinkbluedata.com/sites/default/files/Draft%20Climate%20Change%20Policy%20of%20the%20Kingdom%20of%20Bhutan%202020%20%28EN%29.pdf > (last visited Dec 12, 2024).

[26]National Climate Change Policy, 2020, INTERNATIONAL CENTRE FOR INTEGRATED MOUNTAIN DEVELOPMENT, Available at< https://www.icimod.org/wp-content/uploads/2021/07/National-Climate-Change-Policy_english_2019_compressed.pdf > (last visited Dec 12, 2024).

governance in light of weak financial and infrastructural capacity, revealing an uneven capacity at the regional level.

Pakistan is vulnerable to climate risks due to factors such as energy insecurity, water scarcity, and population pressures. Pakistan's Alternate and Renewable Energy Policy 2019 aims to achieve 30% of the renewable energy share by 2030. The National EV Policy reduces the reliance on fossil fuels to mitigate urban air pollution and aims for comprehensive disaster risk reduction under the National Disaster Risk Management Framework, NDRMF.[27]The country's dependence on foreign financing for adaptation and mitigation projects further complicates its involvement in regional initiatives. In addition, bilateral tensions with India have put the collective dialogues on Climate Action in limbo.[28]

Sri Lanka focuses on sustainable agriculture, renewable energy, and biodiversity conservation. Its NDC stressed reducing greenhouse gas emissions by 14.5% by 2030.[29] However, limited resources pose challenges to integrating these efforts with SAARC frameworks.

As a small island developing state (SIDS), the Maldives faces existential threats from rising sea levels. Its climate strategy includes achieving net-zero emissions by 2030, which is subject to international support.[30]

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[27]Government of Pakistan. (2020). *National Electric Vehicle Policy.* Ministry of Climate Change.

[28]Mukesh Pokhrel, "Indo-Pak Tension Hits SAARC Climate Action", *Nepali Times*, Dec. 08, 2021. Available at < https://nepalitimes.com/latest/indo-pak-tension-hits-saarc-climate-action > (last visited Dec. 19, 2024).

[29]UNDP, Climate Promise- Sri Lanka (Nov 24, 2023). Available at< https://climatepromise.undp.org/what-we-do/where-we-work/sri-lanka#:~:text=Sri%20Lanka%20committed%20to%20reduce%20greenhouse%20gas%20%28GHG%29,to%202030%2C%20including%20an%20unconditional%20reduction%20of%204%25 > (last visited Dec 18, 2024).

[30]Ministry of Environment, Republic of Maldives. 2020. "Updated Nationally Determined Contribution 2020." United Nations Framework Convention on Climate Change.

Afghanistan's climate policy is hampered by persistent violence and political instability. At the same time, the Afghan National Adaptation Plan in water resource management and disaster resilience features limited institutional capacity.

Clearly, the Climate policies of the member states of SAARC reflect a complex interaction of national priorities and aspirations from the region. While some member states are seen to be at the top in implementing strong climate actions, their commitments to regional initiatives of SAARC vary. In contrast, other smaller countries face resource and capacity constraints. These differences raise the need for stronger regional mechanisms to bridge the gap between national actions and collective goals, ensuring that SAARC can effectively address the shared climate challenges of South Asia.

VI. Key Issues

The formation of SAARC aimed to bring together the member states in their common issues; however, the framework of its climate governance framework has critical barriers that undermine effective regional action.

SAARC suffers from an inconsistent disconnection between regional aims and national-level action in terms of climate governance. Member states often prefer national policies that align with domestic political and economic imperatives over regional initiatives. Nationalization of regional commitments reduces the effectiveness of regional programs and exacerbates disparities in climate action. The fragmentation of national climate priorities and their non-harmonization with regional frameworks deters the opportunities for economies of scale in climate financing, technology sharing, and capacity building.

Resource constraints, including limited financial resources and access to advanced technologies, severely restrict SAARC's ability to execute its climate governance initiatives. SDF is underfunded to finance regional projects and has uneven contribution by the member states. Many SAARC countries do not have access to modern climate technologies, such as efficient renewable energy systems and early warning mechanisms for natural disasters. Most climate initiatives by SAARC rely on international organization funding, like GEF and GCF, which raises uncertainties regarding the successful implementation and sustainability of the projects.

The political landscape of South Asia is fraught with long-standing and emerging tensions and rivalries that have consistently undermined SAARC's cohesion. The strained relations between India and Pakistan, based on historical conflicts and border disputes, have often stalled SAARC's decision-making process. For example, SAARC summits have been delayed or derailed due to political differences, and progress on joint climate action is stalled. In other words, India's dominant position within SAARC often comes with a cost, as member states perceive its actions as unilateral and hegemonic. Though India has benefited from bilateral arrangements with Bhutan and Nepal, these bypass the regional setting in SAARC, weakening regional solidarity among its members.

SAARC's institutional framework for climate governance has a weak enforcement mechanism and inadequate monitoring and evaluation, thereby suffering from policy paralysis at the regional level. SAARC's climate-related declarations and action plans are almost entirely non-binding, depending on the member states' voluntary compliance, resulting in inconsistent implementation and minimal accountability. With no monitoring mechanism for the SAARC's climate initiatives, it is hard to judge its effectiveness. The

bureaucratic structure of SAARC, characterized by slow decision-making and overlapping responsibilities, further hampers its effectiveness. The lack of a centralized body to coordinate climate governance efforts across member states creates redundancies and delays in project implementation.

The multitude of challenges that SAARC faces in its climate governance framework prevents it from overcoming the shared vulnerabilities in South Asia. Only a multifaceted response at bilateral and regional levels can tackle these problems. It is only when such efforts are undertaken that SAARC can truly serve its purpose as a collective body for climate governance in South Asia.

VII. Recommendations

The SAARC has significant potential to address shared climate vulnerabilities in South Asia. However, realizing this potential requires transformative changes to strengthen institutional mechanisms, foster member-state participation, leverage global partnerships, and engage non-state actors. Enhancing SAARC's regional climate governance requires a multifaceted approach that addresses institutional, financial, and political challenges. By adopting these recommendations, SAARC can transform from a forum for dialogue into a catalyst for sustainable development and climate resilience in South Asia.

i. SAARC needs a specialized and empowered climate task force to bridge the gap between policy formulation and implementation to move beyond symbolic declarations.
ii. The SAARC Development Fund (SDF) requires enhanced and equitable financial contributions from member states to support climate adaptation projects. Proportional contributions and a dedicated

climate portal within the SDF could go a long way, along with seeking international funding.

iii. To encourage member states to align their national policies with SAARC's regional goals, SAARC should offer tangible incentives, like tech transfers and climate financing.

iv. In order to foster trust-building measures, Joint projects, particularly on climate resilience, and Cultural and academic exchanges on climate research could strengthen interpersonal and institutional relationships across borders.

v. Aligning SAARC's climate governance framework with global agreements and other regional mechanisms/networks that the Member States are a part of would strengthen SAARC's international credibility and bring access to global climate finance mechanisms along with Opportunities for technical assistance and capacity building from multilateral organizations.

vi. The inclusion of non-governmental organizations (NGOs), community-based organizations (CBOs), and academia in SAARC's climate governance framework can enhance innovation and local implementation.

vii. Engaging the private sector is crucial to scaling up climate-resilient infrastructure investments and giving a more significant push to renewable energy in terms of demand and supply. Efforts must be made to mobilize private investments for climate projects at regional levels.

VIII. Conclusion

Climate and its associated risks in the South Asian region are both regional in terms of impact and multifaceted. The associated risks cover not just

environmental concerns but also political and economic ones. Thus, climate change creates new challenges for regional organizations and simultaneously necessitates and increases their relevance.[31]

One of the most formidable challenges faced by the South Asian region relates to climate change, for which its shared vulnerabilities necessitate a collective response. Indeed, SAARC was initially conceived as a body designed to address such transboundary challenges and has come to incorporate issues relating to climate governance within its remit. Yet SAARC's climate governance framework continues to be limited by fragmentation in policy, a scarcity of resources, tensions across the geopolitical spectrum, and the institutional weaknesses of this entity.

The complex interplay of regional aspirations and national priorities can be seen in regional initiatives, which hold tremendous potential to address vulnerabilities that are shared with neighboring countries and are ineffective and in operational due to a non-coherent interface. Member states, driven by domestic political and economic imperatives, have often prioritized bilateral or unilateral approaches over multilateral cooperation, undermining the collective spirit envisioned by SAARC. Mistrust and geopolitical tensions among the member states further complicate these issues by hindering consensus-building and freezing decision-making processes. These tensions highlight the urgent need for trust-building measures and mechanisms to insulate climate governance from political conflicts.

[31]Florian Krampe and Ashok Swain, "Is SAARC Prepared to Combat Climate Change and its Security Risks?", *Dialogue Earth*, Sept. 06, 2018. Available at< https://dialogue.earth/en/climate/is-saarc-prepared-to-combat-climate-change-and-its-security-risks/ > (last visited Dec 15, 2024).

The challenges notwithstanding, the potential for SAARC to act as a facilitator of regional climate governance remains enormous. The common climate vulnerabilities of the member states are an opportunity to overcome the political differences and bring them together. Institutional mechanisms within SAARC can be strengthened with political will and vision to look at future prospects of working together on climate change. Mobilizing the private sector and grassroots organizations can inject dynamism and inclusivity into SAARC's climate governance framework.

In conclusion, SAARC plays a critical yet constrained role in climate governance. To better grapple with the shared existential threats posed by climate change, SAARC needs to change from being a dialogue forum to an action forum that can deliver measurable and transformative output(s). This requires political will, enhanced institutional capacity, and regional solidarity. It will only be possible by establishing trust, aligning policies, and mobilizing resources to allow SAARC to fulfill its mandate as a cornerstone of regional climate resilience.

AI, IoT and Blockchain: A Tripartite Approach to Green Governance under Indian Environmental Law

Ekta Pandey*
Shambhawi Tiwari**

Abstract

In this article, the attempt is to evaluate how the Indian legal and regulatory regime shapes green technology in the crux by focusing on how India centralises the issue of climate change and technological innovation. Starting from the constitutional foundations of environmental protection in India, the analysis proceeds through the Environment Protection Act, the Energy Conservation Act, and the National Green Tribunal Act. It studies India's evolving climate policy framework with a focus on the National Action Plan on Climate Change and net-zero commitments. Legal mechanisms that facilitate different renewable energy technologies, including solar innovations, wind energy developments, hydropower projects, biomass utilisation, and emerging green hydrogen initiatives, are helping in the development of the Green Environment. Finally, the paper explores the integration of frontier technology (AI, IoT, and blockchain) in climate action, the application potential, as well as the ethical and legal considerations of these technologies in this context. A discussion of implementation challenges of market-based instruments and fiscal incentives used to speed market adoption of green technology is also analysed. The article identifies regulatory fragmentation and jurisdictional overlaps as the key barriers to implementing. It does so through the analysis of judicial activism and selected case studies. Finally, the research concludes with the recommendations

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tailored for the harmonisation of India's legal framework to align with the climate commitment of the world to support green technology deployment.

Keywords*: Green technology, Environmental legislation, Renewable energy law, Climate policy, Judicial activism*

"Economic policies designed to promote growth have been implemented without considering their full environmental consequences, presumably on the assumption that these consequences would either take care of themselves or could be dealt with separately. These are serious consequences, and it has become clear today that economic development must be environmentally sustainable."

I. Introduction

India is the third largest carbon emitter in the world is at a critical juncture in addressing climate change. By ironic standards, even after being the topmost carbon emitter ever, India has very low per capita emissions. Being still a developing nation, there is a problem it faces in terms of attaining economic growth while reducing heat discharge possibilities. As we are concerned with sustainable development, there is a need to balance the urgency with the complexity of the ecological systems threatened from the multiple environmental stressors in the vicinity of the developed countries, whose climate commitments may constrain the economic development pathways of developing nations. Implementing of effective climate solutions makes things more complicated because of resource constraints.

India's Climate Change Vulnerability

India qualifies the status of being highly vulnerable to climate impacts by the Intergovernmental Panel on Climate Change (IPCC).[1] India has a diverse geography, which led it to experience multiple severe climate disruption patterns across varied landscapes. It also has a coastline of 7,500 kilometres, inclusive of areas that are densely populated and subject to the threats of rising sea levels. Data from the Indian Meteorological Department shows a temperature rise of 0.7°C between 1901 and 2018, which exemplifies a tendency of an accelerated global warming trend in the future also.[2] These temperature increases negatively affect agricultural productivity and food security, as agricultural systems still struggle to adapt to rapid climate pattern changes. In addition, the excessive heat in 2022 in Northern India and Pakistan brought searing 49°C in Delhi that destroyed crops[3]. In fact, it had the impact of dozens of deaths caused by it. In addition, the pattern of the monsoon across Indian territory becomes very unpredictable and erratic, causing threats to water security. The data of the Ministry of Earth Sciences show that rainfall events have become up to 75% more extreme since 1950[4]. Once it transforms into catastrophic flooding, it affects some major Indian states like Bihar, Kerala, Assam, etc. India is known to be gifted with its exponential agricultural sector, which employs nearly half of its total workforce, but it still faces a high number of undernourished people, according to the UN FAO data,

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[1] Intergovernmental Panel on Climate Change, Climate Change 2022: Impacts, Adaptation and Vulnerability (Sixth Assessment Report, Working Group II) https://www.ipcc.ch/report/ar6/wg2/ accessed on 5th December 2024.

[2] R Krishnan, J Sanjay, S Ghosh *et al, Assessment of Climate Change over the Indian Region: A Report of the Ministry of Earth Sciences (MoES), Government of India* (Springer 2020).

[3] BBC News, 'India's Capital Still Under Prolonged Heatwave' (BBC News, 27 April 2022) https://www.bbc.com/news/world-asia-india-61242341 accessed on 6th September 2024.

[4] R Krishnan and others (eds), Assessment of Climate Change over the Indian Region (Springer 2020) https://link.springer.com/book/10.1007/978-981-15-4327-2 accessed on 4th January 2025

approximately 195 million Indians face this problem.[5] In such a situation, the unpredictable rainfall patterns and heat stress make it worse because their impact can result in declining crop yields.

A study by the Indian Agricultural Research Institute suggests that every 1°C rise in temperature reduces the wheat production by 4-5 million tonnes annually, which also targets food security.[6] The real vulnerability is faced by rural livelihoods due to the climate-related crop failures because it also increases challenges with staple crop productivity across regions, and it is not easy to adapt due to the limited capacity by socioeconomic factors in agricultural communities. Another vital challenge India faces is water scarcity, which threatens over 100 million urban residents. NITI Aayog, the think tank of India, has also given warning that 21 major Indian cities may exhaust their groundwater by 2030 because of the depletion accelerated by changing precipitation patterns.[7] Climate change has not left the air unaffected, as according to IQ Air's 2020 World Air Quality Report, 22 of the world's 30 most polluted cities are located in India[8].

[5] Food and Agriculture Organisation of the United Nations (FAO; with IFAD, UNICEF, WFP& WHO), The state of Food Security and Nutrition in the world 2024: Financing to End Hunger, Food Insecurity and Malnutrition in All its Forms (Rome, FAO 2024) https://doi.org/10.4060/cd1254en accessed on 7th August,2025.

[6] Vulnerability of Indian Wheat Against Rising Temperature and Aerosols' Environmental Pollutionhttps://www.sciencedirect.com/science/article/abs/pii/S0269749119309698 accessed on 19th March 2025

[7] Press Information Bureau, 'Prime Minister Chairs High-Level Meeting to Review Covid-19 Situation and Vaccination Progress' (PIB, 27 March 2022) https://pib.gov.in/PressReleasePage.aspx?PRID=1807790 accessed on 8th February 2025

[8] Disha Shetty, '22 Out of Top 30 World's Most Polluted Cities in India' (Forbes, 16 March 2021) https://www.forbes.com/sites/dishashetty/2021/03/16/22-out-of-top-30-worlds-most-polluted-cities-in-india/ accessed on 4th March 2025.

Green Technologies: A Path Forward

The dual solution of green technologies is used to achieve both climate action as well as to ensure economic growth. Innovations by these cover a range of solutions, including the management of renewable energy systems to cut carbon emissions in the sector. In addition to these, it also brings on board energy-efficient technologies that are great for cutting down on resource consumption, and waste management and circular economy approaches also reinforce such efforts of battling pollution. Green Technologies provides technology which is climate-resilient to the unavoidable impacts of global warming and climate change. According to the report of the International Renewable Energy Agency (IRENA), green technologies have been identified to have substantial economic potential in India. This suggests that renewable energy-based technologies will create 3.4 million jobs by 2030.[9] Apart from providing these economic advantages, it also benefits public health and air quality. A report by the Council on Energy, Environment and Water CEEW also states that over the next decade, India is expected to invest approximately $160 billion in the renewable energy market.[10]

India's International Climate Commitments

India's approach to green technology is significantly shaped by its international commitments related to climate. As a signatory to the Paris Agreement, India has pledged to reduce its emissions intensity by 33-35% from 2005 levels by 2030. It also aims to extract 40% of its electric power

[9] M K Mehra and others, 'Renewable Energy in India: What It Means for the Economy and Jobs' in *India Studies in Business and Economics* (Springer 2021) 343–375 https://doi.org/10.1007/978-981-33-4830-1_17.

[10] Singh, Vaibhav Pratap, Arjun Dutt and Gagan Sidhu, RE-Financing India's Energy Transition: Limited Period Subsidised Credit Enhancement for Domestic RE Bond Issuances (Council on Energy, Environment and Water, Centre for Energy Finance, July 2020), re-financing-india-energy-transition.pdf

capacity from non-fossil sources rather than from fossil sources. It is also affirmed by the Prime Minister Narendra Modi at the 2021 COP26 in Glasgow when he announced a five-part "Panchamrit" initiative [11] which aims to achieve 500 GW of non-fossil energy by 2030, which will help in meeting the goal of reaching the target of 50% energy from renewable sources by 2030, which will consequently contribute to the goal of reaching the net-zero emissions target by 2070. [12] In the context of such a complex terrain, technological innovation in green technologies has emerged as an important step to reach the climate goals with a view to enriching the environmental governance system. Despite this, maintaining the right balance between climate action with equal growth is a key challenge that will be crucial for the nation if we want to keep the growth equal and still be able to participate in climate action.

II. The Legal Foundation for Green Technology in India

India has a high level of commitment to environmental sustainability, and green technologies are part of it. The Indian government validated this commitment by taking time and by passing many acts which have grown with the progression of time. These developments include provisions of the constitution, enacting of legislation, and policy initiatives to make it a strong mechanism. The environmental protection is based on constitutional provisions and influenced by international commitments. It creates laws and

[11] Ministry of External Affairs, *National Statement by Prime Minister Shri Narendra Modi at COP26 Summit in Glasgow* (1 November 2021) https://www.mea.gov.in/Speeches-Statements.htm?dtl/34466/National_Statement_by_Prime_Minister_Shri_Narendra_Modi_at_COP26_Summit_in_Glasgow accessed 10 August 2025.

[12] "India Finalizes Its New Climate Action Targets: 50% of Its Electricity to Come from Non-Fossil Fuel Sources by 2030" The Times of India (2 November 2022) https://timesofindia.indiatimes.com/india/india-finalizes-its-new-climate-action-targets-50-of-its-electricity-to-come-from-non-fossil-fuel-sources-by-2030/articleshow/93330518.cms accessed 14th March 2025.

policies with mechanisms and incentives to promote the adoption of green technologies. The constitutional duties with regard to the environment also direct the policy development.[13]

India's Constitutional Environmental Framework

It is mainly two provisions given under Article 48A and Article 51A of the Constitution, which mandate the conservation of forests and wildlife as a constitutional responsibility and give direction to the state for the protection and improvement of the environment. Article 51A(g) makes it a citizen's fundamental duty to safeguard the environment. The Supreme Court also has the essential role of expanding the constitutional provisions by progressive interpretation of cases before it. Right to Life given under Article 21 is the provision where the main efforts can be seen by the interpretation of this Article. The interpretation suggests that the right to a clean environment is one of its parts. In landmark judgements such as *M.C. Mehta v. Union of India*[14] is very important in environmental jurisprudence. Through *Indian Council for Enviro Legal Action v. Union of India*,[15] the court has further strengthened the framework has also gifted us famous principles of environmental jurisprudence like "polluter pays" and "precautionary principle". In the same way, judicial interpretations in India have strengthened the formation and adoption of green technology.

[13] *Constitution of India*, art 48A ('The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country') and art 51A(g) ('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')
[14] M.C. Mehta v Union of India (1987) AIR 965 (SC).
[15] Indian Council for Enviro Legal Action v Union of India (1996) 5 SCC 281.

Key Environmental Legislation

i. Environment Protection Act, 1986

The Environment Protection Act (EPA) functions as umbrella legislation for comprehensive environmental protection. This Act provides the central government with the power to set standards in terms of environmental quality so as to improve the environment. Additionally, it is a basis of law for the regulation of emissions within the various industries. Another important establishment of the EPA framework is effluent standards. In addition, it sets the limiting pollutant concentration across sectors and bans industrial operations in environmentally sensitive places. In turn, it drives the regulatory requirements for the adoption of cleaner technologies in different industries.[16]

ii. National Green Tribunal Act, 2010

The National Green Tribunal (NGT) Act established a specialised judicial forum for expeditious case disposal related to the environment. Its jurisdiction covers such civil cases that involve substantial environmental questions. It enforces legal rights relating to environmental protection and gives orders and judgments that actively promote compliance with environmental norms. This also led to the incentivising of green technology adoption. The composition of the tribunal plays a vital role in having a wholesome mechanism because there is specialised environmental expertise that is integrated into the tribunal composition.

It is proven to be more efficient in dispute resolution compared to the traditional court system. It is also known to integrate the international

[16] Environment (Protection) Act 1986, No 29 of 1986 (India).

environmental principles into domestic application, which helps in the elevation of industry standards through a consistent adjudication approach. [17]

iii. Energy Conservation Act, 2001 (amended 2022)

It is a legal framework specifying how energy efficiency and its conservation are promoted. As new technologies are coming into existence, it was amended in 2022, which involves the usage of non-fossil sources of energy and carbon credit trading. It establishes the Bureau of Energy Efficiency to enforce energy efficiency labelling of equipment and appliances, as well as to promote energy consumption standards. However, these provisions provide for market incentives for using energy-efficient technologies and renewable energy solutions that facilitate the promotion of new technologies.[18]

iv. Electricity Act, 2003

This Electricity Act was enacted to reform India's electricity sector by including provisions for the promotion of renewable energy. The State Electricity Regulatory Commissions are mandated to promote electricity generation from renewable sources, and this can be seen in section 86(1)(e) of the Act. It also indicates finding a percentage of total consumption to be procured from such sources. With this, Renewable Purchase Obligations (RPO) have also been developed to provide renewable energy producers with a guaranteed market for renewable energy products, resulting in people being more enticed to use it.[19]

[17] National Green Tribunal Act 2010, No 19 of 2010.
[18] Energy Conservation Act 2001, No 52 of 2001, as amended by Energy Conservation (Amendment) Act 2022.
[19] Electricity Act 2003, No 36 of 2003.

India's Climate Change Policy Framework

i. National Action Plan on Climate Change (NAPCC)

Introduced in 2008, the National Action Plan on Climate Change (NAPCC) provides an India-wide strategy focusing on eight national missions such as the National Solar Mission, National Mission for Enhanced Energy Efficiency, and National Mission on Sustainable Habitat. These missions help to define policy with regard to promoting specific types of green technology, e.g., solar power, energy-efficient appliances, and green buildings.[20]

ii. State Action Plans on Climate Change

Indian states have developed the State Action Plans on Climate Change (SAPCCs), standardising it based on the NAPCC framework. These plans are state-specific and provide a list of vulnerabilities and opportunities for state-level climate action by the deployment of green technologies that best suit the local conditions. Such plans are covered by both central legislation and state laws.[21]

iii. Net Zero Commitments and Legal Implications

India has announced that it would reach net zero by 2070 at COP26 in Glasgow. Though such a commitment is not yet encoded in law, it is impacting policy decisions and regulatory coordinates. It will also have legal

[20] Government of India, *National Action Plan on Climate Change* (Prime Minister's Council on Climate Change 2008).
[21] Government of India, *State Action Plans on Climate Change* (Ministry of Environment, Forest and Climate Change, various years) https://moef.gov.in/climate-change/ accessed 13 August 2025.

implications, such as enhanced carbon-intensive industries' liability, green technology incentives and reporting of greenhouse gas emissions.[22]

India's legal basis for green technology is mainly constitutionally based along with some specific legislative and policy frameworks. As the country moves toward its climate goals, this foundation will mutate into a different form that will open up new opportunities and generate new responsibilities in green technology development and deployment.

III. Role of AI, IoT, and Blockchain in Climate Action: Legal and Ethical Considerations

Climate change is considered a defining global problem for which multifaceted solutions are required. The regulatory gaps highlight the need for policy innovation to enable proper regulations arising from the use of such technologies. Technological innovations are key solutions, but they require legal and ethical frameworks. It uses AI to aid the advanced climate modelling and energy optimisation, consequently enabling real-time monitoring of environmental and resource management in IoT networks.

Blockchain technology is helping to create transparent carbon markets and tracking of the supply chain. Data governance and algorithmic decision-making are the two essential ethical issues, and the other is the digital divide, which is a big concern as far as emerging technological developments are concerned in the context of climate and environment.

[22] Government of India, 'Prime Minister's Statement at COP26 World Leaders Summit' (Glasgow, 1 November 2021) https://pib.gov.in/PressReleasePage.aspx?PRID=1768712 accessed 13 August 2025.

AI in Climate Monitoring & Regulation

The integration of AI into climate monitoring has revolutionised the process. At present, the machine learning algorithms are processing massive volumes of environmental data, as well as analysis of satellite imagery via computer vision techniques also contributes to it.[23] Another example is the integration of the weather station data, which is supplying the ground truth validation. The ocean sensor network is also letting us gain critical marine ecosystem insights. AI-driven improvements with predictive capabilities for climate models are advancing with greater accuracy. It is visible that these climate models are making use of predictive capabilities that benefit the temporal and spatial forecasting range.

In India, most of these technologies are regulated through the Environment (Protection) Act, 1986, which was made before these technologies existed. The Act allows flexibility in implementing its broad mandate, permitting technological evolution within its framework. Recently, there have been attempts to address AI-based monitoring systems, which are mostly relevant to industrial emissions compliance and environmental impact assessments.

IoT in Smart Energy and Waste Management

Modern IoT systems have increased energy efficiency through smart buildings, smart grids, and networked devices. The regulatory law in the Indian power sector is the Electricity Act, 2003, which had earlier, in recent years, changed to smart metering and demand response mechanisms. While IoT exists, security against cyber threats remains inadequate, and

[23] P Jain, SCP Coogan, SG Subramanian, M Crowley, S Taylor and MD Flannigan, 'A review of machine learning applications in wildfire science and management' (2020) 28 *Environmental Reviews* 478 https://doi.org/10.1139/er-2020-0019.

stakeholders' lack of data ownership is still unaddressed. IoT enables revolutionary waste management technologies such as smart bins, Automated storage and Retrieval system (ASRS), and waste-to-energy (WtE) monitoring. Solid Waste Management Rules, 2016, have included technology-based waste management as a part, but the same has been very heterogeneous as regard to the implementation at the state level.[24]

Blockchain for Green Governance

Blockchain technology offers three unique advantages essential for environmental governance: transparency, verification, and security. By making the records of carbon offsets carbon stored on blockchain platforms, carbon credit markets can solve the problem of double counting and verification that has plagued carbon markets for decades. Even though the Indian carbon market mechanisms are still in a developmental stage, the Energy Conservation (Amendment) Act has provisions for fitting in the blockchain technology-based carbon trading. Blockchain enhances sustainability in supply chains by providing a permanent record of environmental compliance throughout a product's lifecycle. Recently, the Companies Act introduced ESG reporting requirements, paving the way for blockchain-verified sustainability reports, though technical standards are yet to be established.[25]

[24] Joshi and S Ahmed, 'Status and challenges of municipal solid waste management in India: A review' (2016) 2 *Cogent Environmental Science* 1139434 https://doi.org/10.1080/23311843.2016.1139434.
[25] Companies Act, 2013, s 134(m) (energy conservation disclosure requirement). *https://corporate.cyrilamarchandblogs.com/2021/12/an-introduction-of-esg-disclosures-in-indian-regulatory-space-part-1/* last accessed on 11 August 2025.

IV. Legal Incentives and Marketing Scheme in India

India is the third largest economy after the United States of America, and China and has a good economic expansion, a high rate of exports in Asian and European countries and a large number of start-ups creating employment and economic growth. Even with the recent slowdown, some countries think that India will grow faster than any other large country in the upcoming 25 years.[26]

Green Tax Policy in India

To stabilise this growth and not affect the environment with the surge of growth, the country introduces legislative incentives in support of green technology, and there are certain discounts given by the government in the tax-paying process, and it also provides certain fiscal incentives for the welfare of economic institutions and to control climate change. The Supreme Court of India recognised the importance of a pollution-free environment under the garb of Article 21 and contended it as a fundamental right in *M.C. Mehta v. Union of India.*[27] Environmental concerns in the automobile sector in India have been addressed by the green taxation measures and certain initiatives to encourage a clean environment and without creating any new problems for the upcoming generations. The green tax policy of India can be understood through the following aspects:

[26] David E Abbey and others, 'Long-term Ambient Concentrations of Particulates and Oxidants and Development of Chronic Disease in a Cohort of Non-smoking California Residents' (1995) 7 *Inhalation Toxicology* 19–34.
[27] *Supra* 6

A. According to the 2017 Goods and Services Tax, the Indian government imposed 5% tax on electronic vehicles in comparison to other general vehicles.[28]

B. Vehicles with high pollution levels are subject to green cess. The green cess or pollution tax is determined on the vehicle's usage period, engine capacity, and current emission factor.

C. The government used the FAME India Scheme in the year 2019 to support the affordability of electric vehicles in place of conventional cars; tax relief and subsidies were provided to the manufacturers and buyers.[29]

D. The Indian government proposed the Vehicle Scrappage Policy, which supports the retirement of old and inefficient vehicles at the identified scrappage centres. To promote this vehicle, the scrappage policy, the government started to propose discounts on the new vehicle, subsidies, and provide the appropriate value of the scrap car.[30]

E. BS-VI emission standards were introduced by the government, and they are implemented all over the country by the stringent emission standards and all automobile manufacturing companies must produce

[28] Abhishek Srivastava and others, 'Design and Selection of Government Policies for Electric Vehicles Adoption: A Global Perspective' (2022) 161 Transportation Research Part E: Logistics and Transportation Review https://doi.org/10.1016/j.tre.2022.102726 accessed 28 March 2025.
[29] Press Information Bureau, 'Fame India Scheme' (25 July 2023) https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1942506 accessed 24 March 2025.
[30] KR Nayak and S Auti, 'Reviewing the Problem of ELVs in India and Checking Possibilities of Pyrolysis as a Solution' in H Vasudevan, V Kottur and A Raina (eds), *Proceedings of International Conference on Intelligent Manufacturing and Automation* (Springer 2019) https://doi.org/10.1007/978-981-13-2490-1_52.

vehicles which emit fewer pollutants in the environment and follow the BS-VI Compliance.[31]

The other factor of legal incentives in support of green technology is the government-introduced Green Credit Program under the movement of LiFE.[32] This green credit program supports water conservation and afforestation. Individuals have to register themselves on the Ministry of Forest website and then attain the green credit according to their activity, which they can trade on the green credit platforms.

Carbon Credit Trade Scheme in India

The other aspect to get legal incentives for saving the environment and not creating adverse situations for climate change is the government's new marketing mechanism, i.e., carbon credits.[33] Carbon credits are one favourable aspect provided by the government which is desired by every manufacturing company, corporate stakeholder and businessman in the country. Through carbon credits, the government demystifies the perks of emitting less carbon from any manufacturing company or power sector. The Indian government signed the Paris Agreement in the year 2016, and adhering to the agreement, the Indian government also adopted the carbon trading system to decrease their greenhouse gas emissions by 2030. The carbon trading system is the most authentic and useful global tool to curb climate change by using green

[31] Ministry of Road Transport and Highways, 'GSR 308(E)' (Government of India, 25 March 2025) https://parivahan.gov.in/parivahan//sites/default/files/NOTIFICATION%26ADVISORY/GSR%20308E_0.pdf accessed 25 March 2025.

[32] Press Information Bureau, 'Notification Issued for Green Credit Program (GCP) and Eco Mark Scheme under LiFE Initiative to Promote Sustainable Lifestyle and Environmental Conservation' (13 October 2023) https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1967476 accessed 25 March 2025.

[33] United Nations Framework Convention on Climate Change, 'Kyoto Protocol' https://unfccc.int/kyoto_protocol accessed 31 January 2025.

technologies, and this system works through two mechanisms – compliance and voluntary mechanisms.

The compliance mechanism describes the government power to emit CO_2 in the environment and must be supported by adequate legal provisions. The compliance mechanism of the country supports the cap-and-trade system.[34] Companies under a cap-and-trade system produce less Co2 under allotted credits and then trade the remaining credits in the carbon market by trading of it. This trade system emphasises the win-win situation for the government, companies and environment also. To achieve the ambitious goals of government, they developed the electronic platform named the National Framework for Indian Carbon Market (ICM), the PAT scheme , the National Steering Committee for Indian Carbon Market (NSCICM) and the Bureau of Energy Efficiency (BEE).[35] All these institutional and regulatory frameworks supported by recent amendments of the Energy Conservation (Amendment) Act, 2022.[36] According to Section 14(w), the central government has the power to specify a carbon trading scheme according to the objectives of the Paris Agreement, and the amendment also authorised the central government to issue a carbon credit certificate with the help of an organised agency.[37]

Another mechanism to control carbon emissions in the environment is a voluntary mechanism; a voluntary mechanism supports the inter-exchange of credit between the different corporations according to their needs. It supports

[34] Centre for Climate and Energy Solutions, 'Cap and Trade Basics' https://www.c2es.org/content/cap-and-trade-basics/#:~:text=In%20a%20cap%2Dand%2Dtrade,market%20establishes%20an%20emissions%20price accessed 20 March 2025.
[35] Bureau of Energy Efficiency, 'Carbon Market' https://beeindia.gov.in/en/programmes/carbon-market accessed 10 March 2025.
[36] Energy Conservation (Amendment) Act, 2022.
[37] Energy Conservation (Amendment) Act 2022, Sec. 14AA.

the credit mechanism where non-obligated entities or entities which are not covered under the compliance mechanism can avoid the issuance of the carbon credit system and still get the opportunity to register their project under the GHGs reduction project according to the regulation decided by BEE and recommended by NSCICM. The entities will get the accountability of ICM, which are not covered by the BEE, Ministry of Power. The other benefit is companies will be incentivised by paying less green tax and having less emission of CO_2 in the environment with carbon credit certificates.

V. Challenges Towards Adopting Green Technology in India

Whenever there is adoption of new things, there are always challenges which show the existing dilemma in the country for that particular matter. Here also, when the government adopted the green technology or certain rules for climate changes, there are certain challenges which are prevalent in the country, creates a hurdle in the achievement of an ambitious goal in a global context. The challenges can be discussed through the following points: -

i. **New Concept** – Green technology, climate change, and carbon credit trading system, all of these terms are very new to the Indian literate and urban population; currently, the manufacturers and consumers both have knowledge of it due to the incentives and the increasing pollution diseases. There are many MSMEs which are not covered under the CCTS due to lack of information. The regulatory authorities are only covering the power sectors, large manufacturing corporations and certain specific sectors which are covering the large amount of taxation system. This challenge can be addressed by creating awareness of the carbon credit trading system for the individual and manufacturers at the same time. The incentives should not be limited to corporations only; they should cover the individuals also. As far as

the current situation is concerned, the majority of the people in India are not much concerned about environmental issues due to lack of awareness and benefits provided by the government for it.

ii. **Multiple Agencies** – The green technology and their regulatory bodies are overlapping in nature. It can be understood through an example: the vehicle manufacturing company wanted to apply for a carbon credit system; they must have to go to the ICM registry, and every certificate can be traded on an electronic trading platform. This ICM registry is a voluntary registry under the control of the government but, again, not regulated by any specific provision and it same follows in the case of the electronic trading platform also. The company have to register themselves in a registry and trading platform which are regulated by the central government and follow their norms. On the other hand, for the emission capacity and the carbon control mechanism, they have to adhere to the state government policies, which leads the manufacturing company towards tax evasion or a green tax penalty. The green tax penalty may be enriching the revenue system of the country, but the enrichment of the environment is still questionable and incomplete.

iii. **Lack of Coordination and Legal Inconsistency** – Legal incentives, green cess, green tax penalty, benefits for using green technology, and benefits for following the less carbon emission, all of these things are interpreted and defined by legal provisions, interrelated to each other without any coordination with each other. The taxation system, implications of discounts, GST council notifications regarding the taxation purposes are covered by the Ministry of Finance, the Income Tax Act and the power of the GST council. Benefits of green technology, carbon credits and carbon trading systems are governed by BEE, the Ministry of Power, the Energy Conservation Act 2022 and

the central government. At every step, there is a new law, new regulation and new regulatory authority whose confirmation is necessary, and the unfollowing of one provision will lead to a new penalty, which is paid by manufacturing companies in avoidance of complexity and environmental concerns.

iv. **Inconsistency of Environment Impact Assessment** – The EIA framework adopted by India in the year 2006 and currently in 2025, after 19 years, the assessment framework has failed to ensure adequate protection for the individuals or punishment for the companies that are infringing environmental rights. The recent draft of 2020 created the furore in the country because it empowered individuals and manufacturing companies to cut trees without any permission, demolish the forest according to their needs, and not use special funds for the Environment Management Plan. Any use of groundwater with environmental compliance become not mandatory for any companies, etc. Due to widespread public criticism, the 2020 draft remains unratified, and the government is not giving any consideration to it. There is a lack of transparency, and the lack of potential in attaining the correct data leads to environmental degradation and social dilemmas.

v. **Patent Protection of Green Technology** – With the development of technology and moving towards the digital era, the concept of a green patent was introduced by the authorities. It is given under the perspective of supporting sustainable development and sustainability of the environment.[38] WIPO supports these patents in the global

[38] Intepat Interns, 'Green Technology Patent: A Key to Sustainable Development' (Intepat, 31 December 2024) https://www.intepat.com/blog/green-technology-patent-a-key-to-sustainable-development/ accessed 15 March 2025.

market and says that for the past 5 years the number of green patents has steadily increased, but when it comes to the Indian aspect, the number is very low and the licensing procedure is still complex. These complexities can only be removed when the proper rules and regulations are formed and the recognised authority addresses this issue.

VI. Judicial Activism in the context of Green Technology and Climate Change

Judicial activism is the activism which is led by the judges of the country by interpreting the law and moving beyond the traditional outreach in promotion of justice and legal rights. The concept of judicial activism is supported by the constitutional provision under the power of supreme court and high court judges. When it comes to the clear definition of the term, there is no clear and broadly agreed definition by the scholars and judges.[39]

When it comes to the relationship between judicial activism and climate change, it is often considered an interrelationship between them. Because there are certain rights and environmental justice that came into notice only when it is addressed and recognised by the judiciary. The above contention can be understood by the following judgements:

i. The judiciary defines the concept of the polluter pays principle in the case of the *Indian Council of Enviro Legal v. Union of India*,[40] which states that parties are responsible for their contributions to pollution and their impact on the environment.

[39] D Kmiec Keenam, 'The Origin and Current Meanings of Judicial Activism' (2004) 92(5) California Law Review http://dx.doi.org/10.15779/Z38X71D accessed 12 March 2025.
[40] *Supra* 7

ii. In the case of *M.C. Mehta v. Union of India*,[41] famous for the Taj Trapezium case, which defines the precautionary principle and highlights the need for guidelines for industries located near the Taj. The judgment highlights the issue that any action of industries should not negatively impact the environment, and the government should make proper regulations for climate change.

iii. In the case of *T.N. Godavaram Thirumlpad v. Union of India*,[42] the court provided protection of wildlife and forest and ordered the government to make strict rules and regulations for forests and wildlife.

iv. In the case of *M.K. Ranjitsinh v. Union of India*,[43] The Great Indian Bustard case, which supports the setting up of solar transmission lines in Habitat by highlighting the balance and need for renewable energy. In support of solar panels only, the Supreme Court upholds the order of the Appellate Tribunal of Electricity order and restores the tariff of 8.40 rupees per unit to various solar power holders and developers under the solar power project in Karnataka.

v. The Delhi Pollution case or *M.C. Mehta v. Union of India*,[44] the Supreme Court mandate that all buses in Delhi must be covered by CNG and there must be proper facilities for CNG pumps to be established by the year 2001.

All the judgements support one context: that technology should be used in favour of the environment, not in favour of the pollution and a degrading environment. The upliftment of the tariff and supporting the APTEL order by

[41] 1997] (2) SCC 353
[42] [2012] (3) SCC 277
[43] [2024] 3 S.C.R. 1320
[44] [1991] S.C.R. 866

the Supreme Court explain the judiciary's stand clearly in terms of the climate change aspect. In favour of environmental protection and using technology in support of it, former Chief Justice D.Y. Chandrachud mandated that all cases of government litigation must be e-filed from 1 January 2022, and no physical filings are accepted.

Thus, in recent years, it was seen on various occasions that the issue of climate change has been raised a lot in the galleries of court premises. It is now not only centred on political benefits; it is also part of the judicial institutions. From *M.C. Mehta v. Union of India*[45] to *Massachusetts v. Environmental Protection Agency*,[46] the judiciary not only enforces the right to a healthy environment as a fundamental right, but it also mandates the executive and legislative authority to do the needful acts in support of climate change with the help of technology.

VII. Suggestions and Conclusion

Green technology and climate change, both terms are interconnected with each other. This paper is demystifying this relationship with the help of legal implications. The role of green technology is discussed through the implication of various legal provisions, legal judgements and the legislative policies in moving toward the achievement of ambitious goals. In a dream of a sustainable future, the relationship between green technology, climate change and law must be established. Through technology, data collection and analysis, resource optimisation in less time and prediction of upcoming incidents can be achieved, which automatically helps in environmental protection and provides information related to sudden hazardous changes in

[45] *Ibid 30*
[46] [2007] U.S.497 (549)

the environment due to climate change. Through the use of IoT, a rise in AQI is determined, a rise in temperature and sensors that detect the wildfires and send intimation to the individuals.

However, again, every technology must be protected and regulated by the legal framework. The privacy right, accountability and transparency are still needed, which can be achieved through the strict legal framework only. The strictness should be adhered to properly, because once a technology is launched and access is given by the authorities, the idea of misuse and options for degradation of society is large. This paper discusses the approach of green tax policy and legal implications by considering the interests of individuals and manufacturing companies at the same level.

For eco-friendly vehicles, lower taxes and incentives should be imposed, but it should be done on time. The infrastructure of green mobility should also be increased because providing tax relief in the buying process of electric vehicles questions the current infrastructure system of fuel stations. While policy provisions appear robust on paper, their implementation is often Adoption is inconsistent. Adoption of renewable energy in the generation of electricity will move forward to a sustainable environment, and the replacement of electricity generation through conventional methods will decrease the carbon emissions in the environment. The use of water in another manner and less use of turbines will lead to less pollution in the environment. But again, the question arises for infrastructure support in the country for renewable energy.

This can be attained through the adoption of solar panels at a large level, and subsidies in support of solar energy[47] should also be increased. This ambitious goal of the Paris Agreement can be achieved through renewable energy and the goal of less carbon emission in the global market by ensuring continuous improvement in policies by the Indian government, adequate legal provisions, clear distinction of powers of regulatory authorities, providing adequate relief for using green technology and less carbon emission in a reasonable time, awareness of environmental issues in the general public and promotion of sustainable transformation in the country.

[47] Ministry of New and Renewable Energy, 'PM Rooftop Solar Programme Phase-II' (2019) https://mnre.gov.in/solar/schemes/ accessed 13 August 2025.

The Efficiency of Climate Litigation in Enforcing Environmental Rights: A Comparative Analysis of India, the U.S, and the EU

Pranaswi Kareti*

Abstract

Climate litigation is one of the main channels to comply with environmental rights and global response against climate change. This paper investigates the effect of climate litigation in a comparative way by studying the three jurisdictions i.e.; India, US and European Union. The study, scrutinizing legal systems; courts as well with the power of judicial activism and run-up of litigation to policy changes as well public opinion contends role of courts in aligning climate policy with implementation. India has made significant strides in advancing environmental rights through its public interest litigation framework and judicial activism but enforcement lags. As a foundation, the United States has a deep web of federal statutes and common law, but politics and money intervene to stop enforcement. The EU's (to be somewhat reductive about it) matched legal standards across member states and robust policing framework serve as an example for regional co-operation, c.f. procedural blockades. It delineates the core obstacles (such as narrow standing provisions, judicial capacity problems and political reluctance), highlighting the import of international law, NGOs and public opinion in detuning climate litigation. The paper in the end insists on legal systems as a vehicle to push systemic change, while other strategies, e.g. legislative reform, public engagement and international cooperation should be supported as needed to facilitate climate justice.

Keywords*: Climate litigation, environmental rights, judicial activism, policy influence, public awareness.*

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I. Introduction

Climate change is arguably one of the greatest challenges of 21st century with implications beyond each and every ecosystem, economy human right. Litigation is one of the strongest forces in enforcing environmental rights and to push for entity liability on climate change as governmental and corporate leaders falter on their climate obligations. Climate litigation is the use of the legal system to look at climate change issues such as mitigation, adaptation and for survival of vulnerable communities. Globally, this approach has caught fire with courts being more pointedly asked to interpret the meaning of climate-related laws, constitutional rights & international accords.

This paper studies the effectiveness of climate litigation in order to further human rights based environmental law practice by means of a comparative study on three different legal systems that are India, United states (US) and the European Union (EU). These are different systems from various legal, political and cultural contexts which shed their own light on how climate litigation plays out. Having a well consolidated form of public interest litigation in India, along with the incorporation of environmental right under their Constitution gives a special angle to the judicial activism in the Global South. This case of US, with its common law heritage and federalism provides an example of how courts can mold environmental governance in a hyper industrialized nation. The EU supranational legal system, focus on human rights and practices of adjudication in the service of climate objectives may provide a model for regional cooperation

Several dimensions of assessment the adequacy of climate litigation include legal frameworks for such cases, courts as enforcers and interpreters of environmental rights, impact of lawsuits on policy & be corporate behavior and difficulty for litigants in terms of forcing change. The paper contrasts

related jurisdictions to identify best practices, learning and barriers to climate litigation as a means of advancing environmental justice.

This paper aims ultimately to add to the emerging stream of literature on climate litigation by clarifying what the promise and peril of litigation might look like in different contexts. As the climate crisis escalates, courts will be all the more important to protect environmental rights and promote accountability. This paper highlights the significance of using legal systems to promote climate justice and guarantee the rights of both living and future generations.

Research Problem

Climate litigation is a new and fast developing area of law that includes various litigations connected to climate change, but hardly anyone has systematically delved into full potential and effectiveness as yet. Research issue of this paper is with respect to climate litigation existing globally, but ambiguous how it truly works in other jurisdictions like in India, the US and the EU An inquiry carries the implication that while these jurisdictions may not be equal in their implementation and results for policy, the range of a courts enforcement powers on environmental rights and holding entities to account is multi-fold and nuanced. In this sense the study seeks to answer how judicial activism and PIL intersect with international commitments (as well as the obstacles/benefits climate litigation provides) in order to gauge the possibilities, it offers for environmental justice.

Literature Review

Setzer, J., Narulla, H., Higham, C., & Bradeen, E. (2021). Climate Litigation in Europe: A Summary Report for the European Union Forum of Judges for the Environment. EU Forum of Judges for the Environment.

This Report discusses how the climate litigation is emerging in Europe more as an instrument to pursue states and corporations on climate action. The authors set out to discuss some of the core concepts in climate litigation and the legal foundations that allow such actions to take place as well as how courts interpret climate-responsive laws. The research shows how climate litigation in Europe is enabling environmental justice and targeting both state actors and corporations for their role in the causes of climate change the article highlights the judiciary's role in bridging the voids of political and legislative delay, and a roadmap on litigation in the face of climate change in the region.[1]

Basseches, J. A., Bromley-Trujillo, R., Boykoff, M. T., Culhane, T., Hall, G., Healy, N., Hess, D. J., Hsu, D., Krause, R. M., Prechel, H., Roberts, J. T., & Stephens, J. C. (2021). Climate Policy Conflict in the U.S. States: A Critical Review and Way Forward. Environmental Politics, 30(5), 752-774.

This article offers a systematic review of the disputes around climate policy at the state level in U.S., specifically along fights between state governments and the federal authorities with respect to climate change. The ways in which these conflicts create with the climate litigation are studied, aiming to show how they influence effectiveness and results of legal actions at the state level going on nowadays through the authors reflection. The paper highlights some of the major barriers to success in climate litigation, notably political opposition and standing problems, and provides ways to navigate around these obstacles.

[1]Joana Setzer, Harj Narulla, Claire Higham and Emma Bradeen, Climate Litigation in Europe: A Summary Report for the European Union Forum of Judges for the Environment (EU Forum of Judges for the Environment 2021).

Relevant in unlocking how state environmental law can enable or inhibit climate change mitigation in the U.S.[2]

Jacob, V. A. (2021). Climate Litigation in India: An Overview. Environmental law Review, 23(1), 42-58.

The legal India movement in relation to climate litigation has been briefly reviewed by Jacob (2017) indicating role of Indian judiciary to some extent at environmental issue especially focusing on Climate Change. It sketches out the principal PIL case which have impinged upon India's climate change agenda. Jacob details the hurdles like the pangs of legal standing and judicial competence litigants might face but underlines how an emerging field of climate litigation holds the promise of both policy gains to India and a ramping up of its international climate commitments.[3]

Colombo, E., & Giardiasis, A. (2020). Comparative International Litigation and Climate Change: A Case Study on Access to Justice in Adaptation Matters. Journal of Environmental Law, 32(4), 550-579.

The paper is a comparative study of international climate litigation with emphasis on the access to climate justice for adaptation concerns. In this respect, the authors analyze the question of climate adaptation from various legal systems and impediments to justice confronting the marginalized sections of society. They contend that access to climate litigation can deliver greater fairness but only if the factual barriers to accessing justice — the difficulty of standing and judicial need for specific legal skills are dealt with

[2] Joshua A Basseches and others, 'Climate Policy Conflict in the US States: A Critical Review and Way Forward '(2021) 30 *Environmental Politics* 752.
[3] Vidhya A Jacob, 'Climate Litigation in India: An Overview '(2021) 23 *Environmental Law Review* 42.

in legal systems. The research also mentions that international legal instruments are indispensable for promoting climate change adaptation around the globe.[4]

Aristova, E., & Lim, J. (2020). Climate Litigation in Europe Unleashed: Catalyzing Action against States and Corporations. Edward Elgar Publishing.

Aristova and Lim in this edited volume focus particularly on European climate litigation as a means through which both state and corporate actors can be pursued. Looking at significant cases it offers a comprehensive insight into the power of law to prosecute governments and corporations for their contribution to climate change. The editors call attention to the growing practice of taking governments to court to further environmental policy and demand states/corporations to improve their climate protection policies/forms. The piece sheds light on the facets in how climate litigation in Europe can impact policy debate, public mood and business independent from more considerate repercussions.[5]

Scope of the study

This research paper explores climate litigation as a means, for the promotion of environmental rights on the basis of three significant case studies: India, United States and European Union. The study is limited to common law countries (India/United States) or common law inspired jurisdictions (EU) in general. The research will genuinely look at jurisprudential precedents of climate litigation, in-depth look at how courts in those jurisdictions construe

[4] Elena Colombo and Alessandra Giadrossi, 'Comparative International Litigation and Climate Change: A Case Study on Access to Justice in Adaptation Matters '(2020) 32 *Journal of Environmental Law* 550.
[5] Ekaterina Aristova and Joanne Lim (Eds), Climate Litigation in Europe Unleashed: Catalyzing Action against States and Corporations (Edward Elgar Publishing 2020).

and enforce environmental rights, how that is shaping policy making & public awareness.

Objectives of the study

1. To understand the conceptual framework and significance of climate litigation as a tool for enforcing environmental rights.
2. To analyze the intersectionality and challenges of climate litigation across jurisdictions, focusing on India, the United States, and the European Union.
3. To critically evaluate the effectiveness of climate litigation in influencing policy-making, raising public awareness, and mobilizing support for environmental action.

Research Questions

1. Whether the intersectionality has or a rift between climate litigation and national enforcement mechanisms of environmental rights in India, US, EU?
2. Whether climate litigation playing a critical role in influencing the rule of law and environmental governance in India, the U.S. and the EU?

Hypothesis

Climate litigation has become an important way in which environmental rights can be enforced, policies can be nudged in certain directions by challenging decisions within courts and governments/corporations held accountable. The truth is its effectiveness differs between jurisdictions, driven by things like the legal structure, judicial activism, and political will. Courts are important in climate governance, but climate litigation standing by itself is not enough to actually ensure an environmental protection unless enforced by, legislation

and public participation. While climate litigation has a big potential of constitutional change, it is constrained in justiciability, economic interests and geopolitics leading it to be a potent but limited legal weapon against climate change.

Research Methodology

This study adopted descriptive and critical methods with both primary and secondary data collection. Primary data is comprises of statutes, case laws and legal writings while secondary data is constituted in articles, journals and blogs and website. These serve as a complete background on climate litigation in India, US and EU pros, present scenario, legal framework etc. The research is strongly influenced of existing legal perspectives, judicial activism and important cases without implementing any field study. Relevant indicators are seen in the analysis of climate litigation success rates with regard to environmental rights, the relevant nature of the policies, public recognition and challenges. The role of international law and NGOs are also evaluated at a critical level. Findings are discussed with policy implications and next steps for climate litigation research.

II. Climate Litigation: Concept and Importance

Climate litigation is the use of judicial or quasi-judicial processes to resolve legal claims arising from climate change.

That includes public lawsuits brought against governments, companies and other parties asserting environmental rights claims or with the objective of preventing climate change; the damage caused by it among others.

The breadth of climate litigation expanded substantially in the last few decades since human rights law began to pay increasing attention to environmental rights and the immediacy of climate action.

Historically, climate litigation developed as a subdiscipline of environmental law and within jurisdictions with statutory public interest standing, and judicial review mechanisms for government action etc. The earliest cases grounded in climate change, often referred to as the first wave were "compliance" based, where parties sued governments for not enforcing environmental laws. From climate science further developing, the second wave of climate litigation then was focused on a request for governments to move towards more aggressive climate policy and reduce greenhouse gas emissions. Most recently, this culminated into a third wave that focuses on corporations and financial institutions for their participation to climate change (mostly tort law, human rights law, fiduciary duty…etc.).

Climate litigation globally has expanded in recent years as the increasing impact of international climate agreements like Paris Agreement (2015) takes root. The courts have accepted the matter as serious over recent years, with key decisions creating a new legal framework that punishes governments and companies that have damaged the climate. This legal evolution has turned climate litigation into a vital instrument of environmental governance.

Importance of Climate Litigation in Addressing Environmental Degradation and Enforcing Environmental Rights

Climate litigation is of outmost importance when it comes to the prevention of environmental destruction and the promotion of environmental rights through legal responsibility of governments as well corporations. The

importance of climate litigation can be understood by three dimensions of climate litigation: The legal enforcement; Policy advocacy; public awareness.

a) Legal Enforcement of Environmental Rights: Climate litigation bolsters the enforcement of environmental rights by creating a legal mechanism for individual, communities and organizations to litigate for unlawful environmental harm. For jurisdictions that have constitutional provisions to recognize environmental rights, such as India and the European Union at that stage climate litigation has been a critical vehicle to force governments to live up such rights. In India for example, The Supreme Court has expansively interpreted Article 21 of the Constitution i.e., the right to life, to include the right to a clean and healthy environment. Significant cases like MC Mehta vs Union of India (1987) were passed to enforce Judicial activism for environmental protection.[6] Likewise in the European Union, courts have grounded environmental rights in the lex humana juris based on human rights as evidenced by decisions of the European Court of Human Rights.

b) Influence on Climate Policy and Legislative Frameworks: Climate litigation is an intervention to drive policy change by order governments to enact more robust climate policies and enforce existing environmental laws. The judiciary has been making forays in requiring national policies to converge with international climate commitments. Years ago, climate finance would never have passed for example, cases like Massachusetts v. EPA in the US (2007) led to greenhouse being considered pollutants under Clean Air Act and

[6] *M.C. Mehta v Union of India*, AIR 1987 SC 1086.

regulatory efforts at federal level.[7] Further, litigation can amplify regulatory voids and weaknesses leading legislative bodies to write new laws or revise past statutes. With the case of Urgenda Foundation v. The Netherlands (2007) in the EU being a preeminent example, which put climate risks on the Dutch government to update its policy leading this was judicial intervention in climate governance.[8]

c) Raising Public Awareness and Mobilizing Climate Action: In addition to legal and policy implications, climate litigation is also significant in raising public discourse on climate change and building consultation for a greener society. Climate cases of the highest public profile tend to generate interest and debate among media on environmental matters Strategic litigation on the part of non-governmental organizations (NGOs) and advocacy organizations to shine the spotlight onto corporate and governmental inaction on climate issues has been particularly effective. Public support for the climate justice movements have been notably increased by cases such as the national origin Juliana v. United States lawsuit (2016), which involves young plaintiffs claiming a constitutional right to a climate in which they can fulfil themselves.[9] Corporate climate litigation, e.g. lawsuits against fossil-fuel companies for not telling the truth about climate damages, is another aspect of growing corporate accountability and investment policy changes.

d) Role of Courts in Bridging the Gap Between Policy and Implementation: Climate litigation has the most important

[7] *Massachusetts v EPA*, 549 U.S. 497 (2007).
[8] *Urgenda Foundation v The Netherlands*, ECLI:NL:HR:2019:2007, [2019] NJ 453.
[9] *Juliana v United States*, 217 F. Supp. 3d 1222 (D. Or. 2016).

contribution being that in closing the feedback loop between climate policies and their actual delivery. Governments have the UN treaty obligations as well, but lots of countries adopt climate targets and enforcement mechanisms within the international agreements are often thin and implementation lags following many a time. Courts have indeed stepped in to close this enforcement gap by reading constitutional, statutory and international law obligations as facilitating climate action.

e) Judicial Review and Government Accountability: Courts provide a check on government inaction or inadequate climate policies by reviewing executive decisions through judicial review. Courts in jurisdictions with robust judicial review have ordered governments to take emissions reduction and community protection measures. The Indian judiciary has taken upon itself to initiate judicial intervention on environmental issues by interpreting the wide scope of basic rights as interpreted in some of the recent judgments of Indian Supreme Court. For example, the court in M.C. Mehta v. Union of India interpreted the right to life to include the right to a clean environment.[10]

f) Corporate Accountability and Climate Responsibility: We see that the push for corporations to be held responsible for climate change is growing with more and deeper climate litigation. Climate-related harm suits against polluters, mostly in the U. S. and Europe have been seeking compensation from companies as well as demanding the entities concerned disclose their climate risks. The idea of climate-

[10] *M.C. Mehta v. Union of India,* AIR 1987 SC 1086.

related fiduciary duties is catching wind, and courts look into whether executives and boards are being considerate of climate risks in decision making.

g) Judicial Activism and Evolving Legal Standards: In many respects, judicial activism has been essential in creating new legal norms around environmental protection. Human rights laws have been interpreted by courts to contain climate change provisions, thus recognizing environmental harm as a breach of basic rights. This emerging jurisprudence has shed light onto new legal routes for climate litigation and pushed courts to take a more dynamic approach in environmental matters.

III. Legal Frameworks for Environmental Rights and Climate Change.

India

Environmental Rights and Climate Change Litigation in India: its substrate being the Constitution, statutory laws and judicial activism. Article 21 under the Constitution of India lays the foundation for environmental protection that says no person shall be deprived of his right to life and personal liberty. The Supreme Court of India has interpreted this as a right to clean environment, which in turn ensured environmental protection as basic right. Lastly, The Directive Principles of State Policy (Art 48A and 51A(g) make it obligation for the State as well its citizens to safeguard and improve environment.[11]

Central government also has competence under the Environmental Protection Act, 1986 to legislate in relation to the protection and enhancement of environment. It vests in you the legal right to deal with environmental matters

[11] Constitution of India 1950, arts 21, 48A and 51A(g).

such as climate. The National Green Tribunal (NGT) set up in 2010 under National Green Tribunal Act,2010 is primarily responsible for hearing and determining cases relating to environmental disputes as well with environmental laws. Civil proceedings under the NGT on environmental issues and main judge for climate conflicts.[12]

India's environmental jurisprudence has been deeply influenced by judicial activism. Absolute liability for industries in the field of hazardous activities has been laid down in M.C. Mehta v. Union of India (1987) by the apex court for which such companies are responsible for any environmental damage.[13] The concept of sustainable development as one of Indian environment law was launched in case Vellore Citizens Welfare Forum v. Union of India (1996)[14], focusing on the equilibrium between economic development and environmental protection.

In the wake of recent climate related cases, the judiciary has taken on a prominent position to deal with climate change matters. Such as NGT has taken matters up air pollution, deforestation and carbon emissions because people are now realizing climate litigation is a reality in India too.

United States

United States maintains a comprehensive legal structure to protect the environment, in large part exercising federal statutes and common law. Federal statutes in the clean air and water sectors are the Clean Air Act (CAA), Environment and Public Land (CWA). The Environmental Protection Agency

[12] Environmental Protection Act 1986, National Green Tribunal Act 2010.
[13] *M.C. Mehta v Union of India*, AIR 1987 SC 1086.
[14] *Vellore Citizens Welfare Forum v Union of India*, AIR 1996 SC 2715.

(EPA) is the main federal agency that has jurisdiction over the implementation of these laws and climate change.[15]

Climate change litigation uses common law principles of public trust and nuisance The public trust doctrine is a common law principle that says the government holds natural resources in trust for the public with a duty to protect and preserve them for future generations[16]. Nuisance law enables persons who are injured to obtain redress for damage caused by environmental contamination.

Climate litigation in the US has been defined by a few landmark cases. In Massachusetts v. EPA (2007), the environmental foundations were laid when Supreme Court ruled greenhouse gases as pollutants under Clean Air Act therefore requiring the EPA to regulate them.[17] That case was a high-profile and pivotal moment in climate case law: establishing the judiciary as probative climate change solution. SL and Helme (2015) Juliana v. United States a case that was filed by a group of young plaintiffs claimed that the government had infringed its constitutional rights endangering life, liberty and property.[18] This case, while hindered procedurally noted the climate case law as a new avenue in which to hold Governments to account.

Climate lawsuits at the state level have also heated up, recently fossil fuel companies are named targets of lawsuits from different states and cities claiming damages for climate harms[19]. They are the latest in a spate of climate

[15] Clean Air Act 1970, 42 USC § 7401; Clean Water Act 1972, 33 USC § 1251.
[16] *Illinois Central Railroad Co. v Illinois*, 146 US 387 (1892).
[17] *Massachusetts v EPA*, 549 U.S. 497 (2007).
[18] J*uliana v United States*, 217 F. Supp. 3d 1222 (D. Or. 2016).
[19] *City of New York v. BP plc*, 325 F.Supp.3d 466 (SDNY 2018).

litigation cases, seeing as how courts are increasingly utilizing litigation to tackle climate change.

European Union

European Union (EU) has a very extensive legal framework on environmental law with broad powers to implement this from EU Directives, Regulations and international conventions. EU Environmental Directives and Regulations offer a common approach for environmental protection at the level of all Member States the European Court of Justice (ECJ) basically has a major role in the interpretation & enforcement of these laws ensuring compliance with European environmental norms.

The Aarhus Convention, ratified by the EU ensures public access to information, participation in decision-making and access to justice in environmental matters[20]. Litigating has become more important in realizing environmental rights under the above-mentioned convention within the EU, this convention.

Landmark cases have shaped the EU's approach to climate litigation. In Urgenda Foundation v. The Netherlands (2015), the Dutch court decided that as a government the state had «the obligation to protect its citizens from greenhouse gas emissions.[21]

This case established a cause for the world to hold governments to account in their climate action commitments. The Peoples Climate Case (2018) a group

[20] Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus, Denmark, 25 June 1998) 2161 UNTS 447 (Aarhus Convention).
[21] *Urgenda Foundation v. The Netherlands*, ECLI:NL:RBDHA:2015:7145, [2015] HA ZA 13-139.

representing individuals and their kid's youth organization challenged the EU's 2030 climate targets as not protective enough of their fundamental rights.[22] The case was thrown out of court on procedural grounds, but underlined the scope of litigation to shape climate policy.

ECJ recent case law developments have also strengthened the position of climate litigation in the EU. For example, the court has ruled that EU climate policies are legal and built a case for severe implementation of environmental enforcement laws[23].

IV. Comparative Analysis of Legal Framework

Environmental Rights and Climate Litigation in India, the US, and the EU showcases similarities as well as distinct features of its legal frameworks. Though all three jurisdictions appreciate the need for climate change amelioration and are open to judicial intervention, the way in which each approach it varies according their traditions of jurisprudence and institutional arrangements. In India the Judiciary has proactively interpreted constitutional and statutory provision to protect environmental rights. NGT has grown to be administrative decision tribunal for climate-based disputes which shows the country ambitions under the realm of environmental justice.[24] Climate litigation in the United States is founded on federal statutes and common law principles. The court has stepped in to interpret these laws for environmental reasons, evidenced by decisions such as Massachusetts v. EPA and Juliana v.

[22] *Armando v Council*, Case T-330/18, ECLI:EU:T:2021:282.
[23] *European Commission v Poland*, Case C-441/17, ECLI:EU:C:2018:255 (2018).
[24] MC Mehta v Union of India AIR 1987 SC 1086; Vellore Citizens Welfare Forum v Union of India AIR 1996 SC 2715.

United States.[25] However, the political and economic pressures also apply to implementing court orders.

In the European Union for example, there is such a harmonized legal framework that fulfils environmental protection from a top-down perspective (directive and regulation) by law. The ECJ has been crucial in the implementation of those laws to comply with international climate-deals such as the Paris Agreement.[26]

While all three jurisdictions use litigation to enforce environmental rights, there is the (so-called) three-jurisdictions-environmental rights by litigation norm: India and judicial activism; US as topic of statutory and constitutional interpretation, EU as harmonized legal standards international commitments.

V. Tiveness of Climate Litigation: Successes, Challenges, and Broader Implications.

One of the key instruments for realization of environmental rights and climate change is Climate litigation. It has varying degrees of success depending on legal systems, judicial interpretations and socio-political contexts. This part compares court orders success- and enforcement-rates, the effect of litigation on policy-making and activism for change and the obstacles and constraints of climate litigation. It looks at how international law, NGOs and public opinion impact the evolution of climate litigation.

[25] Massachusetts v Environmental Protection Agency 549 US 497 (2007); Juliana v United States 217 F Supp 3d 1224 (D Or 2016).
[26] Urgenda Foundation v The Netherlands ECLI:NL:RBDHA:2015:7145, HA ZA 13-139 (24 June 2015); Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, opened for signature 25 June 1998, 2161 UNTS 447 (entered into force 30 October 2001); Paris Agreement, opened for signature 22 April 2016, UNTS I-54113 (entered into force 4 November 2016).

Success Rates and Enforcement of Court Orders

As the enforceability of court orders and compliance of governments/corporations is the backbone of climate litigation, quite a lot depends on this. The Indian judiciary has pioneered in the area of granting enforceable environmental rights by way of some of the seminal judgments like M.C. Mehta v. Union of India and Vellore Citizens Welfare Forum. However, challenges such as lack of effective of operationalization and shortage of resources remain the primary role of NGT in environment compliance.[27]

In the U.S. where instances like Massachusetts v. EPA have prompt stringent regulation of greenhouse gases. Nonetheless enforcement is frequently met with political and economic forces, as evidenced by the recent procedural hurdles which blocked judicial relief in Juliana v. United States.[28]

In the longer term, the EU has been more compliant with its court obligations as evidenced by many cases flags like the Urgenda Foundation v. the Netherlands, where the court ordered the Dutch government to cut emissions. The European Court of Justice (ECJ) likewise declared the validity of EU climate regulations to assure fulfilment with international obligations.

Influence on Policy-Making and Legislative Changes

Climate litigation has altered policy and legislative developments in multiple jurisdictions. In India, judicial interventions have resulted in environmental policy making and the creation of NGT as well other bodies to administer law

[27] M.C. Mehta v Union of India, AIR 1987 SC 1086; Vellore Citizens Welfare Forum v. Union of India, AIR 1996 SC 2715.
[28] *Massachusetts v EPA*, 549 U.S. 497 (2007); *Juliana v. United States*, 217 F. Supp. 3d 1222 (D. Or. 2016).

directly. National climate strategies aspired by the judiciary with respect to sustainable development, however implementation lag in many areas.

Climate regulation is one such example, as the United States sees regulation by litigation such as the EPA regulating greenhouse gases in the Clean Air Act. The politicizing of climate cites often negates judicial decisions.

In the context of European Union, climate litigation has been used to reinforce the implementation of EU Directives, but also in international treaties (as) in the case with the Paris Agreement.

Collected case in point: the People's Climate Case, this illustrates the point of serious climate targets end up driving policy debates in countries and European Union.[29]

Public Awareness and Mobilization

Climate litigation is a watershed in bringing the climate into mainstream and creating public support for taking climate actions. PILs in India have been instrumental to make environmental issues a force to be reckoned with and hence brought the civil society as well media under radar for climate calling.

In the USA, high profile US cases such as Juliana V. United States have led by example for youth climate movements championing the features of the intergenerational equity in climate change.[30]

[29] Armando v Council, Case T-330/18, ECLI:EU:T:2021:282.
[30] *Juliana v United States* 217 F Supp 3d 1224 (D Or 2016)

While cases such as the Urgenda Foundation v. the State of Netherlands in the European Union has inspired similar lawsuits across Europe, putting government climate responsibility back onto the public debate.[31]

Challenges and Limitations

Although climate litigation has had some successes, it is constrained by a number of obstacles too.

Legal standing and access to courts: Access to the courts is still a formidable hurdle, especially for jurisdictions with tight standing rules. PILs in India though widened the door of justice but has procedural red tapes and lack of resources restrict the litigation from being effective. In the US, standing requirements generally make it difficult for plaintiffs to bring climate-related lawsuits.

Judicial Capacity and Expertise: Judges do not become climate scientists overnight, and the subtleties of climate science can create difficulty for judges. Courts lack the technical expertise to decide climate conflicts on their own, and so external experts have ended up playing a role which creates potential for incoherency in judgements.

Political and Economic Pressures: Climate litigation is almost always a target of robust political and economic pressures. Fossil fuel companies have fought unsuccessfully at the US Congress to regulate climate change making enforcement of court orders impossible. In India, there are economic development and environmental considerations that sometimes may contradict.

[31] *Urgenda Foundation v The Netherlands* ECLI:NL:RBDHA:2015:7145, HA ZA 13-139 (24 June 2015)

Role of International Law

Climate litigation usually has an underlying concern but international law is what determines it. In addition to the Paris Agreement itself, it put into place a structure for national climate actions which have since generated judicial interpretations on governmental obligations. Cross-border litigation and extraterritorial jurisdiction are also significant, characterised by the limitation that multinational corporations risk liability for climate harms committed in other jurisdictions.

Role of Non-Governmental Organizations (NGOs) and Public Opinion

NGOs and other public opinion NGOs are playing huge roles via strategic litigation and advocacy to shape climate litigation efforts. In India, NGOs such as Centre for Science and Environment have filed PILs with public support. The United States has had organization as Our Children's Trust propel youth-led climate lawsuits. Non-governmental organizations in Europe, for example, such as Client Earth are using litigation to enforce environmental laws and hold governments to account.

Long with its educating nature and extensive media coverage, it is shaping public opinion on climate litigation and pushing for climate action on multiple fronts by stressing judicial decision making.

VI. Conclusion

While climate litigation is a critical response to enforcing environmental rights and global climate crisis, its success hinges on differences in legal setup and judicial practices across jurisdictions due to their varying socio-political setting. Judicial activism and public interest litigation have played a crucial role in the evolution of environmental rights jurisprudence in India judicial

precedents such as M.C. Mehta vs Union of India and the creation of National Green Tribunals (NGT) were landmark cases. Yet this has been severely inhibited by challenges like slow implementation and weakness in resourcefulness to achieve much more.

Climate litigation in the United States has built upon these federal statutory underpinnings, along with the Clean Air Act and common law principles such as the public trust doctrine. Section 202 has led to countless pieces of regulatory action through cases like Massachusetts v. EPA but a litany of political and economic tugs will usually precede this enforcement. The European law provides clear demonstration of harmonised legal standards and a capable judicial enforcement from top echelon as shown in cases like Urgenda Foundation v. The Netherlands and Peoples Climate Case. Crucially, the EU´s position in international agreements such as the Paris Agreement only buttresses its climate litigation framework. Nevertheless, climate litigation is plagued with difficulties, such as narrow standing requirements for suit; limited judicial capacity; and political resistance.

Complementing this, international law NGOs and perceptions of the opinions have been important in the escalation and impact of litigation also there are no real changes. Finally, climate litigation is an important instrument to achieve environmental justice, but it is no panacea. A little bit of its efficacy rests on the robust legal framework, independent judiciary and adherence by both state and its corporations to court rulings. The court, in tackling the climate change crisis will play a more critical role if their authority to protect the environment and access justice is to be fully realized. The research highlights taking use of legal frameworks to push for broad structural reforms, with complementary approaches including policy change via legislation, public participation and international collaboration.

Laws need to be made, interpreted and interpreted as instruments to achieve a symbiosis of constitutional principles on the one side and societal values on the other, not allowing for moral (public mores) as well as constitutional infringing. The legal set-up should evolve over time to keep up with the progression of society, supporting in a balance that it is more just. The Constitution as Constitutional Morality to steer the nation in a direction of progressive advancement and not decadence which is in keeping with the rule of law and values enshrined in the Constitution.

The Role of AI in Achieving the Sustainable Development Goals (SDGs)

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Abstract

Artificial Intelligence (AI) is a transformative technology with the potential to significantly contribute to achieving the United Nations' Sustainable Development Goals (SDGs). This paper explores the opportunities and challenges of leveraging AI to address global issues such as poverty, hunger, healthcare, education, and climate action. AI can play a crucial role in eradicating poverty by optimizing resource allocation, predicting socio-economic patterns, and automating aid distribution. In agriculture, AI-powered precision farming techniques can enhance productivity, reduce waste, and improve food supply chain management, contributing to zero hunger. AI also has the chance to reinvent healthcare by improving diagnostics, personalizing treatment plans, and enabling remote patient monitoring. Furthermore, AI can enhance the quality of education through personalized learning experiences, language translation, and increased access to educational resources. However, the deployment of AI in pursuit of the SDGs also presents challenges and ethical considerations. Issues such as data privacy, algorithmic bias, and the digital divide need to be addressed to ensure equitable and sustainable outcomes. It is essential to establish robust regulatory frameworks, promote transparency in AI systems, and prioritize inclusivity in AI development processes. By carefully navigating these challenges and harnessing the power of AI responsibly, we can accelerate

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progress toward achieving the SDGs and create a more sustainable and equitable future for all.

I. Introduction

Science has made significant developments, but the evolution of the Earth is certainly a mysterious thing that has not been completely solved. Many questions have been unanswered. Starting with the earlier times, the world became the center of survival of the fittest. [1] Resources are unevenly distributed globally, creating inequality.

The gap between Developed Nations and Developing Nations gets bigger in this process. To bring equality and uplift human living conditions in all spheres of the world, the countries of the world formed a consensus and agreed to help each other. Several goals were set, primarily known as Millennium Development Goals (MDGs), that were implemented from 2000 to 2015.[2] During this period, the prime focus was on eradicating extreme poverty, improving health, and providing education to increase the literacy rate. After the period of the MDGs in September 2015, the United Nations officially adopted the Sustainable Development Goals. Sustainable Development is a significant step in reaching human advancement, or at least reaching a level where people should live a dignified and happy life.

A development well managed by each section and perspective and keeping the needs of the present generation fairly without compromising the ability of

[1] J Grilli, S Suweis and A Maritan, 'Growth or Reproduction: Emergence of an Evolutionary Optimal Strategy' (213) 2013 Journal of Statistical Mechanics: Theory and Experiment P10020.

[2] 'The Millennium Development Goals: Experiences, Achievements and What's next | Semantic Scholar' <https://www.semanticscholar.org/paper/The-Millennium-Development-Goals%3A-experiences%2C-and-Lomazzi-Borisch/157832b38ec4b0c8c3f413bf432f04ad90e69359> accessed 18 September 2024.

future generations to meet their own needs.[3] This type of development focuses on a balance between economic growth, environmental protection, and social equity, ensuring long-term ecological health and human well-being. There is a total of 17 SDGs; in this essay, we will be primarily focusing on No Poverty, Zero Hunger, Good Health and Well-being, Quality Education, Affordable and Clean Energy, and Climate Action. All the sustainable development goals are interrelated to each other; if one is achieved, then its impact will be felt on other goals. For example, achieving equality will develop the education rate and economic growth as men and women both will contribute equally without any disparity, stigma, or social backlash.[4] This needs a collaborative effort from all sectors of society, like the government, the private sector, and civil society.

These developments will be well managed with the help of Artificial Intelligence. Artificial Intelligence is a revolution that is bringing many changes to the world dynamics. It refers to the development of computer systems that can stimulate human behavior and give results without interference from humans. AI has a wide range of services, starting with learning, reasoning, problem-solving, understanding natural language, perception, and decision-making.[5] AI can resolve intricate human issues and holds promise for application in various sectors, including education, healthcare, finance, and technology.

[3] 'Sustainable Development: A Critical Review | Semantic Scholar' <https://www.semanticscholar.org/paper/Sustainable-development%3A-A-critical-review-Lele/6c8698d9b7736119913f2095696f1ce8c45caa5c> accessed 18 September 2024.
[4] Luis Miguel Fonseca, José Pedro Domingues and Alina Mihaela Dima, 'Mapping the Sustainable Development Goals Relationships' (2020) 12 Sustainability 3359.
[5] R Pugalenthi and others, 'Artificial Learning Companion using Machine Learning and Natural Language Processing' (2021) 24 International Journal of Speech Technology 553.

AI can significantly assist in achieving sustainable development goals by analyzing data to inform better policies, developing personalized courses for individuals, optimizing traffic management, creating algorithms for improved agricultural combinations to address Zero Poverty, and many other applications that will be discussed in the upcoming sections of this essay. While AI is useful, at the same time, it presents different challenges, like ethical considerations and equitable growth.

This paper is structured to present each potential application of AI towards achieving specific Sustainable Development Goals (SDGs) alongside its corresponding limitations and challenges. For instance, in discussing AI's role in agriculture, the section will also examine barriers such as infrastructure gaps, financial constraints, and climate-related risks. Similarly, in education and healthcare, each opportunity will be followed by critical considerations, including ethical concerns, data bias, and accessibility issues. This approach ensures that the reader is not left with unqualified assertions in the first half and criticisms concentrated in the second, but rather receives a balanced perspective throughout the discussion.

II. AI and Specific SDGs: Opportunities and Applications

No Poverty

Elevating poverty remains the main goal of sustainable development. Poverty bars people from access to different things such as education, health care, technology, etc. Although the government, various NGOs, and the private sector make significant efforts to eradicate poverty, these efforts often fail to meet people's basic needs. In India, the government runs different schemes, like a public distribution system where they provide free rations to needy people, but there have been significant cases where the system has been

misused.[6] By analyzing existing socio-economic data and identifying areas of increased risk of poverty, artificial intelligence can assist governments in maximizing resource distribution. However, the availability and accuracy of the underlying datasets constrain this opportunity.[7] The absence of a post-2011 census within India limits the level of detail of demographic information, making it difficult to identify contemporary socio-economic trends.[8] AI algorithms depend heavily on existing administrative and survey data (e.g., NFHS, NSSO, or SECC), which are possibly outdated or incomplete. Therefore, any AI-powered poverty mapping or targeting must be supplemented by periodic high-quality data gathering initiatives, possibly using satellite imagery[9], cellphone data, or online surveys in real time.[10] Early detection of poverty can also be predicted with the help of AI; it can analyse job losses or market disruption, ultimately providing efficient data in advance, through which the government can make different programs to prevent those households from going into poverty. Efficient policymaking helps policymakers understand patterns and implement them with the greatest effectiveness possible. AI can optimize resource allocation through real-time

[6] Parmod Kumar, 'Functioning of the Public Distribution System in India: An Empirical Evaluation' (2010) 39 Outlook on Agriculture 177.
[7] Shreehari Paliath & IndiaSpend, Delayed census: How India's welfare schemes are suffering, India Dev. Rev.,https://idronline.org/article/advocacy-government/delayed-census-how-indias-welfare-schemes-are-suffering/ (last visited Aug. 8, 2025).
[8] Finshots, Why India can't afford a delayed census anymore, Finshots (Aug. 8, 2025), https://finshots.in/archive/why-india-cant-afford-a-delayed-census-anymore/.
[9] Ola Hall, Francis Dompae, Ibrahim Wahab & Fred Mawunyo Dzanku, A review of machine learning and satellite imagery for poverty prediction: Implications for development research and applications, 35 J. Int'l Dev. 256 (2023), https://doi.org/10.1002/jid.3751.
[10] Steele et al., Mapping poverty using mobile phone and satellite data, 14 J. R. Soc. Interface 20160690 (2017), https://doi.org/10.1098/rsif.2016.0690.

monitoring and distribution, cost reduction in program delivery, and fraud detection.[11]

If the government launches a scheme to assist low-income individuals, AI can identify the most in-need individuals using existing government data and automatically distribute benefits to them. This will reduce the cost spent for management of this data and transportation expenses, and it checks for fraud if it happens anywhere.

It can assist with cash transfers by analyzing individuals' economic data and ensuring that the transferred amount of money is appropriate, neither excessive nor insufficient, thus enabling them to meet their basic expenses without redundancy. People with low income and fewer skills can match their job profiles through an AI-driven platform. There have been many examples of AI-driven growth; one notable performance is *Sahyog: AI-Powered Financial Inclusion through Digital KYC.*[12] This is a startup based on AI algorithms and data that facilitates people from rural India connecting with the banking system. In rural India, many people don't have the proper documents required for formal KYC, and because of this, they are unable to apply for loans and open bank accounts. This app assists users by simplifying the process; they only need to upload a photo of an individual, and Sahyog will automatically verify it using software based on optical character recognition. This reduces the time and cost associated with connecting many people to the bank and provides an opportunity for them to open savings accounts, microloans, and insurance products.

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[11] Darrell M. West, Using AI and machine learning to reduce government fraud, Brookings (Sept. 10, 2021), https://www.brookings.edu/articles/using-ai-and-machine-learning-to-reduce-government-fraud/.

[12] Douglas W Arner and others, 'Sustainability, FinTech and Financial Inclusion' (2020) 21 European Business Organization Law Review 7.

Zero Hunger

Achieving zero hunger can be done by producing enough crops and distributing them rationally so that they reach all the people in need. There are two factors involved in this development: the first is equal distribution of produced crops, and the other is to produce maximum crops, which can be done through high yield. AI can help in both cases. In the first case, it analyses the different types of data and gives a chart as to where needs what number of crops; in the other case, it can help in improving the yield of fields through different technologies. AI can help farmers to make data-driven decisions, enhance productivity, and reduce environmental impact.

Precision farming is one such step where farmers make efficient use of resources such as water, fertilizer, and pesticides. One such step is precision farming, where farmers employ the efficient use of resources like water, fertilizer, and pesticides. They are based on the data trend gathered by AI technology like sensors, drones, and satellites. Smart sensors using AI will gather information about the soil moisture, nutrient levels, weather conditions, and the health of crops, and, depending on the results obtained, farmers will be able to intervene accordingly, to apply just the right amount of nutrients or only irrigate when it is necessary, saving resources. This is more pertinent in drought-prone regions like Vidarbha, where the shortage of rain is a significant contributor to agrarian distress.[13] Though AI will not resolve the problem of the lack of rainfall, it can assist them to adjust by advising them to select drought-tolerant crops, irrigate using available groundwater resources more effectively, and make predictions to anticipate dry periods. Case in point, the

[13] Sudhir Suryawanshi, '767 Farmers Die by Suicide in Just Three Months in Maharashtra' (*The New Indian Express*, 1 July 2025) <https://www.newindianexpress.com/nation/2025/Jul/01/767-farmers-die-by-suicide-in-just-three-months-in-maharashtra> accessed 12 August 2025.

Mahalanobis National Crop Forecast Centre (MNCFC) has already been able to use satellite data in conjunction with AI to accurately predict crop harvesting levels in Maharashtra, ensuring the correct interventions are made. Such solutions can be efficient, however, only under the condition of sufficient infrastructure and financial backing by the State, the resources of which are limited. The gains of AI can be lost on the most vulnerable farmers without subsidizing AI-based tools and guaranteeing access to water-conservation technologies.

Food Supply Chain Optimization based on also helps in improving the hunger condition.[14] AI can use data and forecast the demand in particular areas or for people having specific income. It can estimate demand and cut down on waste since it has access to a lot of high-quality data, such as prior sales, trends in spoilage, weather conditions, and how people use things.[15] For instance, Nestlé's AI trial cut down on food waste by 87% in less than two weeks, saving up to 1.5 million meals and stopping 1,400 tonnes of CO_2 emissions.[16] However, AI only works well when it has accurate data. Poor inputs can throw off forecasts and cause costly mistakes in supply chains.

[14] Helen Onyeaka et al., Using Artificial Intelligence to Tackle Food Waste and Enhance the Circular Economy: Maximising Resource Efficiency and Minimising Environmental Impact: A Review, 15 Sustainability 10482 (2023).
[15] K. Manohar Rao, Renukuntla Sukumar, Banoth Swarupa & G. Surya Kiran, Enhancing food supply chain efficiency using AI-based demand forecasting, 21 Int'l J. Eng. Res. & Sci. & Tech. 565 (2025), https://dx.doi.org/10.62643/ijerst.v21.n3(1).pp565-574.
[16] Rachel Hall, Food Companies' Edible Waste Given to Charities Thanks to AI Tool Trial, The Guardian (May 27, 2025), https://www.theguardian.com/environment/2025/may/27/food-companies-edible-waste-charities-ai-tool-trial.

IBM's Food Trust uses AI and blockchain to enhance the traceability of food products. Retailers and consumers can trace the journey of food items, ensuring that products are fresh, safe, and ethically sourced.[17]

Good Health and Well-being

Healthcare services in many parts of the world are very costly. People don't have easy access to diagnoses, medicines, and proper emergency services. AI in healthcare can play a critical role. Image recognition systems based on AI can help in analyzing X-rays, MRIs, and CT scans faster than humans; they can also detect different types of diseases related to different parts of the body. These AIs can read large amounts of data, like the history of patients, and predict the likelihood of disease before the symptoms arise. They can also prescribe medicines with the best combination. *Google's DeepMind has developed algorithms to predict acute kidney injuries up to 48 hours in advance.*[18]

With the help of an AI-based platform, we can identify the epicentre of the pandemic and further prevent traffic to that area in the wake of the pandemic. This enables timely intervention by public officials and facilitates better arrangements. We can allocate resources effectively, and real-time data, where needed, can enhance the healthcare sector in many developing countries.

[17] Ching-Fu Lin, 'Blockchainizing Food Law: Implications for Food Safety, Traceability, and Sustainability' [2019] SSRN Electronic Journal <https://www.ssrn.com/abstract=3387467> accessed 18 September 2024.
[18] Yuan Wang and others, 'An Acute Kidney Injury Prediction Model Based on Ensemble Learning Algorithm' [2019] 2019 10th International Conference on Information Technology in Medicine and Education (ITME) 18.

Different electronic gadgets like smartwatches, BP measuring, and sugar measuring devices can help in the early prediction of an emergency.[19] AI's ability to process vast amounts of data quickly and identify patterns that may not be obvious to human experts makes it indispensable in modern healthcare, driving advancements in diagnostics, treatment, and public health surveillance.

Quality Education

Personalized learning, language translation, and access to remote learning are some of the most important roles that AI can play in the education market. With the help of AI-powered platforms, personalized learning can be further improved when individuals feed their learning information, and the system can create personalized courses based on their ability and speed. Artificial intelligence could be an effective teacher in some topics, especially in providing well-organized, fact-based knowledge. Another significant advancement is real-time language translation, which has made communication among people who speak different languages a very easy task.

This has minimised the travelling in order to achieve quality education because the resources can be learnt anywhere. It should be noted, however, that AI can be more inclined towards so-called hallucinations (generating wrong or artificial information) and can be biased due to the pre-programmed prejudices imbued in training data. Such risks are particularly acute where they apply to areas most closely approximating the Humanities, including in history, sociology, or political science, where interpretation, context, and critical dialogue are paramount. The uncontrolled biases, on the other hand,

[19] Simon Meyer Lauritsen and others, 'Explainable Artificial Intelligence Model to Predict Acute Critical Illness from Electronic Health Records' (2020) 11 Nature Communications 3852.

may become factually misrepresenting or enforcing the stereotypes, thus rendering AI-assisted tools rather harmful in such scenarios. Thus, the incorporation of AI into education should be accompanied by the control of humans, the transparency of informational sources, and subjective critical questioning by the learners to properly maintain accuracy and fairness.

III. The Role of AI in Achieving the Sustainable Development Goals (SDGs): Challenges and Ethical Considerations

AI stands as one of the most transformative technologies that has vast potential contributions toward the goals for attaining Sustainable Development proclaimed by the United Nations. By 2030, these goals aim to tackle a variety of issues related to extreme poverty, inequality, climate change, and unsustainable development.[20] While AI promises to provide a solution to most of these issues, it raises critical questions of challenges and ethical considerations that must be addressed to make the best use of AI properly.

Growing recognition is being given to AI as a pivotal technology toward achieving the United Nations' SDGs. The Sustainable Development Goals are 17 milestones adopted in 2015 with the view of solving global challenges such as poverty, inequality, climate change, and sustainable development through reaching 2030.[21] While AI can bring far-reaching changes toward these goals, it also presents many challenges and ethical issues that require cautious management.

[20] Ricardo Vinuesa and others, 'The Role of Artificial Intelligence in Achieving the Sustainable Development Goals' (2020) 11 Nature Communications 233.
[21] 'Role of Economics in Analyzing the Environment and Sustainable Development | Semantic Scholar'<https://www.semanticscholar.org/paper/Role-of-economics-in-analyzing-the-environment-and-Polasky-Kling/df8a8dfa752048a37f9742e86bc1e0d84d5d5dad> accessed 24 September 2024.

Environmental Impact of AI

This article deals with the environmental impacts of AI, the need for sustainable practices, and the ethical issues surrounding its implementation. This section discusses data privacy and security issues related to critical aspects of AI, particularly the accumulation and processing of vast amounts of data required for integrating AI into efforts aimed at achieving the SDGs. Although AI presents a wide range of ethical issues and problems that necessitate strict regulation, it also has the potential to significantly contribute towards achieving these objectives. This paper will revolve around AI adoption implications on ethics, the demand for sustainable approaches, and the environmental influence of AI. The most significant impediment is that people ought to be informed about the use of their data. There are so many AI systems that fit into the category of "black boxes," which makes it tough to understand what is processed and utilized based on the user's information.[22]

Also, organizations must be under more complex legislative frameworks, especially the data protection rules, which are the General Data Protection Regulation in Europe. Organizations employing very complicated algorithms in their decisions are susceptible to not being able to comply with such regulations, as individuals demand transparency in the practice over the use of using their data. Opacity in AI systems can cloud data processing, leading to the exposure of an individual to the potential violation of his or her private rights. And the threat of unauthorized data collection is also high. Breach of trust and the likelihood of legal charges all spring from various AI applications

[22] Mattia Setzu and others, 'GLocalX - From Local to Global Explanations of Black Box AI Models' (2021) 294 Artificial Intelligence 103457.

that acquire information without consent from users. [23] For instance, considering the Cambridge Analytica scandal, personal data, without individuals' knowledge or consent, can be misused to further political interests.

Another significant challenge in data privacy and security relates to the bias inherent in AI algorithms. The latter may have a discriminatory impact on various vulnerable groups of people. If the training data used in creating the AI systems is biased or unrepresentative, outcomes produced by the resulting algorithms would be discriminatory and have a harmful effect on targeted, marginalized communities. This is particularly dangerous in industries like health care and law enforcement, as well as employment practices, where biased algorithms may lead to unequal treatment.

Research demonstrates that face recognition technology, for instance, exhibits racial bias in all its forms, leading to higher rates of misidentification among specific population groups. Such biases not only question the SDGs' premise of equality but also prevent them from fulfilling their commitment to "no one left behind." Organizations must prioritize inclusivity and impartiality in their AI development process to mitigate such risks. These corrective measures encompass identifying bias, conducting regular audits of bias, and involving a wide range of stakeholders in the design phase.

The digital divide is an important challenge when sharing AI applications uniformly. In this context, advanced AI tools and a wider range of resources are typically much more accessible to developed nations than to developing

[23] Syed Raza Shah Gilani, Ali Mohammed Al-Matrooshi and Muhammad Haroon Khan, ‘Right of Privacy and the Growing Scope of Artificial Intelligence’ (2023) 3 Current Trends in Law and Society 1.

countries.[24] This may exacerbate an already existing difference; stopping the development and production of new ideas may hinder innovation in poorer areas.

Geographic location is not the only criterion, because socioeconomic factors have a lot to say about access to technology. People from marginalized communities may not have the basic infrastructure, skills, or finances to reap the benefits of the advancement that AI has brought.[25] Thus, what is urgently required are policies that can be inclusive by providing equal technology availability for all sections.

AI thus becomes an agent that could further aggravate inequalities rather than mitigate them if not managed in an inclusive manner. Companies that deploy AI solutions chiefly for generating profit may give way to efficiency rather than the social consequences this entails-for example, job displacement or fewer job opportunities for low-skilled workers. This outcome can thus be prevented if there exists a holistic strategy concerned with the societal implications of AI deployment.

Investments in education and training programs must be made, creating capabilities to flourish in an increasingly automated workforce. Policymakers should regulate AI to promote social equity and prevent its irresponsible use.

However, the ecological implications of AI technologies cannot be ignored. Additionally, the energy expenditure related to the extensive training of AI models and the operation of data centres is a significant factor. This

[24] Jeffrey James, 'The Global Digital Divide in the Internet: Developed Countries Constructs and Third World Realities' (2005) 31 Journal of Information Science 114.
[25] Joachim Von Braun, 'AI and Robotics Implications for the Poor' [2019] SSRN Electronic Journal <https://www.ssrn.com/abstract=3497591> accessed 24 September 2024.

consequently demands the assessment and reduction of the environmental footprint of AI since more dependence on it creates a plethora of applications.

Instead, ensuring that energy-efficient practice accompanies AI deployment becomes an important step toward the achievement of sustainability goals. This involves optimizing the algorithms for minimal power consumption in the solution development process, using environmentally friendly hardware by embracing sustainability in the form of becoming emission-free, and using renewable sources of energy within data centers.[26]

In an effort to integrate sustainability in AI development, the technology would have to align with the realization of the SDGs. This calls on organizations to adopt a lifecycle approach in their processes, factoring in environmental considerations at every step from collection and processing of data to deployment and eventual disposal. By sustainable practice, we can be sure that AI does not detract but rather assists in the pursuit of initiatives toward global sustainability.

High amounts of AI technological advancements necessitate stringent governance frameworks that offer ethical deployment. Such frameworks should be positioned in relation to ethical standards and the promotion of human rights, meaning other factors like transparency, accountability, and impartiality.

It is imperative that governments and organizations collaborate with the objective of developing stringent norms that will guide the process in different

[26] 'Uncovering Energy-Efficient Practices in Deep Learning Training: Preliminary Steps Towards Green AI | Semantic Scholar' <https://www.semanticscholar.org/paper/Uncovering-Energy-Efficient-Practices-in-Deep-Steps-Yarally-Cruz/397079e697a7ebbe9a13bad646333e266ce458b3> accessed 24 September 2024.

industries. The enforcement of responsible decision-making processes, accountability of algorithms, and data protection is also included.[27] Only if we foster an accountability culture within the organization, implementing AI technologies, can we inculcate trust among stakeholders and, at the same time, reduce the potential adverse effects of irresponsible practice.

It is, therefore, key to finding a balance between innovation and human rights as we look to navigate the complexities of integrating AI into society. It will also require that policymakers approach matters of regulation regimes governing AI technologies with ethical considerations. This simply means involving different stakeholders, such as civil society organizations, in ensuring that regulations are consonant with societal values and protect individual rights. Companies should then have ethical standards that guide how they are to apply AI. We must balance technology and ethics to create a space that fosters human-benefiting innovation rather than erodes it.

AI also marks some positive changes regarding other pressing environmental issues that relate to the consumption of energy. Data centres, which provide a critical support environment for operation, are among the biggest consumers of electricity in the world.[28] Data centres currently account for an estimated 1-2% of global electricity consumption. However, the ever-demanding use of AI technologies is likely to see this figure rise multiple-fold soon.

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[27] Serge Abiteboul and Julia Stoyanovich, 'Transparency, Fairness, Data Protection, Neutrality: Data Management Challenges in the Face of New Regulation' (2019) 11 Journal of Data and Information Quality 1.

[28] 'Assessing the Environmental Impact of Data Centres Part 1: Background, Energy Use and Metrics | Semantic Scholar' <https://www.semanticscholar.org/paper/Assessing-the-environmental-impact-of-data-centres-Whitehead-Andrews/a0e556e393bbff4a49b1ba2fb70f7397706a6c8b> accessed 24 September 2024.

The power needed to train and run AI models is massive. For example, a simple Google search is estimated to use up to 10 times the energy as a query that uses a generative AI model like ChatGPT. Demand for electricity in data centres is forecast to double between 2022 and 2026 as organizations invest heavily in AI capabilities. Because of this upward trend, the international climate goals are seriously threatened by growing energy consumption, which often becomes associated with increased production of greenhouse gases.

Energy and Water

Data centres are an added source of energy consumption, but also water, which might strain local resources in places where water shortage already poses a significant problem. Sustainable practices in the development and deployment of AI technologies can minimize their effects on the environment. For instance, the improvement of energy efficiency in data centers through smart burden management and state-of-the-art cooling can be achieved.[29] For instance, AI can be used to automatically allocate resources in real-time according to immediate demand, thereby reducing waste caused by excessive energy use.

Companies also need to invest in renewable energy sources for their data centres. Many of the top tech companies have promised that by certain dates, all of their businesses will run on carbon-free energy, but these goals mean huge investments in renewable infrastructure. Apart from alignment with SDGs, sustainability adds operational effectiveness and reduces costs over time. Sustainability will have to be incorporated into AI's design so that it does

[29] Rohit Nishant, Mike Kennedy and Jacqueline Corbett, 'Artificial Intelligence for Sustainability: Challenges, Opportunities, and a Research Agenda' (2020) 53 International Journal of Information Management 102104.

not harm the environment with its inevitable evolution as technology develops.

Strong governance frameworks are very important for making AI a part of this society. Ethical application is the only option through which it can exist. Such structures ought to support rights involving humans as well as concerning matters such as accountability, distribution of value, and transparency in society. In the absence of proper protocols, AI systems will replicate the status quo or establish some altogether new means of discrimination.

For instance, biased algorithms can result in discriminatory treatment across multiple areas, such as law enforcement and hiring practices. AI systems in this regard may not reduce inequality but rather may become a source of discrepancy if they are trained using datasets that do not represent the population, such as datasets representative of historical inequalities. [30] Therefore, we must establish ethical standards in AI development to ensure that all classes of people perceive the technologies equitably.

A third significant ethical concern is the balance between innovation and respect for human rights. To safeguard individual rights and freedoms, policymakers must establish regulations that govern AI technologies without foreclosing innovation. That would involve an interactive multi-stakeholder process with civil society organizations. Regulations could embody values in society and reduce the negative connotations associated with the deployment of AI. Moreover, organizations must define ethical premises for using AI technologies. This includes adequate and regular audits in order to detect potential biases and integrate diverse perspectives in the design. By paying

[30] Duncan Purves, 'Fairness in Algorithmic Policing' (2022) 8 Journal of the American Philosophical Association 741.

attention to ethics alongside innovation, we will be able to better create environments that more creatively enable innovation to improve rather than harm people's welfare.

On a concluding note, there is clear evidence that AI can accelerate processes toward attaining SDGs; however, it poses significant challenges in terms of ethical governance and environmental sustainability in the integration into various sectors. We can responsibly and effectively harness the potential of AI by directly overcoming its huge challenges by applying sustainable practices and a sound governance framework.

The stakeholders' countries, companies, and civil societies must commit to prioritizing ethical considerations in all cycles of development and deployment to significantly advance AI technology's efforts toward global sustainability. One should be aware of the risks and misuses resulting from the use of AI in this dynamic scene. Furthermore, we must actively collaborate on solutions that align with our shared aspiration for an equitable and sustainable future.

There is promising potential in AI to contribute to the SDGs; however, it should not be taken recklessly, and make us responsible for it. Ethics priority in the governance framework and sustainable practices we make today will ensure our technology is on our side as an agent for positive change instead of bringing new, enjoyable problems to us.

IV. Conclusion

AI has immense potential to facilitate progress toward achieving the Sustainable Development Goals (SDGs). However, its integration into various sectors presents significant challenges related to environmental sustainability

and ethical governance. By addressing these challenges through sustainable practices and robust governance frameworks, we can harness the power of AI responsibly and effectively.

Ensuring that AI technologies contribute positively to global sustainability efforts requires a commitment from all stakeholders, governments, businesses, and civil society to prioritize ethical considerations throughout the development and deployment processes. As we navigate this complex landscape, it is imperative to remain vigilant about the harms and negative effects associated with utilizing AI, and it is also essential to actively work towards finding solutions that align with our collective aspirations for a more equitable and sustainable future.

In summary, while the role of AI in achieving the SDGs is promising, it must be approached with caution and responsibility. By embracing sustainable practices and prioritizing ethics in governance frameworks, we can ensure that technology serves as a catalyst for positive change rather than a source of new challenges.

Carbon Credits: A Solution or a Smokescreen

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Abstract

Carbon credits have gained prominence as a market-driven strategy to combat climate change, playing a key role in curbing greenhouse gas emissions. This paper delves into the complexities of carbon trading analyzing its potential as both an effective solution for mitigating environmental damage and a source of ethical and operational challenges. By exploring the economic foundations of emissions trading, such as the Coase theorem, it traces the development of global carbon markets from the United States Clean Air Act addressing sulfur dioxide emissions to the Kyoto Protocol, the EU Emissions Trading System, and China's National Carbon Market. The paper highlights systemic flaws, including surplus permit allocation, market instability, and exploitation of developing nations. It also examines ethical issues such as treating nature as a tradable commodity, shifting responsibilities, and reinforcing global inequities, while critiquing the tendency to turn penalties for pollution into purchasable allowances. Through an evaluation of these schemes, the study questions whether they effectively reduce emissions or merely offer an illusion of progress. The paper concludes that while emissions trading has certain advantages over direct regulation it falls short in delivering fair and sustainable solutions. It emphasizes the need for stronger oversight, widespread public education, and a shift toward policies that harmonize

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environmental preservation with economic objectives fostering a more equitable and effective approach to addressing climate change.

I. Introduction

The sky has darkened in recent years due solely to the long-term consequences of all the carbon dioxide that has been released into the atmosphere, which has significantly altered our climate. Global warming has been exacerbated by the atmosphere's ongoing buildup of carbon dioxide. Growing awareness of the dangerous concentrations of these greenhouse gases has compelled governments, private organisations, and international organisations like the World Trade Organisation to put in place mechanisms that will aid in lowering the atmospheric concentration of greenhouse gases like carbon dioxide.

Countries production of greenhouse gases is limited by international treaties which also impose limitations on enterprises. To improve the situation tools like carbon offsets and credits were established to incentivise businesses to conduct their operations in a more environmentally responsible manner. One tonne of carbon dioxide or an equivalent quantity of other greenhouse gases can be released into the atmosphere with one carbon credit. While nations below their quotas can sell their remaining carbon credits, those above them must purchase carbon credits for excess emissions. Known as an emission trading system, this credit exchange between companies has promoted carbon trading on a global scale.

The main topic of this essay is cap-and-trade schemes, which some contend are an essential part of the effort to stop "dangerous anthropogenic forcing"[1],

[1] (*United Nations Framework Convention on Climate Change*) <https://unfccc.int/resource/docs/convkp/conveng.pdf> accessed 12 August 2025

and harmful temperature increases.[2] In fact Article 17 of the Kyoto Protocol allowed for the trade of greenhouse gas emissions.[3] Emission trading is supported by many environmentalists since it establishes a predetermined emission limit. As a result, emissions can fall with time for example, in line with the idea of "contraction and convergence"[4] The goal of several other comparable measures, such as carbon fees is the same but one drawback of such programs is that they offer no assurance whatsoever that emissions will be kept to a minimum. Around the world, several emission trading schemes for greenhouse gases have been put into place. The most prominent is the EU Emissions Trading Scheme (EU ETS) which is currently in its third phase (2013-2020) and went into operation on January 1, 2005.[5] Other types of environmental trading schemes existed before cap-and-trade systems were put in place to reduce greenhouse gas emissions. The most well-known is perhaps the sulphur dioxide (SO2) trading program in the United States which is governed by Title IV of the Clean Air Act modifications from 1990 and has effectively and affordably decreased acid rain.[6]

Critiques have surfaced as cap-and-trade schemes to reduce carbon dioxide emissions have been put into place. Climate change sceptics who would rather see no government response to climate change and who believe that cap-and-trade is the most probable policy to pass through the relevant legislatures are the ones who criticise it the most harshly. Arguments that emissions trading is

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[2] We focus on carbon dioxide emissions given their sheer volume and contribution to climate change, but we should note, of course, that carbon dioxide is not the only greenhouse gas.
[3] (*Carbon trading: A review of the Kyoto Mechanisms – Cameron Hepburn*) <https://www.cameronhepburn.com/research/publications/carbon-trading-a-review-of-the-kyoto-mechanisms/> accessed 12 August 2025
[4] Aubrey Meyer, 'Contraction and Convergence: The global solution to climate change' Schumacher Briefing 5, 2000, Foxhole, UK: Green Books Ltd.
[5] For an overview of the EU ETS see the special issue of Climate Policy, vol.6 no.1 (2006).
[6] Robert N Stavins, 'What Can We Learn from the Grand Policy Experiment? Lessons from SO2 Allowance Trading'. Journal of Economic Perspectives 12:3 (1998), 69-88.

intrinsically unethical are among the more sober critiques. According to Michael Sandel, "Making pollution a commodity to be bought and sold removes the moral stigma that is properly associated with it, may undermine the sense of shared responsibility that increased global cooperation requires."[7] For example, under a cap-and-trade system, commerce can take place between nations (as in the Kyoto Protocol and as in the EU ETS, for instance) or even amongst people.

This Paper looks at a number of moral and ethical arguments against carbon trading. It examines and expands upon a general taxonomy of moral justifications for exercising caution when using markets while taking into account its moral virtues. It then uses this taxonomy to evaluate the argument that carbon trading is immoral. It also looks at the idea that carbon trading can have unfair effects and revisits claims that carbon trading hasn't been successful in lowering emissions thus far. The conclusion makes recommendations for policy consequences.

II. The Background and the Theoretical Roots of Emission Trading

The theoretical justification for emission trading as a market driven solution to climate changes and environmental challenges lies in foundational economic theories such as the Coase theorem by Cecil Pigou who advocated for taxing activities that created negative externalities such as pollution and global warming, this idea lays about the basis for financially incentivising environmental responsibility. Another notable economist John H. Dales[8], expanded on this idea in his work "Pollution, Property & Prices" wherein he

[7] Michael J Sandel, Public Philosophy: Essays on Morality in Politics (Harvard University Press 2005) 94–95.
[8] John H. Dales, Pollution, Property & Prices: An Essay in Policy-Making and Economics, Univ. of Toronto Press (1968).

assigned economic value to pollution as an externality which could be made tradeable by emission permits that could yield an efficient environmental outcome.

The first successful implementation of the emissions and the carbon trading program can be traced back to the Clean Air Act and the Clean Air Amendments (1990) wherein the United States introduced a cap-and-trade for SO2 with the primary objective of tackling the dangers of Sulphur oxide induced acid rains and its undeniable damage to the eco system. The statute created a trading program for major polluting industries under which emission allowances were allocated which could be traded in offset to trade access permits when their emissions fell below the set cap.[9] The success of the USA model for emission trading laid the foundation for the broader implementation of carbon and emission trading programs across the world. The adoption of the Carbon Trading Scheme on the global scale was kickstarted with the landmark Kyoto Agreement of 1997 under the aegis of the United Nations Framework Convention on Climate Change (UNFCCC). Article 17 of the Kyoto protocol allowed for international emissions trading between countries with significant reduction in their emission surplus with countries struggling with their targets under the protocol.[10]

The Kyoto Protocol was instrumental in introduction of two other international tools to facilitate reductions of emissions by trading carbon credits namely, the Clean Development Mechanism (CDM) and the Joint Implementation (JI) Scheme which both allowed developed countries to obtain credits by funding green projects in developing countries and helping them meet their emission

9 A. Denny Ellerman et al., Markets for Clean Air: The U.S. Acid Rain Program, Cambridge Univ. Press (2000).
10 A Global Turn to Greenhouse Gas Emissions Trading? Experiments, Actors, and Diffusion, 18 Global Envtl. Pol. 1 (2018).

targets. With the ever-emerging complexities in climate change regulations and models the mechanisms in place for emission trading evolved with time wherein it could be observed that global emission trading schemes were narrowed down and restricted to limited geographical areas. For example, The European Union in 2005 introduced its very own emission trading system known as the European Union Emissions Trading System (EUETS) under which the world's largest carbon trading market was established which adopted the cap-and-trade model for emissions trading in several vital industries such as aviation and power.

Following the European Union's regulatory model of carbon trading various stakeholders felt the need to move away from a regulatory model to a more free offset model which was inclusive of Voluntary Carbon markets which allowed organisations and individuals to offset their carbon footprint by trading carbon credits, new certification bodies emerged to regulate voluntary emission trading by states and their industrial entities such as the Verified Carbon Standard (VCS) which ensures the integrity of such trading mechanisms. Similar diversifications later emerged in Asia, leading with the establishment of China's National Carbon Market in 2021 which over time has become the largest global trading system for carbon and other allied emissions. Impetus to the Voluntary Trading Model can also be inferred under various provisions of the historic Paris Agreement of 2015; Article 6.2 and 6.4 allowed for bilateral and multilateral trading of transferred mitigation outcomes between countries in line with Sustainable Development Goals and the Net Zero goals for fuel usage.

The global carbon and emission trading system is not devoid of flaws, the over allocation of permits and tradeable credits has undermined the very purpose of the exercise that is reduction of emissions, various projects such as the clean

development projects by developed countries have become tools of exploitation wherein emission reductions are overstated and meaningful contribution to emission reduction is given the back seat ultimately benefiting wealthier nations disproportionality to their contributions. Unpredictability of carbon pricing and the fluctuations in the market is another cause of worry as it leaves large uncertainties to investors which acts a major deterrence to adoption of carbon trading as a viable economic solution to environmental problems.[11]

III. Five Ethical Arguments Against Emission Trading

Numerous arguments are made against carbon trading, and in this part, we offer a broad categorisation of the types of arguments that may be taken into account in order to list the various justifications for opposing carbon trading. Drawing inspiration from Judith Andre's analysis of Michael Wlazer's moral limits of commodification, we offer a categorization of arguments against carbon trading.[12] Andre aims to offer a more thorough classification of the various justifications for believing that particular costs or advantages shouldn't be purchased and sold.[13] Based on the above analysis by Andre, we infer five situations in which trading might be construed to be beneficial or a burden. Firstly, there are products that "cannot be owned by nature."[14] Secondly, there are some items that we believe would be improper to own, even though they are possible to own.[15] When it is impossible to alienate a

[11] Robert N. Stavins, *The Evolution of Market-Based Environmental Policy Instruments*, 19 Envtl. & Resource Econ. 299 (2001).
[12] Michael Walzer Spheres of Justice: A Defence of Pluralism and Equality (Oxford: Basil Blackwell, 1983), 100- 103.
[13] Judith Andre 'Blocked Exchanges: A Taxonomy' in Pluralism, Justice, and Equality (Oxford: Oxford University Press, 1995) edited by David Miller and Michael Walzer, 171-196.
[14] Andre 'Blocked Exchanges', 175: cf 175-176.
[15] Andre 'Blocked Exchanges', 176: cf 176-178

good or a responsibility, a third situation where a transaction in goods or services presents difficulties occurs.[16] Alongside the first three categories, there are other situations in which it is possible to detach a good or a responsibility, even though we may believe that doing so is wrong.[17] Finally, to the fifth category, some obligations or goods shouldn't be traded for cash.[18]

Our perspective is very consistent with the idea that Polluters have a duty to lower emissions, avoid energy wastage, and adopt a thrifty ethic similar to that put forth by David Wiggins in his study.[19] The paper will now examine five anti-market arguments to see if the benefits of emissions trading supersede the drawbacks.

Owning What Should not be Owned

One argument against emissions trading is, because it entails the ownership of a type of good that although it is conceivable to own, ought not to be owned. Emission trading suggests that people have property rights over nature and its resources by granting a certain nation, business or individual the ability to destroy the environment through the purchase of carbon credits. One could argue that treating nature as private property is undesirable. The argument's main flaw, though, is that emissions trading is not predicated on the idea that people own the atmosphere. Although the right to utilise a natural resource is a component of emissions trading, a "use right" and a "property right" are not the same thing.

[16] Andre 'Blocked Exchanges', 178-179.
[17] Andre 'Blocked Exchanges', 179-180.
[18] For an excellent discussion of arguments against markets in permits 'to pollute' see Robert Goodin 'Selling Environmental Indulgences', Kyklos 47:4 (1994 573-596. For a contrary view and response see Wilfred Beckerman and Joanna Pasek 'The Morality of Market Mechanisms to Control Pollution', World Economy 4:3 (2003), 191-207.
[19] Wiggins 'A Reasonable Frugality' this volume.

With the aid of an example, this may be further explained. Think about a lessee who has an agreement to utilise a specific plot of property that belongs to the lessor. In this case, he or she does not acquire a private property claim over the land. Instead, they have a "use right" which gives them the ability to occupy the land for a predetermined amount of time. Permits for emissions can be interpreted similarly.

While it is true that "ownership rights" over nature are not necessary for emissions trading, using "usage rights" over nature as an excuse is insufficient because usage rights might still be morally objectionable. It is morally impossible to defend certain types of usage rights. The "trading" of licenses is not the only or even the main purpose of this argument. It appears to be more concerned with a system that allots "rights to use the atmosphere" whether or not those rights are exchangeable. The fundamental goal of protecting the environment is undermined by the categorisation of pollutants as a commodity and subsequent trade of such carbon credits, which encourages environmental exploitation. This clarifies the moral unacceptability of these usage rights.

For example, the European Union Emissions Trading System (EU ETS) which is among the largest carbon markets globally has been criticized for issuing an excess of permits in its early stages. This over-allocation led to reduced carbon prices diminishing the motivation for companies to cut emissions. Critics contend that such practices transform the atmosphere into an object of financial speculation, undermining its role as a shared global resource.[20]

Moreover, Carbon Offset initiatives, a significant element of many Emissions Trading Systems, have faced scrutiny for both ethical and practical

[20] Ellerman, D., & Buchner, B. (2007). "The European Union Emissions Trading Scheme: Origins, Allocation, and Early Results." *Review of Environmental Economics and Policy.*

shortcomings. A report by Friends of the Earth International documented instances where these projects displaced indigenous populations or caused environmental harm, raising serious concerns about fairness and justice in their implementation.[21]

Categorizing pollution rights as tradable commodities risks normalizing environmental degradation. By allowing entities to "buy their way" out of reducing emissions, the fundamental goal of protecting the environment is weakened. Furthermore, the trading framework may prioritize economic efficiency over ecological sustainability creating a moral hazard where polluters are incentivized to maintain the status quo.

Alienating Responsibilities That One Should Perform Oneself

The foundation of this type of argument is the idea that some products shouldn't be alienated. For example, it is improper to distance oneself from civic duties. People can distance themselves from the obligations that carbon trading entails by using this type of argument.
They shouldn't alienate anyone. Emission trading reduces a nation's efficiency, which leads to global inefficiency. For example, a nation can easily acquire emission credits, detaching itself from its responsibilities even if it complies with its obligations by not exceeding the set emission level. An atmosphere of total inefficiency regarding the country that buys the emission credits and the country that sells them will result from this alienation of responsibilities.

The former nation that buys the emission credits transfers its burden using its financial resources (primarily in the case of rich countries). However, in order

[21] Friends of the Earth International. (2009). "A Dangerous Distraction: Why Offsetting is Failing the Climate and People."

to profit financially from unused credits, the latter country selling those credits will be sacrificing the expansion of its own economy (primarily in the case of underdeveloped countries). Providing nations with such options will never incentivise them to limit their own emissions and to transfer the cost of reducing their own emissions to another nation. It is possible to argue that even the nations that buy this carbon credits are making a financial sacrifice, but we must recognise that this is not the appropriate kind of sacrifice to make. As a result, it can be said that emission trading causes people to become less accountable.

A report published by Oxfam International in 2018 highlighted significant flaws in carbon offset mechanisms, emphasizing how they are often misused by wealthier nations and corporations to sidestep meaningful emissions reductions. The report noted that these practices disproportionately harm poorer countries, where land and resources are frequently commodified for offset projects, sometimes resulting in the displacement of local communities.[22] Similarly, a study by the World Bank on emissions trading schemes revealed that nations heavily reliant on purchasing carbon credits tend to lag behind in adopting renewable energy and sustainable technologies compared to those prioritizing domestic emission reduction efforts.[23]

Emissions Trading and the Vulnerability

The idea of alienating what should not be alienated lies at the core of the previous discussion. However, this argument shifts focus to nations that sell emission credits, especially those that are underdeveloped and vulnerable, rather than those purchasing them. Emission trading systems, which allow the

[22] Oxfam International. (2018). "Carbon Offsets: The Inequality of a False Solution."
[23] World Bank. (2020). "State and Trends of Carbon Pricing 2020."

exchange of greenhouse gas emission credits, often place a disproportionate burden on less developed countries. These nations frequently face significant resource and infrastructure limitations that hinder their progress. As a result, they may turn to selling carbon credits as a quick way to generate revenue and address pressing economic challenges.

Although this approach might seem advantageous in the short term, it can lead to flawed decisions regarding national priorities, emphasizing immediate financial benefits over sustainable development. Relying on pollution trading risks stalling long-term growth, fostering dependency on external revenue streams instead of promoting internal resilience in both economic and environmental terms. Moreover, selling emission rights can leave these countries vulnerable to exploitation, as wealthier, developed nations often dominate negotiations, imposing terms that disregard the broader developmental and ecological needs of the sellers.

To mitigate such risks, it is vital to restrict the ability of states to sell their emission rights. Limiting this practice can prevent potential abuse of sovereign authority and protect citizen's well-being. Selling a large portion or the entirety of a country's emission rights could jeopardize its population by restricting access to essential environmental resources. Treating certain emission rights as non-transferable is crucial to ensuring their availability for meeting the basic needs and sustainable growth of future generations.

This principle is especially important in cases where the allocation or sale of emission rights is glaringly inequitable. In such scenarios, international intervention may be required to uphold justice and sovereignty. For example, emission rights should be allocated to secure fundamental needs such as access to clean air, water, and energy for all citizens. Without such safeguards

developing nations may prioritize short-term fiscal gains, jeopardizing ecological stability and the quality of life for their people. Creating a framework that classifies essential emission rights as non-transferable can empower developing countries to prioritize their long-term development goals without succumbing to external pressures. For instance, emissions necessary to provide essential infrastructure and energy should remain outside the scope of trading systems. This strategy ensures more equitable outcomes in global carbon markets while protecting vulnerable nations from exploitation.

Ultimately, emission trading systems need strong safeguards to shield less developed nations from adverse effects. Recognizing the limitations of treating emission rights as commodities and preserving certain rights as inalienable can support sustainable development while addressing global greenhouse gas emissions. Achieving this balance is crucial to fostering a fair and inclusive international response to climate change.

When emissions trading systems give rise to significant inequities international intervention might be required. Ensuring that emission rights are allocated to meet fundamental necessities such as access to clean air, water, and energy can help prevent these systems from compromising the rights and welfare of vulnerable communities. For example, the Environmental Justice Foundation (EJF) has called for policies that center on the needs of local populations within emissions trading schemes, stressing the critical need to safeguard resources for the benefit of future generations.[24]

[24] United Nations, "Environmental Justice Foundation | United Nations" (*United Nations*) https://r.search.yahoo.com/_ylt=AwrPrKvxPZtoEQIAZsO7HAx.;_ylu=Y29sbwNzZzMEcG9zAzIEdnRpZAMEc2VjA3Ny/RV=2/RE=1756214001/RO=10/RU=https%3a%2f%2fwww.un.org%2fen%2fcivil-society%2fenvironmental-justice-foundation/RK=2/RS=p_NpCaKods45jzzfSvpDyjy3Tds-

The Implications of Putting a Price on the Natural World

The value of the natural world is intrinsic and cannot be quantified in monetary terms. Emission trading gives greenhouse emissions a monetary value by exchanging carbon credits for cash. One could argue that emission trading gives carbon dioxide (and other greenhouse gases) a monetary value in addition to enabling people to shirk their obligations. It is possible to view the practice of pricing the natural environment as unacceptable in relation to emissions trading. Since the value of the natural world cannot be expressed in monetary terms, this mindset is actually unsuitable.

Because it has artistic, cultural, ecological, and ethical qualities that are not entirely measurable by economic standards, the natural world has intrinsic value that goes beyond monetary evaluation. By turning pollution rights into tradable carbon credits, emission trading, a market-based strategy to combat climate change aims to give greenhouse gas emissions a monetary value. Critics contend that this method commodifies the environment and reduces its value to a purely transactional figure even as it encourages emission reductions. Emission trading can be seen as allowing people and businesses to "purchase" the right to pollute by putting a price on carbon dioxide and other greenhouse gases potentially avoiding their ethical and environmental obligations.

Instead of emphasising actual decreases in ecological effect, this strategy runs the risk of creating the impression that environmental harm can always be compensated for with adequate financial means. The loss of biodiversity, cultural legacy associated with particular ecosystems, or the psychological and physical benefits that pristine natural landscapes offer are just a few examples of the larger intangible components of environmental degradation that are not taken into consideration by such pricing mechanisms. Critics argue that this

way of thinking reduces natural systems to crude economic models and fundamentally misrepresents their intricate interdependencies.

The primary issue with monetising the natural world is that it ignores the boundaries of economic value. Although they are essential to human survival, ecosystems and the services they provide such as water filtering, air purification, and climate regulation defy precise financial depiction. By turning these services into tradable commodities, carbon trading runs the risk of promoting unsustainable behaviours like putting immediate financial gain ahead of long-term environmental stability. Furthermore, marginalised communities who frequently suffer the most from environmental degradation are disproportionately affected by this strategy because they lack the financial means to participate in such trading programs. Global inequality is sustained when monetary value is given precedence over moral and egalitarian considerations, undermining the larger moral duty to preserve the environment for coming generations.

Emission trading schemes can result in abuse and loopholes, according to critics. The efficiency of the system in lowering overall emissions may be compromised if businesses take advantage of tax regulatory frameworks to exaggerate the quantity of carbon credits available. This leads to a paradox: although the system's goal is to reduce greenhouse gas emissions it may inadvertently encourage dishonest behaviour that postpones important action. Furthermore, the monetisation of carbon can draw focus away from more sensible strategies like direct regulation or funding renewable energy and green technology. A paradigm change that acknowledges the intrinsic value of the natural world rather than just its monetary worth is necessary for true environmental management. In order to promote sustainable practices and

acknowledge the inherent worth of ecosystems, ethical, cultural, and ecological factors must be integrated into policymaking.

In the end, emission trading has drawbacks even though it might be a useful strategy for reducing climate change. It runs the risk of normalising the commercialisation of nature and undermining the ethical principles that support environmental preservation. A more comprehensive strategy is required, one that recognises the natural environment as an indispensable basis for life and wellbeing rather than merely as a financial resource.

The framework of emissions trading often places an undue burden on marginalized groups, particularly in developing nations. According to a 2018 report by Friends of the Earth International[25] carbon offset initiatives in economically disadvantaged regions have frequently led to the displacement of local communities and deepened existing inequalities. For example, forest conservation projects under the REDD+ program have resulted in land seizures in countries like Kenya and Indonesia, stripping indigenous populations of their traditional ways of life. Meanwhile, affluent corporations have reaped the benefits by using these projects to fulfil their carbon offset requirements.

A significant issue with emissions trading lies in its inability to address the broader ethical and ecological implications of environmental harm. The destruction of ecosystems or the loss of biodiversity often triggers a cascade of effects that extend well beyond the immediate economic costs. Research conducted by the Stockholm Resilience Centre in 2020 highlighted how ecosystems function as intricate networks, where disturbances such as

[25] Friends of the Earth International. (2018). "The Impact of Carbon Offsetting on Developing Nations."

deforestation can lead to widespread repercussions, including climate instability and the degradation of essential life-support systems.[26]

Does Emissions Trading Convert What Ought to Be a Fine into a Fee?

This argument is predicated on the idea that greenhouse gas emissions are wrong and ought to be punished. Conversely, emissions trading allows individuals to pollute more than the allowed amount in exchange for a monetary compensation. It is imperative that one realises that paying a charge should not grant permission to do so. Policies with a deterrent impact must be taken into account while discussing the negative aspects influencing the environment. Sandel effectively conveys the main point in a succinct analysis of carbon trading. “We shouldn’t give up the distinction between a fine and a fee for despoiling the environment too easily,” adds Sandel. Let’s say a wealthy hiker chose to pay $100 for the convenience of not having to pay a $100 fee for tossing a beer can into the Grand Canyon. Would it be acceptable for him to handle the fine as though it were just a costly dumping charge?[27] “No,” is Sandel’s response. Treating the “fine” in this instance as though it were a “fee” would be incorrect.

Likewise, it would be improper for an able-bodied person to park in a disability parking space with the sole intention of paying the associated fine and considering it a fair price to exchange for the privilege. Sandel then discusses greenhouse gas emissions using this line of reasoning. People should limit themselves to a predetermined quota and if any attempt is made to go

[26] Stockholm Resilience Centre. (2020). "Planetary Boundaries and the Interconnected Nature of Ecosystems."
[27] Sandel ‘Should we Buy the Right to Pollute

beyond their personal quota, it must be regarded as a crime that carries a fine rather than a choice that they can afford, as would be the case with a fee.

The European Union Emissions Trading System (EU ETS) , recognized as one of the largest carbon markets globally, has been criticized for enabling businesses to view carbon credits as a routine operational expense rather than a mechanism to discourage pollution. A 2021 report by the European Environment Agency highlighted that industries such as aviation and heavy manufacturing often chose to buy credits instead of implementing significant sustainable initiatives. This practice has been seen as counterproductive, as it detracts from the system's primary objective of reducing emissions and fosters the perception that pollution can be justified through financial expenditure.

IV. Case in Point:

The paper will now look into two of the major Carbon Trading Systems with significant global presence namely:

1. European Union Emission trading System (EU ETS)
2. The Chinese National Emissions Trading Scheme

and analyse the various shortfalls in the operation of these schemes in light of the above presented arguments.

The European Union Emissions Trading System (EU ETS)

The EU ETS, launched in 2005, is the world's largest and longest-running carbon trading market. It was created as a cap-and-trade system, in which corporations are granted allowances (or permits) to emit a particular amount of greenhouse gases (GHGs), and a limit (or cap) is placed on the overall GHG emissions for specific sectors. Businesses that cut emissions below their

allotted levels can sell the extra, while those who go over their limitations are required to buy more licenses or pay fines.[28]

Carbon trading under the European Union Model has not been effective due to multiple reasons such as:

(1**) Permit Overallocation**; The EU ETS suffered from the overallocation of emission permits in its early stages. Permits for several industries were significantly higher than their actual emissions. Permit prices plummeted as a result of this excess, with carbon trading prices in Phase 1 (2005–2007) occasionally dropping below €5 per tonne. The financial motivation for businesses to invest in greener technologies or embrace more sustainable practices was eliminated by low costs.[29]

(2**) Windfall Gains**; Certain industries were able to improperly profit from the free distribution of permits. Power companies in a number of EU member states, for instance, obtained permits for free but added the notional cost of the permits to electricity rates, so taxing customers and making money off of excess permits. This did not result in appreciable carbon reductions and instead distorted market signals.

(3) Concerns regarding "**Carbon Leakage,"** or businesses moving their operations to nations with laxer or non-existent emission restrictions, were frequently voiced by industries that were subject to carbon trading. The EU countered this by giving high-emission industries like steel and cement

[28] A.D. Ellerman & B. Buchner, *The European Union Emissions Trading Scheme: Origins, Allocation, and 2005 Results*, 1 Rev. Envtl. Econ. & Pol'y 66 (2007)
[29] David G. Victor & Richard B. Stewart, *Can the European Union's Emissions Trading Scheme Succeed as an International Policy Model?*, Brookings Inst. (2005)

significant free allowances, which further undermined the incentive to innovate or cut emissions.

(4**) Absence of Policies** that complement each other. The system's capacity to achieve significant reductions was constrained by its reliance on market mechanisms like carbon trading in the absence of robust complementing policies, such as investments in renewable energy or more stringent energy efficiency standards.[30] Systemic emission reduction goals were not given enough priority because of the overemphasis on trade.

China's National Emission Trading Scheme (ETS)

China's National ETS, launched in 2021, is the world's largest carbon trading market in terms of emissions covered. The ETS was first aimed at the power generation sector, which accounts for nearly 40% of China's CO_2 emissions.[31] Its goal is to assist the country achieve carbon neutrality by 2060. The method takes an intensity-based approach, limiting emissions per unit of energy output rather than absolute emission ceilings. The Chinese approach to carbon trading being slightly different from the European model suffers from various flaws that has resulted in diminished efficiency to meeting the targets.[32] The scheme has not been effective due to:

(1) **Absolute Reductions vs. Intensity-Based Goals**; China's ETS places more emphasis on lowering emissions per unit of energy output than cap-and-

[30] Stanford Program on Energy and Sustainable Development, *The EU's CO2 Emissions Trading Scheme: A Global Prototype?*, Stanford U. (2005)
[31] Jonathan Elkind & Noah Kaufman, *Can China's CO2 Trading System Avoid the Pitfalls of Other Emissions Trading Schemes?*, Center on Global Energy Policy, Columbia Univ. (Feb. 27, 2018)
[32] Zhang et al., *China's Pilot Emissions Trading Schemes: A Comparative Analysis and Lessons Learned*, 75 *Energy Policy* 9 (2014)

trade schemes that enforce absolute emission caps. If energy production rises, as has been the case with China's strong economic expansion, this strategy permits total emissions to continue rising. As a result, the ETS is unable to impose a strict limit on total emissions.

(2) **Low Costs of Carbon;** The Chinese ETS's carbon costs have been modest in its early stages, averaging about $8 per tonne in 2023. This price is much lower than what is needed to encourage major transitions to cleaner energy sources. For comparison, research indicates that significant emissions reductions in the power sector require a price above $50 per tonne. It is economically rational due to its low prices.

(3**) Absence of Strict Monitoring and Validation;** Weak Monitoring, Reporting, and Verification (MRV) systems have drawn criticism to China's ETS. The system's trustworthiness is weakened by irregular data collecting and doubts over the veracity of self-reported emissions. It is challenging to enforce compliance or determine the true effect of the ETS on emissions in the absence of trustworthy data.[33]

(4) **Excessive dependence on free allocations;** China's ETS, the majority of allowances are distributed freely as opposed to through auction. As a result, businesses are under less financial pressure to cut emissions. Free allocations are justified economically as a way to avoid a negative impact on industrial competitiveness, but they also lessen the motivation to invest in and invent cleaner manufacturing techniques.

The difficulties of establishing a successful carbon trading system in a quickly evolving economy are exemplified by China's National ETS. The difficulty of

[33] Becker (2020), *Comparative Policy Insights from China's Emissions Trading Systems Pilots*, *Environmental Economics Review*.

striking a balance between environmental objectives and economic demands is shown in the limited coverage, low carbon pricing, and reliance on intensity-based targets. These design decisions greatly impair the system's capacity to achieve large emission reductions, even while they support economic growth and competitiveness.

V. Conclusion

Although the evidence to date points to the effectiveness of greenhouse gas emission trading schemes in lowering emissions, sceptics of climate change have been increasingly critical of them. A taxonomy of ethical objections to this type of trade system was presented in this paper. We have looked at many attempts to demonstrate the unethical nature of carbon trading schemes. We have maintained that emissions trading programs are not dedicated to either “ownership” rights or intolerable “Right to Use” over the atmosphere in its entirety. Later, we contended that in order to safeguard the weak, carbon trading might be restricted.

We also call attention to the questions of who should have the legal authority to emit greenhouse gases and how to best guarantee that the licenses are obtained by the rightful owners. Lastly, we have maintained that the distinction between a “fine” and a “fee" is not eliminated by carbon trading programs. The impact of carbon trading programs on wealth distribution is the first important concern. This leads us to the conclusion that poorer households are likely to be more negatively impacted by emission trading systems than are wealthier households. In terms of economic disparity, such programs now affect the poor more than the wealthy do.

We come to the conclusion that, in contrast to other similar policies like carbon taxes, emissions trading is still a useful instrument for policymakers.

Compared to cap-and-trade, carbon taxes offer certain benefits but they are worse in other respects, such as not guaranteeing environmental results. In fact, it seems doubtful that carbon prices would result in the kind of emission reductions required to produce a fair outcome for future generations. Additionally, because it raises compliance costs, creates waste, and limits people's and business's ability to adjust to a low-carbon economy, direct regulation is worse than an emission trading scheme or a carbon tax.

Strict sanctions may be put in place, such as revoking the licenses of businesses, organisations, etc. that are consistently above the allowed emission level and are entirely reliant on such an emission trading scheme. In the short term, emission trading schemes may seem like effective tools, but in the long term, we need a different approach that allows us to adapt to a sustainable and healthy environment while considering the interests of future generations. To give our future generations a cleaner and better environment, widespread education is necessary to raise public awareness of the problem.

Open Defecation at Maha Kumbh Mela, 2025: Administrative Negligence or Lack of Civic Sense?

Pulkit Vashist*

Abstract

The present research paper focuses on the problem of sanitation and Open defecation at the Maha Kumbh Mela, 2025. It focuses on the aspect 'Open Defecation' especially by the people of rural India, highlighting the root cause and issue of Open defecation, and how this practice has significantly damaged the water of holy river Ganga, at Prayagraj, Uttar Pradesh. The paper provides an exhaustive understanding of the Science, Significance and mythology of the 'Maha Kumbh Mela' and the reason for organizing it once in 144 years. The research analysis, also provides the details of the initiatives taken by the Government of Uttar Pradesh in collaboration with the Ministry of Housing and Urban affairs, in order to prevent environmental damage and ensure proper Sanitation during Maha Kumbh Mela.. The initiatives of the Government is broadly categorized into three heads, namely, 'Sanitation for all' in which the government has established more than 1.45 lakh toilets in order to prevent open defecation at the Sangam ghat; secondly, the government has established 'Smart Sanitation' in which the government has emphasized the use of technology and A.I. to navigate and control sanitation facilities at the MahaKumbh Mela; Lastly the government has collaborated with Private sector companies, namely, Coca-Cola, Dabur, Amazon, in order to spread environmental awareness among the devotees. However, the paper critically analyses the efficiency of initiatives with the ground reality of the

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Maha Kumbh Mela, analysing administrative failure or lack of civic sense among the citizens.

***Keywords**: Open defecation, MahaKumbh Mela, Sanitation, Administrative failure, lack of Civic sense*

I. Introduction

The Maha Kumbh Mela is once in a centennial event, i.e. it takes place once in every 144 years. The term 'Kumbh' comes from the Sanskrit word 'kumbha', meaning 'a sacred pot'. According to the Hindu mythology, the Kumbh symbolizes the celestial pot that emerged during the churning of the cosmic ocean containing the divine nectar known as 'Amrit'. Adi Shankaracharya describes how the gods and demons fought over the sacred pot of 'Amrit' called the 'Ratna of Samudra Manthan'. To make sure that the demons do not get the 'Amrit', Indra's son, Jayant ran off with the pot. As a result of which, the sacred pot, the 'Amrit' that was contained inside the 'kumbh', fell into the rivers of four places, namely, Prayagraj, Haridwar, Ujjain and Nashik. Hence, this is the exact reason, because of which it is a ritual to take a holy dip in the river where the 'Maha Kumbh mela' takes place, having faith that the holy rivers still contains the 'amrit' that was fell due to the fight between the Gods and Demons. It is believed that taking dip at the 'Triveni Sangam' cleanse sins and offer spiritual liberation. It is believed that when 12 'Poorna Kumbh' completes, 'The Mahakumbh Mela' is organized. Since, this religious gathering takes place once in every 144 years, a large population takes place to take holy dip at the river. The Maha Kumbh Mela, 2025 took place recently and a staggering 600 million took bath at the River Ganga.

The ultimate issue of such huge religious gathering was environmental concerns which included, open defecation at the banks of River Ganga, waste management, Sewage treatment, and many other environmental hazards. Hence, in order to protect the holy river of Ganga from getting polluted by Human excrete at the Maha Kumbh Mela, the Government took various initiatives to minimize such practice at a huge gathering which is being observed and analysed by Major countries and organizations including the United Nations, etc. Therefore, the Government of India took initiatives, like, 'Sanitation for all', in which a total of 1.45 lakh toilets were established and 'Faecal Sludge Treatment Plants' were also established. Apart from this, technological and A.I. facilities were also used to have a robust waste management and to ensure minimum defecation at the river.

However, even after such initiatives, on February 4, 2025 faecal coliform levels (Microbes from human excreta) in the Ganga reached 11,000 MPN/100ml near Shastri Bridge and 7,900 MPN/100ml at Sangam, far exceeding the recommended maximum of 2,500 MPN/100ml. Hence, various applications and notices were filed against the Government of Uttar Pradesh and the Ministry of Housing and Urban Affairs at the National Green Tribunal related to lack of sanitation at the 'Mahakumbh Mela'. However, the other side of the coin also shows that the Indian people does not have basic civic sense and do not cooperate with the government in order to sustain the water bodies, as it was observed that a large number of people were seen spitting pan/gutkas inside the R.O water purifiers, openly defecating into rivers, tents, roads, etc. Furthermore, a many were seen brushing and washing their hair at the 'Triveni Sangam'.

The Maha Kumbh Mela is not the only large religious gathering that has taken place, 'Hajj' is also an example of a large religious gathering which attracts

millions of devotees, at once. However, no such irreparable environmental hazards is caused in such gathering. The main reason for such difference in environmental hazard is the penal and strict guidelines in Arab countries which acts as a deterrent. Hence, the pertinent research paper will analyse the environmental and sanitation challenges in Lines of Green Initiatives v. Ground Reality at Maha Kumbh 2025.

II. The Problem of Open Defecation in India- "An Inherited Crisis"

Despite large-scale initiatives under the Swachh Bharat Mission, open defecation in India remains an inherent crisis a practice deeply rooted in history and passed down through generations. For centuries, large sections of the population, particularly in rural areas, have defecated in the open, and this cultural habit continues to persist even in the face of modern sanitation initiatives. A recent peer-reviewed analysis of India's Household Consumption Expenditure Survey (2022–23) reveals that 12.5% of households, i.e. more than 162 million people still lack access to any toilet**,** with the burden falling predominantly on rural populations and the economically disadvantaged.[1]

Even among communities declared "Open Defecation Free (ODF)," the ground reality often contrasts starkly with official claims. For instance, in remote tribal pockets of Maharashtra's Nandurbar district, women continue to trek at dawn to fields for defecation due to missing water, stalled toilet construction, and upfront cost barriers inherent in the reimbursement-based financing model. [2] Nationally, although the NFHS-5 (2019–21) showed

[1] Anoop Jain, Akhil Kumar, Rockli Kim, S V Subramanian, 'Prevalence and burden of no-toilet households in India: an analysis of 261,746 households in 36 states/Union Territories in 2022–2023' (19 June 2025) <https://pmc.ncbi.nlm.nih.gov/articles/PMC12180355/ > accessed on 14 August 2025.

[2] Nisha Nambiar, 'It's still the fields as toilets in Nandurbar's tribal communities remain on paper' (5 June 2025) <https://timesofindia.indiatimes.com/city/pune/its-still-the-fields-as-

significant improvements, about 35% of rural households still lack improved sanitation facilities**,** underlining persistent inequities rooted in socio-economic and spatial disparities.[3] These findings show that open defecation is not merely a symptom of inadequate infrastructure, it is an inherited socio-cultural practice intertwined with poverty and administrative shortcomings, making it one of India's most stubborn public health challenges.

Root-Cause of the Practice of Open Defecation in India.

Human excreta or waste, since pre-independence times is considered to be taboo especially in rural India. As a result of lack of education related to defecation, people often consider that their 'Home' that is considered to be not less than a temple for them, defecating at the same place, would amount to disrespect and grouse. This belief imposes serious hardships on women, who are often not permitted to relieve themselves during daylight hours and are compelled to do so only before the men wake up. The popular Bollywood film *Toilet: Ek Prem Katha*, inspired by true events, vividly portrayed this deeply ingrained social stigma and the gender-specific challenges it creates, thereby bringing national attention to the urgent need for behavioral change alongside infrastructure development.

Beyond cultural beliefs, systemic obstacles compound the issue. For instance, caste-based stigma around pit emptying, historically assigned to the Scheduled Castes or Dalits, makes latrines socially undesirable despite their

toilets-in-nandurbars-tribal-communities-remain-on-paper/articleshow/121632233.cms > accessed on 14 August 2025.

[3]Pradeep Kumar, Nihal Hasan & Rahul Rajak, 'Socio-economic disparities in the utilization of improved sanitation facilities among Indian households' (30 December 2024) <https://www.nature.com/articles/s41598-024-80949-3 > accessed on 14 August, 2025.

affordability.[4] Studies have confirmed that deeply held ideas of ritual purity and untouchability[5], continue to deter latrine use, even in households equipped with functional toilets.[6] Behavioral research further shows that individuals are influenced by their perceptions of what others do; when open defecation is perceived as normative, toilet use remains low, highlighting the importance of shifting social norms through community-led behavioural change initiatives[7]. Systemic failures, such as poor sanitation planning, inadequate financial support, lack of genuine community involvement, and mistrust in government programs also undermine effective use and sustainability of sanitation infrastructure.[8]

III. "The Maha Kumbh Mela"- the Science, Significance and Mythology of the Largest Religious Gathering

The term 'Kumbh' comes from the Sanskrit word 'kumbha', meaning 'a sacred pot'. According to the Hindu mythology, the Kumbh symbolizes the celestial pot that emerged during the churning of the cosmic ocean containing

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[4]Ananya Sharma, 'Here's Why India Is Struggling to Be Truly Open Defecation Free' (28 October 2021) <https://thewire.in/rights/heres-why-india-is-struggling-to-be-truly-open-defecation-free > accessed on 14th August, 2025.

[5]Coffey D, Gupta A, Hathi P, Spears D, Srivastav N, Vyas S. 'Understanding Open Defecation in Rural India: Untouchability, Pollution, and Latrine Pits'(7 January 2017) < https://pubmed.ncbi.nlm.nih.gov/38249816/ > accessed on 14 August 2025.

[6]Avijit Roy, Margubur Rahaman, Rohit Bannerji, Mihir Adhikary, Nanigopal Kapasia, Pradip Chouhan, Kailash Chandra Das, 'Spatial pattern and clustering of open defecation in India' (12 Jun 2023) <https://www.indiawaterportal.org/health-and-sanitation/sanitation/spatial-pattern-and-clustering-open-defecation-india >accessed on 14 August 2025.

[7]Varun Gauri, Tasmia Rahman And Iman K. Sen, 'Shifting social norms to reduce open defecation in rural India' (10 September 2020) <https://www.cambridge.org/core/journals/behavioural-public-policy/article/abs/shifting-social-norms-to-reduce-open-defecation-in-rural-india/F28AC2738801EFFD78254F70E246400C > accessed on 14 August 2025.

[8]Anna V, Lauren S, Rachel B, Sarah Lebu, Aaron S, Musa Manga, 'Effectiveness of the Swachh Bharat Mission and barriers to ending open defecation in India: a systematic review' 9 May 2023 <https://www.frontiersin.org/journals/environmentalscience/articles/10.3389/fenvs.2023.1141825/full > accessed on 14 August 2025.

the divine nectar known as ‘Amrit’. Adi Shankaracharya describes how the gods and demons fought over the sacred pot of ‘Amrit’ called the ‘Ratna of Samudra Manthan’. To make sure that the demons do not get the ‘Amrit’, Indra’s son, Jayant ran off with the pot. As a result of which, the sacred pot, the ‘Amrit’ that was contained inside the ‘kumbh’, fell into the rivers of four places, namely, Prayagraj, Haridwar, Ujjain and Nashik. Hence, this is the exact reason, because of which it is a ritual to take a holy dip in the river where the ‘Maha Kumbh mela’ takes place, having faith that the holy rivers still contains the ‘amrit’ that was fell due to the fight between the Gods and Demons. It is believed that taking dip at the ‘Triveni Sangam’ cleanse sins and offer spiritual liberation.

According to the Hindu mythology, there are 4 types of Kumbh Melas, namely, ‘Kumbh mela’ that takes place in every 4 years at each of the four locations, in rotation; ‘Ardh Mela’ that takes place in every 6 years in Haridwar and Prayagraj; ‘Poorna Kumbh’ this kumbh takes place in every 12 years, at each of the four locations, in rotation[9]. Lastly, the ‘Maha Kumbh Mela’ considered to be the most auspicious and rare which takes place once in every 144 years in the city of Prayagraj, Uttar Pradesh. The science behind organizing the ‘Maha Kumbh Mela’ once in every 144 years is due to the astrological significance. The Maha Kumbh is determined by the rare celestial alignments involving the Sun, Moon, and Jupiter, reflecting the depth of India’s ancient wisdom. Additionally, when 12 ‘Poorna Kumbh’ are completed, then takes place the ‘Maha Kumbh Mela’ which happens once in every 144 years.

[9] Reviving Rituals, ‘Kumbh Mela, Explained: Its Mythology, History, Astrology, And Why Millions Flock To It’ 14 January <https://www.revivingrituals.com/kumbh-mela-explained-its-mythology-history >accessed on 5 March 2024.

Hence, the 'Maha Kumbh Mela' in 2025 is a landmark event, building upon the success of previous editions while embracing innovative advancements. Prayagraj's rich historical, cultural, and spiritual fabric, combined with state-of-the-art facilities, offered pilgrims an unparalleled experience of faith, unity and devotion. However, considering the fact that this religious gathering takes place once in every 144 years, the congregation is so large that it outnumbered the entire population of a sovereign nation. It was estimated that approximately 40 Crore people[10], will take dip at the 'Triveni Sangam', however, in reality the figure reached more than 60 Crore, which is more than 50% population of India. Hence, the following chapter discuses about the initiatives that were taken by the Government of India for the protection and sustainability of the water bodies and environment.

IV. "Green Maha Kumbh 2025"- Government's Sanitation and Green Initiatives

"*We do not inherit the Earth from our ancestors; we borrow it from our children*."[11]

This profound statement, provides a stark reminder, that the responsibility of environmental protection and sustainability is not just a choice, it's a duty that we must fulfill. The Maha Kumbh 2025, recognized by the United Nations as an 'Intangible Cultural Heritage of Humanity', where a staggering 1/3rd of the population of India[12], gathered to take holy dip at the 'Triveni Sangam', made

[10] Ministry of Information & Broadcasting, 'Mahakumbh 2025: Over 40 crore Devotees have taken the Holy Dip at the Triveni Sangam at Prayagraj till date' Release ID: 2100656
[11] 1936, Oscar Wilde Discovers America (1882) by Lloyd Lewis and Henry Justin Smith, Book 4: Eastward, Southward, Northward, Chapter 2: Adds a New Horror To Death, Quote Page 350, Harcourt, Brace and Company, New York.
[12] Santosh Kumar et al., 'Mahakumbh 2025: A Spectacle of Faith, Unity, and Tradition' 26 February 2025 https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2106476 > accessed 8 March, 2025.

it a huge responsibility for the State Government of Uttar Pradesh as well as the Government of India, to ensure environmental protection and sustainability, including, sanitation for all, robust waste management, faecal sludge treatment plants, plastic-free Swachh Maha Kumbh, etc. This pertinent chapter will closely analyse all the initiatives that were taken by the Govt. of Uttar Pradesh in collaboration with the Ministry of Housing and Urban Affairs (MoHUA), to ensure that this Maha Kumbh is a 'Green Maha Kumbh' and aligns with the principle of 'Swatchh Bharat':-

'Sanitation for All'- Open Defecation Treatment, Waste Management and Plastic-Free Swatchh Maha Kumbh

While preparing for the Maha Kumbh, the major environmental challenge for the Government, was to maintain cleanliness of the river, where the devotees shall be taking the holy dip, as the problem of open defecation is a serious issue in India. Hence, the first and foremost objective of the Government was to ensure proper sanitation and faecal waste management at the Maha Kumbh. Therefore, under the banner of 'Sanitation for all', the Govt. of Uttar Pradesh in collaboration with the MoHUA had argued that they had established a robust sanitation system, with more than 1 lakh 45 thousand toilets built, all around the Maha Kumabh mela. These 1.45 lakh toilets included both community and public facilities which ensured that sanitation needs are met for every individual attending the event. Apart from this, for the problem of open defecation at the Maha Kumbh area, the Govt. had developed Faecal Sludge Treatment Plants[13], ensuring effective human faeces and waste management. The FSTPs, had a combined capacity of 150 Kilo Litre Per Day

[13] Garima Sadhwani, 'Green Maha Kumbh, A Departure From The Past: Several Measures In Place To Make Event Big On Sustainability' 12 January, 2025 <https://www.ipeglobal.com/green-maha-kumbh-a-departure-from-the-past-several-measures-in-place-to-make-event-big-on-sustainability/ > accessed on 10th March, 2025.

(KLD), alongside, 10 Operational Sewage Treatment Plants, in order to meet the strict and stringent environmental standards.

Alongside the establishment of toilets and FSTPs, the Govt. has asserted that approximately 25,000 dustbins have been strategically placed along with 28.5 million liner bags.[14] Apart from this, the waste collection process was streamlined, and a fleet of 120 tippers, hoppers and 40 refuse compactors ensured efficient transport and disposal. Hence, these were the robust initiatives taken by the Government of India to ensure 'Sanitation for all' which includes, establishment of toilets, faecal treatment and efficient waste management. Moreover, apart from maintaining such aspects, it was also very important to maintain cleanliness at the Kumbh area around the clock, for the same reason, the Government asserts that for the swachhata initiative at the Maha Kumbh the govt. had employed more than 15,000 sanitation workers and approximately 2500 Ganga Seva Doots, who were required to ensure that cleanliness is maintained at the Kumbh throughout the day.[15]These sanitation workers and seva doots were offered with a special sanitary colony, basic utilities, and special funding for their children's education. The 'Swachh Kumbh Kosh' offered these workers life and health insurance as well as other benefits.

[14]Kapil Dixit, '1.5 Lakh Toilets and 25,000 Dustbins To Be Set On Maha Kumbh Campus' 16 October 2024 http://timesofindia.indiatimes.com/articleshow/114292440.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst accessed on 10th March 2025.

[15]HT Correspondent, Prayagraj, 'Government focuses on cleanliness during Mahakumbh' 17 October 2024 <https://www.hindustantimes.com/cities/others/government-focuses-on-cleanliness-during-mahakumbh-101729106155721.html >access on 24 March 2025.

Furthermore, a relentless push for a plastic-free Kumbh was initiated by the Government.[16] Approximately ten lakh environmentally friendly dona-pattals, or traditional leaf plates, were given out to pilgrims prior to the festival in an incredible attempt to decrease single-use plastic and promote sustainable alternatives. The Plastic Unmulan Mahaabhiyan 3.0 and Arambh 5.0 campaigns at the Maha Kumbh had spearheaded the drive to phase out single-use plastic and promote environmentally suitable substitutes.[17]Moreover, the "Ek Thali Ek Thaila" campaign was introduced to encourage sustainability by giving away eco-friendly substitutes including cloth bags, steel plates, and glasses. It has been asserted that it was a very crucial step towards achieving a successful 'Green Kumbh'.

Hence, these are the initiatives taken by the Govt. of Uttar Pradesh in collaboration with the MoHUA, in order to maintain 'Sanitation for all' which includes, robust waste management, Faecal Sludge Treatment Plants (FSTPs), cleaning urinals at mela, mobile toilets for the devotees, daily waste management by the sanitation workers, campaigns like 'Ek Thali EK Thaila', liner bags for safe sanitation, plastic-free Kumbh 2025, etc.

'Smart Sanitation'- Unique Swachhata Initiatives at Maha Kumbh 2025

Apart from the conventional cleanliness initiatives taken by the Govt. for huge gatherings, the govt. had also taken certain unique cleanliness initiatives which includes using technological and Artificial Intelligence (A.I) advancements for maintaining environmental standards, and various other measures in order to

[16]'One Plate, One Bag' campaign launched for plastic-free Maha Kumbh (*The Hindu*, 16 January 2025) <https://www.thehindu.com/news/national/one-plate-one-bag-campaign-launched-for-plastic-free-maha-kumbh/article69103675.ece> accessed on 10th March 2025.
[17]HT Correspondent, 'Mahakumbh to Be Plastic-Free 'Green' Event' (*Hindustan Times*, 11 November 2024) <https://www.hindustantimes.com/cities/others/mahakumbh-to-be-plastic-free-green-event-101731267898964.html> accessed on 10th March 2025.

maintain stringent environmental standards at the Maha Kumbh mela, where a staggering 65 Crore people will gather. The Govt. of India had established an 'Integrated Command and Control Centre' (ICCC), in order to implement real-time monitoring of cleanliness management throughout the mela, with extra oversight provided by QR Code. [18] Moreover, A Solid Waste Management Control Room was enabling effective cleanliness monitoring by utilizing A.I. For smooth tracking, web-based apps that run on portable devices were also been established. Additionally, all the 1.45 lakh toilets were being monitored by the ICCC, in order to manage public feedback and grievance resolution.

Alongside the ICCC, a Hybrid Granular Sequencing Batch Reactor (HgSBR), was successfully established by the Govt. of India at the Maha Kumbh, 2025. It was one of the most pioneering element of Maha Kumbh 2025. It was a State-of-the-art technological development, developed by the Indian Space Research Organization (I.S.R.O) in collaboration with the Bhabha Atomic Research Centre (B.A.R.C). The establishment of HgBSR successfully helped in the enhancement of waste management and water management at the Maha Kumbh. Hence, as it is rightly said that the 21st Century is the century of Technological and Artificial Intelligence advancements, therefore, the use of tech & A.I. at the largest religious and spiritual gathering was a very crucial aspect, that contributed in the safekeeping and protection of the water bodies of India and maintaining stringent environmental standards.

Apart from the use of technology, some other unique initiatives were taken by the Govt. of India, in order to have a successful green Maha Kumbh, which

[18] Ministry of Housing and Urban Affairs GOI, 'Swachh Bharat Mission Urban 2.0' <https://sbmurban.org/storage/app/media/newsletter/english/MAHAKUMBH-Swachh-Vaarta-Eng.pdf > accessed on 12th March, 2025.

includes, embracing of 'Zero Waste Vision' in which, a staggering 60 Crore eco-friendly leaf plates, natural dona-pattals, kulhads, jute bags, and cloth bags were made and were offered for sale at around 300 locations[19]. Alongside the 'Zero Waste Vision', under the unique 'Miyawaki Project', the city's largest dumping yard was transformed into a dense forest. Over 9000 square meters of land was transformed into a thriving green space. Some other unique initiatives include, the uplifting of 'Safaimitra Families', Green Drives and Awareness Campaigns for Green Mahakumbh, etc. Hence, considering the volume of crowd gathered at Prayagraj, Uttar Pradesh, these unique initiatives tantamount great importance and relevance apart from the conventional methods, in order to sustain the environment and maintain cleanliness of our rivers.

'Collaborative Governance'- Private Sector's Initiatives in Swatchh Maha Kumbh, 2025

The collaboration between the MoHUA, State Govt. of U.P. and the Private Sector, played a pivotal role in boosting Swachh Mahakumbh initiative under the Swachh Bharat Mission. Top Private Sector companies, including, Coca-Cola, Dettol, Amazon, Dabur, ITC etc. tried their level best to propel Swachh Mahakumbh Initiative. The campaign of 'Maidaan Saaf' with Coca-Cola India and local authorities, promoted recycling and sanitation at Mahakumbh 2025. It has been asserted that over 21,000 recycled-plastic jackets were given to safaimitras, 10,000 life jackets to Kumbh boatmen, and 1500 jackets to SHG Sanitation workers.

[19]Eco-Friendly Maha Kumbh 2025: 'One Plate, One Bag' To Replace Plastic, Green Kumbh, Waste Management (Outlook India, 16 January 2025)< https://www.outlookindia.com/national/eco-friendly-maha-kumbh-2025-one-plate-one-bag-to-replace-plastic-green-kumbh-waste-management-details > accessed on 19 March 2025.

Moreover, a 12-kilometer stretch of 1,000 recyclable plastic changing rooms was installed for the safety of the women.[20] In order to raise awareness of cleanliness, the project also started the Jagrukta Vahan Yatra with Radio City and installed reverse vending machines at strategic areas. Alongside the Coca-cola's initiative, Amazon also took initiatives to embrace the principle of Reduce, Re-use and Re-cycle. The company transformed their iconic delivery boxes into portable beds, in order to provide a place to rest for the devotees.

In addition to this, brands like Dettol and Dabur have also promoted cleanliness drives at the Maha Kumbh Mela, with their large-scale campaigns.[21] The 'Banega Swasth India' program of Dettol, supplied crucial hygiene essentials and educated more than 15,000 sanitation workers, on the other hand the 'Daant Saaf' zones established by Dabur promoted Oral hygiene and Swachhata among devotees. By giving pilgrims access to dental care facilities and samples of Dabur's oral care products, these designated areas encourage them to put their oral health first and maintain hygiene during their journey.

Lastly, brands like R.R. Hospitality Pvt. Ltd. and ITC, assisted in providing sustainable solutions and Plastic free Kumbh.[22] The 'Sunehra Kal Initiative' by ITC, Curbed plastic use at the Kumbh Mela by promoting waste segregation and eco-friendly alternatives. Moreover, R.R. Hospitality Pvt. Ltd.

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[20] 'Coca-Cola India promotes sustainability at Maha Kumbh with 'Maidaan Saaf'' (Indian Television, 15 January 2025)<https://indiantelevision.com/mam/media-and-advertising/ad-campaigns/coca-cola-india-promotes-sustainability-at-maha-kumbh-with-%27maidaan-saaf%27-250115 >accessed on 15 March 2025.

[21] Sakina Kheriwala, 'Maha Kumbh 2025: Top Brand Campaigns Making A Splash' (Storyboard, 28 January 2025) <https://www.storyboard18.com/brand-marketing/maha-kumbh-2025-top-brand-campaigns-making-a-splash-53472.htm >accessed on 19 March 2025.

[22] Team Angel One, 'Maha Kumbh 2025: How ITC, Dabur & Other Major Brands Are Grabbing Attention!' 10 February2025<https://www.angelone.in/news/maha-kumbh-2025-how-itc-dabur-other-major-brands-are-grabbing-attention> accessed on 19 March 2025.

played a key role in supporting food and beverages at the Mela, promoting cleanliness by adopting eco-friendly alternatives for cutlery, packaging and food supplies throughout the event. Hence, the Collaborative Governance between the Private Sector and the Government, was crucial as it helped to reduce the burden on Government, and assisted in maintaining hygiene and cleanliness at the Kumbh Mela.

Therefore, these were the initiatives that were taken by the govt. of Uttar Pradesh in collaboration with the Ministry of Housing and Urban Affairs (MoHUA), to ensure that this Maha Kumbh is a 'Green Maha Kumbh' and aligns with the principle of 'Swatchh Bharat'. The initiatives of the Govt. has been broadly classified into three aspects, i.e. Sanitation for all; Smart Sanitation; and Collaborative Governance. However, usually these initiatives are far from the ground reality because of lack of governance, improper implementation and lack of civic sense among the citizens. Hence, the following chapter will critically analyze the ground reality of the Maha Kumbh, and will understand whether it was the administrative negligence that the Maha Kumbh organized, caused an irreparable damage to the water bodies and environment or was a complex mix of both governmental negligence and lack of civic sense among the people of India.

V. Ground Reality at the Maha Kumbh 2025- Administrative Negligence and Lack of Civic Sense

"*A Government is nothing more than a reflection of its own citizens*"

George Mason

This statement by George Mason, founding father of the United States, perfectly explains the ground reality related to environmental concerns at the Maha Kumbh Mela 2025. The situation of the holy River Ganga after the

conclusion of the Maha Kumbh mela is hazardous and as a result of such a huge congregation, the water of Ganga River at Prayagraj, Uttar Pradesh, is facing significant contamination. An alarming level of 'faecal coliform' bacteria is found by government agencies at the 'Triveni Sangam' where more than 60 Crore people took the 'Shahi Snan'.[23] Such condition of the River Ganga is not caused only because of administrative negligence, the lack of civic sense among the Indian citizens is equally responsible for such contamination of the River Ganga. Even after providing 1.45 lakh toilets at and around the mela, still it has been observed that a large portion of the devotees were more comfortable in openly defecating in the river or around the mela in public places instead of defecating at the toilets.

Hence, this chapter closely analysis the failure of Environmental agencies such as Central Board of Pollution Control (CPCB) and Uttar Pradesh Pollution Control Board (UPPCB) alongside the lack of civic sense among the citizens of India, and the National Green Tribunals Directives with respect to maintaining purity of River Ganga at the time of world's largest religious gathering i.e. 'The Maha Kumbh mela'.

NGT Directives with Respect to Maintaining the Purity of River Ganga during and after the 'Maha Kumbh Mela'

In order to ensure that the Central Board of Pollution Control (CPCB), Uttar Pradesh Pollution Control Board (UPPCB), and other authorities follow the guidelines issued by the National Green Tribunal (NGT) regarding

[23]Maha Kumbh: 'What Is Faecal Bacteria, Found In Alarming Levels In Prayagraj Waters' (Hindustan times, 18 February 2025) https://www.hindustantimes.com/india-news/maha-kumbh-what-is-faecal-bacteria-found-in-alarming-levels-in-prayagraj-waters-101739885740833.html accessed on 19 March 2025.

maintaining the purity of the rivers during the ongoing Maha Kumbh Mela at Prayagraj, a plea was filed with the principal bench of the NGT.

In December 2024, the Tribunal issued a number of instructions in Kamlesh Singh v. State of UP[24], which included the following:

i) The CPCB and UPPCB will increase their monitoring points and frequency of monitoring on the Ganga and Yamuna rivers during the Maha Kumbh to have a better monitoring mechanism and to ensure that pilgrims who come for holy baths may not suffer due to the undesired flow of untreated sewage in the rivers.

ii) In order to prevent duplicate samples from being taken on the same day, the CPCB and UPCB will collect water samples from the Ganga and Yamuna rivers from the places at least twice a week. The results of the sample analysis will be posted on the websites of the CPCB and UPPCB.

iii) At the exit of Sewage Treatment Plants (STPs) and advanced oxidation ponds, UPPCB and CPCB will periodically collect samples, and the analytical reports will be posted on their websites. In addition to the aforementioned, the data from online monitoring will be uploaded.

These instructions include uploading a variety of data, such as the sample analysis report that includes the performance of STPs and geo-tubes, analytical reports of periodic samples collected at the outlet of STPs, and advanced oxidation, according to the plea, which was filed by political activist

[24]Kamlesh Singh v. State of UP, Original Application No. 310/2022, decided on: 23-12-2024.

and former Indian Police Service officer Amitabh Thakur. In addition to this, the plea also asserted even though more than three weeks have passed since the order was delivered and the Kumbh Meal has officially begun, it appears that none of the information, statistics, or reports ordered by the Tribunal in the aforementioned decision are available anywhere on the CPCB website. Hence, it is very crucial and important for CPCB and UPPCB to display the sample analysis report, with links on the Main page of the respective websites, considering the fact that the issue is extremely important and could have a significant impact on the lives and safety of millions of Kumbh Yatri.

Administrative failure to maintain environmental standards at the Maha Kumbh 2025, NGT issued notice over inadequate sanitation facilities

The Uttar Pradesh Pollution Control Board (UPPCB) was cited by NGT for not submitting a thorough action report as required by a previous order. Rather, the board just supplied a covering letter and specific water test results that verified elevated levels of total and faecal coliform at several sites. This shows a negligent approach taken by the Central Pollution Control Board as well as the Uttar Pradesh Pollution Control Board as the boards were not efficient in following the guidelines that were provided in the case of Kamlesh Singh V/s State of Uttar Pradesh.

It has been asserted by the Govt. that around 1.45 lakh toilets has been established by the Govt. of Uttar Pradesh in collaboration with the Ministry of Housing and Urban Affairs for proper sanitation facilities, though, it seems a huge number however, considering the fact that around 600 million people would attend the particular religious gathering, the mathematical analysis

shows that 1 toilet for approximately 4000 devotees.[25] As a result of lack of sanitation, the National Green Tribunal issued a notice to the govt. of Uttar Pradesh for inadequate sanitation facilities at the Maha Kumbh Mela, which has led to open defecation alongside the banks of River Ganga.

The Petitioner claimed that thousands of pilgrims have been forced to defecate in the open due to a lack of proper restrooms, contaminating the holy river. The applicant requested ₹10 crore in environmental compensation from the state government and has also provided video evidence to back up their accusations. Invoking the polluter pays principle, a key idea in environmental law, the petition stated that the government must shoulder the financial responsibility for failing to prevent large-scale pollution. The Constitution's Article 48A, which requires the state to preserve and enhance the environment, was also mentioned. The plea argued that many pilgrims lack access to sanitary or functioning facilities, rendering them unsuitable for the large influx of devotees, even though officials had promised to erect 1.5 lakh bio-toilets at the Kumbh site.[26] Visitors' videos purport to show human excrement piling up along the riverbanks. The petition also referenced a November 2024 water quality test that revealed Faecal Coliform levels at Sangam were 3,300 MPN (Most Probable Number) per 100 millilitres, which was more than the 2,500 MPN/100 ml standard set by the Ministry of Environment, Forests, and Climate Change (MoEFCC). Even before the Maha Kumbh Mela, the water of river Ganga was not fit for bathing, and after the Maha Kumbh Mela, the faecal coliform levels in the Ganga reached 11,000 MPN/100ml near Shastri

[25] *Supra Note 32*

[26] NGT Reserves Order On Sanitation Issues At Maha Kumbh Mela, Directs UP Govt To Take Remedial Steps', (Economic Times, 24 February 2025) <https://health.economictimes.indiatimes.com/news/policy/ngt-reserves-order-on-sanitation-issues-at-maha-kumbh-mela-directs-up-govt-to-take-remedial-steps/118530983>accessed on 6 March 2025

Bridge and 7,900 MPN/100ml at Sangam, far exceeding the recommended maximum of 2,500 MPN/100ml.[27]

Hence, even after making initiatives such as, Sanitation for all; using technological advancements and A.I. for maintaining environmental standards, and organizing the conventional campaigns and drives, numerous applications and notices has been filed against the government of Uttar Pradesh for providing lack of sanitation, stampede and various other issues. However, the government alone is not responsible for the environmental damage, as it can be argued that government had attempted to provide a satisfactory sanitation conditions at the Maha Kumbh, but at the same time, people have also showed minimum cooperation with the government to prevent environmental damage.

Lack of civic sense: The biggest obstacle to a Swachh Maha Kumbh

On the directions made by the National Green Tribunal, when the 'Maha kumbh mela' was at the verge of conclusion, the CPCB and UPPCB submitted a report to the NGT, revealing that a high level of 'faecal bacteria' i.e. Human or livestock excreta were found in the river water testing at the same locations where the devotees from across the nation were taking the holy dip during the Maha Kumbh Mela. The report pointed out serious shortcomings in public hygiene practices despite the government's massive efforts to establish sanitation infrastructure, such as, more than 1.45 lakh toilets and waste-disposal systems were made. Still a huge portion of population were seen not maintaining cleanliness at the toilets built by the govt., spitting pan/gutkas inside the R.O water purifiers, openly defecating into rivers, tents, roads, etc.

[27] Sharat Chandra prasad, 'Can we celebrate Kumbh while ignoring the health of its rivers?' 19 Feb 2025 <https://www.indiawaterportal.org/people-and-culture/culture/can-we-celebrate-kumbh-while-ignoring-the-health-of-its-rivers > accessed on 15 March 2025.

A lot of people were seen brushing and washing their hair at the ‘Triveni Sangam’. High concentrations of faecal coliform bacteria at one of the biggest religious gatherings in the world causes tensions with respect to waterborne illnesses, public health hazards, and the general breakdown of sanitary protocols. The CPCB and UPPCB revelations highlights a basic problem: although the government can provide an infrastructure for such gatherings, however, real change would not occur until the citizens themselves accept the responsibility of upholding hygienic conditions. As demonstrated at Maha Kumbh 2025, even the best-laid sanitation plans run the risk of failing if civic awareness and behavioral discipline don't improve. As discussed earlier, the root cause of people defecating in the open and rivers, lies in the norms that are being followed blindly without providing any education to the people of India, especially the rural population of India.

Hence, we cannot just hold the authorities responsible for the infrastructure failure; attendees' blatant disregard for civic duty was also a major contributing factor. Nearly every area was littered, and the holy river was contaminated by food wrappers, plastic bottles, and abandoned offerings. Because so many people choose to relieve themselves in public areas, public restrooms were overcrowded. The spiritual site became an environmental catastrophe as a result of the devotees' complaints about poor management. Ironically, at an occasion that was supposed to be all about religion and unity, a mad rush took precedence over mutual respect and peace.

VI. Conclusion of the Study

It is an undisputed fact that open defecation is not just prevalent in India, it is enjoyed and preferred over defecating in toilets by large population of rural India. However, often it is considered the negligence and fault of the government for not providing adequate sanitation facilities especially in rural

areas of our country. A staggering 1/3rd of Indian population gathered at Prayagraj, Uttar Pradesh to attend the Maha Kumbh Mela, hence, Open defecation was inevitable at such huge religious gathering.

The government of Uttar Pradesh in collaboration with the Ministry of Housing and Urban Affairs undertook major efforts to sustain and protect the environment from the problem of open defecation and waste management. However, various applications were filed at the National Green Tribunal complaining about lack of sanitation facilities and improper waste management at the 'Maha Kumbh Mela'. Though, there have been several loopholes in the implementation of sanitation facilities at the Maha Kumbh Mela, however, the government cannot be held solely responsible for the damage caused to the river and environment, the devotees attending the event are equally responsible for such environmental hazard, as not maintaining cleanliness at the toilets built by the govt., spitting pan/gutkas inside the R.O water purifiers, openly defecating into rivers, tents, roads, etc. and even brushing and washing their hair at the 'Triveni Sangam', is not something which can be solved by government initiatives or awareness drives, the public themselves have to understand their duties as a citizen.

Hence, in order to conclude the research analysis, it can be understood through the study that the irreparable damage caused to the water bodies and environment was a complex mix of both governmental negligence and lack of civic sense among the people of India.