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Exploring Approaches to Environmental Challenges: India and Sub-Saharan Africa

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Abstract

Global environmental challenges, particularly climate change, are increasingly at the forefront of political discourse, drawing significant attention both at the national and international levels. Now a days climate change creates difficult policy considerations for all nations. India is obligated to improve living conditions for its 1.4 billion citizens while simultaneously serving a significant role in reducing global GHG emissions. While the government has implemented various policies to promote renewable energy adoption and reduce dependence on coal, further efforts are essential for India to successfully achieve its net-zero targets by 2070. The Sub-Saharan Africa has the highest vulnerability to climate change globally. The increasing natural disasters are being driven by rising sea levels, escalating temperatures, and irregular rainfall patterns, all of which are profoundly reshaping the region's landscape. The 4th assessment report of IPCC projected that by 2020, climate change-induced water stress could impact between 75 and 250 million people across Africa, exacerbating water scarcity and posing significant challenges to livelihoods and development. Despite Africa's remarkable progress climate change, droughts, floods, shifting rainfall patterns, and the potential to derail efforts to combat hunger and accomplish the goals established in the Paris Agreement and 2030 Agenda for Sustainable Development still remains critical. An extensive overview of the existing climate policy and adaption strategies in India and Sub-Saharan Africa provides in the present article.

Keywords

Climate change, Sustainable development, Renewable energy, GHG, Poverty, Hunger.

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1. Introduction

Climate change compels policymakers to navigate complex trade-offs, balancing the urgent need to accelerate climate adaptation and reduce reliance on fossil fuels with the economic implications of such transitions. While new regulatory frameworks are essential to drive these changes, they may, in the short term, affect GDP and create disparities, inevitably shaping both beneficiaries and those who face challenges in the process. The yearly cost of making the shift to net zero in 2050 is estimated to be as high as US $9.2 trillion (Krishnan, 2022). India is not an exception to these compromises and is seeing a rise in the dangers associated with climate change. Between 1950 and 2018, average temperatures increased by 0.5°C, while average rainfall declined by 0.6 meters. More critically for India, weather patterns have become increasingly unpredictable, with some regions experiencing temperatures consistently surpassing 50°C and the monsoon season growing more erratic in both timing and intensity of rainfall. States are not all affected equally, and the economy's weather-dependent industries-such as transportation and agriculture-are suffering (Chateau, 2023). Pollution and climate change are also having a negative impact on health outcomes. The same activities that contribute to global climate change also frequently cause large amounts of pollution locally, which has detrimental effects on people's health. Research indicates that in 2019, pollution in India led to an estimated $8 billion in production losses due to illness and $28.8 billion in economic losses resulting from premature deaths. The burden of these impacts fell disproportionately on the country's most vulnerable populations, exacerbating existing socio-economic disparities (Chateau, 2023). It is projected that between 2030 and 2050, the effects of climate change would result in an extra 250,000 fatalities year from heat stress, diarrhea, malaria, and malnutrition (Rajput, 2022). India ranks as the world's third-largest emitter of greenhouse gases (GHGs); however,

its per capita emissions remain the lowest among G20 nations. In comparison, the United States emits seven times more per capita than India, while India's total emissions slightly exceed those of the EU, despite being only 1/3 of the EU's per capita emissions. India's contribution to world historical cumulative GHG emissions is very tiny, at about 3 percent, considering that its modern economic growth started much later than that of advanced nations (UNEP, 2022). India's contemporary policy trajectory has led to a steady rise in greenhouse gas (GHG) emissions, with historical emissions showing a consistent upward trend since 2014. The energy sector remains the largest contributor, accounting for 37% of total emissions, followed by agriculture at 21%, industry at 17%, and transportation at 9%. India aspires to move from lower to upper middle-income status, which would result in increasing power demand (Stanley, 2022). However, this development trajectory is expected to raise GHG emissions by 41% by 2030, exceeding the Nationally Determined Contribution (NDC) objective of 45% decrease in GDP emissions intensity by 2030 compared to 2005 levels (Thube, 2021). Additional mitigation initiatives are required to match India's emission trajectory with its long-term objectives.

The urgent need for climate change adaptation is essential not only to safeguard developmental progress but also to ensure the well-being and resilience of vulnerable communities facing its most severe impacts. Systems that are resilient are essential for human, economic, and environmental growth. Climate resilience is especially important for fragile nations that depend on resources that are susceptible to climate change. Africa's least developed nations are very vulnerable yet lack the ability to adjust. Climate unpredictability threatens African economy and millions of people's livelihoods. To overcome this, climate change issues must be included into sub-Saharan Africa's socioeconomic development activities. Enhancing socioeconomic circumstances including health, education, and social welfare via investment increases the ability of communities to adapt and become more resilient. This investment holds the potential to enhance revenue streams, enabling governments to allocate resources toward climate-related public goods and fortify essential services-such as healthcare, infrastructure, and water supply systems-that are increasingly at hazard due to climate change. The Global Environment Facility Least

Developed Countries Fund (GEF-LDCF) provides around US$1.3 billion in voluntary contributions for adaptation initiatives, with an emphasis on implementation and inclusion. Financing for adaptation must pay particular attention to fragile and conflict-affected nations, which frequently coincide with the least developed ones. As part of the Paris Agreement, the GEF will continue to take the lead in adaptation by integrating climate change into policy and assisting in efforts to increase ecosystem and human resilience around the world (Chevallier, 2008).

2. Strategies for Environmental Challenges in India

Both government and citizens are essential to reducing perils and enhancing the resilience to vulnerable populations of the world ensuring their ability to resist and recover from environmental challenges. While they cannot be completely eliminated, adaption measures can lessen the effects of climate change in the short run. If we don't slow down climate change, the effects will become so great that adaptations won't work in the long run. Mitigation is the process of reducing greenhouse gas emissions in order to prevent the continuation of the present and historical emissions-driven climate change. It involves changing how people, organizations, and businesses create and consume energy, altering practices to cut down on or completely eliminate emissions, and creating efficient and clean infrastructure in places where it doesn't already exist. Rather than being viewed as mutually exclusive approaches, adaptation and mitigation should be explored in tandem (Kundu, 2013). The following are a few of the main programs or initiatives that significantly address variation aims:

1. Sampoorna Grameen Rozgar Yojana
2. Mahatma Gandhi Swarnajayanti Gram Swarozgar Yojana
3. Pradhan Mantri Gram Sadak Yojana
4. Disaster Management
5. Accelerated Rural Water Supply Programme
6. National Rural Health Mission
7. Sustainability of Dryland/Rainfed Farming System
8. Major and Medium Irrigation and
9. Desert Development Programme

These collective efforts have ultimately led to a successful shift, where the expansion of the energy sector is no longer directly tied to overall economic growth, demonstrating a more sustainable development trajectory. The Indian government has established a "Expert Committee on Impacts of Climate Change" to determine future actions India may need to take to address its vulnerability to the effects of anthropogenic climate change. The National Action Plan on Climate Change, developed under the oversight of the Prime Minister's Council on Climate Change, underscores the government's commitment to mobilizing national efforts in addressing the pressing challenges of climate change. At its core, the plan prioritizes following eight key national missions, each playing a pivotal role in fostering climate resilience and sustainable development:

1. Jawaharlal Nehru National Solar Mission (JNNSM)
2. Energy Conservation and Efficiency
3. National Mission on Strategic Knowledge for Climate Change
4. National Mission for Sustaining Himalayan Ecosystem
5. National Water Mission
6. Green India Mission
7. National Mission on Sustainable Habitat (NMSH)
8. National Mission for Sustainable Agriculture

An environment challenge adaptation approach improves ecological sustainability. Under the NAPCC, eight national missions were established, each concentrating on a distinct facet of development, adaptation, mitigation, and sustainability. On the global stage, India reaffirmed its commitment to climate action by submitting its third Biennial Update Report (BUR) on emissions levels, along with a revised Nationally Determined Contribution, to the United Nations Framework Convention on Climate Change in 2022. The new NDC committed India to reducing its GDP's emissions intensity by 45 percent from 2005 levels by 2030, on top of its prior commitments. India has also committed to advancing and mainstreaming a sustainable and health-conscious way of life (LiFE) while setting an striving mark of attaining 50% of its fitted power size from non-fossil fuel-based energy sources by 2030, at COP26, India also pledged to reach NZE by 2070 (Chandran, 2013).

3. Indian Financial Support for Mitigation and Adaptation

According to the Reserve Bank of India's 2021 Financial Stability Report, climate change-along with the policy measures designed to mitigate its impact-is poised to redefine the broader macroeconomic and financial landscape. Effectively curbing future emissions and securing the necessary funding for adaptation efforts will require substantial investment to ensure long-term resilience and sustainability. In their 2016 Nationally Determined Contribution (NDC), India projected that, at 2014-15 prices, at least US$ 2.5 trillion will be needed to achieve their climate change objectives between 2016 and 2030 (Vishwanathan & Garg, 2020). Furthermore, according to projections from the International Energy Agency, machinery and infrastructure that does not yet exist would account for close to 60% of India's CO2 emissions in the late 2030s (Vishwanathan *et al.*, 2018). Over the next 20 years, an additional US$ 1.4 trillion in financing will be needed if this investment is to be sustainable (beyond the amount needed for existing policy). In India, which might supply part of this finance, green bond issuance now makes up a very modest percentage of total bond issuance, similar to much of the rest of the globe. Nonetheless, the rate of issuance is rising; in 2022, US$ 21.6 billion worth of green, sustainable, or social bonds were issued. Additionally, the Indian government entered the green finance sector in 2023 by issuing US$ 2 billion in green bonds to pay for expenditures on afforestation, green hydrogen, and solar electricity, among other projects. We should anticipate seeing more of these issued in the future because they were able to receive a greenium, which entails cheaper financing costs than other identical bonds. Other financial markets also present significant prospects. For example, the creation of a derivatives market to facilitate adaptation through the provision of products like agriculture commodity derivatives, which offer hedging and enable ongoing price discovery, can help lower risks and weather derivatives, which help reduce the risk associated with low-risk, high-probability occurrences. Fulfilling the finance requirements for climate change entails the standard financial risk associated with any lending. Based on an estimate by the RBI, 10% of all outstanding non-retail bank credit is directly related to fossil fuels, such as power, chemicals, and automobiles. As such, the impact on the banking system should be

minimal. It also points out that a lot of other businesses also utilize fossil fuels inadvertently, thus their effects also require careful observation (Nelson, 2023).

4. Africa's Response to Environmental Challenges: Worldwide Mitigation

The world community has put up a plan to lessen climate change's detrimental effects in Africa, which calls for concurrent action on two fronts: adaptation and mitigation. Reducing greenhouse gas (GHG) emissions remains an urgent priority for both developed and developing economies. Presently, atmospheric carbon dioxide levels have reached their highest concentration in the past 800,000 years, underscoring the critical need for immediate and sustained action, these numbers will keep rising if nations carry on with their "business as usual" practices (Chevallier, 2008).

However, the degree of their mitigation efforts will dictate whether or not future hazardous climate change can be prevented. There are several strategies for lowering emissions of carbon dioxide, these include a greater reliance on clean technology and renewable energy sources, as well as coordinated efforts to stop land degradation and deforestation (Climate Adaptation Archives, n.d.). Adaptation strategies must be implemented in addition to mitigation efforts. These reflect of many strategies to deal with developing nations' susceptibility to current and future consequences of climate change as well as its attendant risks. It is essential to acknowledge, specifically in the African context, that a nation's susceptibility to climatic variability is contingent upon its government's capacity to optimize the allocation of natural resources and energy supply. Support in the form of institutional, financial, technical, and capacity building is frequently required to help developing countries make the transition to more sustainable development paths (Brown, 2007). In Africa, discussions surrounding climate change mitigation and adaptation are still in their nascent stages, gradually gaining momentum as the continent navigates the complexities of sustainable development and resilience-building. The industrial North's mitigation initiatives are now the major topic of conversation, with less emphasis placed on the adaptation strategies that other global stakeholders will need to put in place. This

misguided strategy has several causes, all of which hamper the development of the political will required to actually implement mitigation and adaptation plans throughout Africa. It's critical to influence public opinion before the leaders of the continent can commit to a proactive and comprehensive climate change agenda a top priority, it's critical to dispel the myth that development goals and climate change duties are mutually exclusive. Fossil fuel-based electricity, which includes coal, which is quite abundant in many African nations, has large greenhouse gas emissions but is relatively inexpensive to create. For instance, the most lucrative industries in South Africa are those with high carbon intensity, and the nation produces around 50% of its power from coal. Shifting South Africa's growth trajectory toward a more carbon-efficient path would entail significant financial investment. This presents a complex challenge for democratic governance across Africa, as nations must navigate the delicate balance between advancing climate action and achieving more general development goals. The political leadership and citizenry alike must collectively support the substantial upfront costs associated with mitigation and adaptation initiatives to secure long-term economic and environmental benefits. African leaders will need to see beyond election cycles in order to do this. The "State and Trends in Climate Adaptation Finance 2023" study, which was introduced at COP28, offers a thorough examination of the flows of climate money worldwide with an emphasis on Africa. Adaptation finance decreased from 7% to 5% of overall climate finance in 2021-2022, despite global climate finance tripling to US$ 1.3 trillion yearly in that same period. Africa only got 20% of global adaptation financing flows, which is inadequate given that the continent is badly affected by climate change while having very low greenhouse gas emissions. The Nationally Determined Contributions (NDCs) for the region project a requirement of US$ 53 billion per year between 2020 and 2035; however, this might be up to 100% underestimating real costs. Based on prevailing patterns, it appears that Africa will only raise US$ 195 billion by 2035, a far cry from the projected US$ 1.6 trillion required for adaptation. Furthermore, there is a worrying trend in the balance between investments in climate mitigation and adaptation, with adaptation financing falling to 36% of overall climate finance in 2021-2022 from 39% in 2019-2020 (Ede Ijjasz-Vasquez, 2024).

5. Building Climate Resilience in Sub-Saharan Africa: Strengthening National Initiatives through Regional and Global Collaboration

A wide range of tactics, such as adaptation, mitigation, technical advancement, and research, are required to handle climate change in Africa. In order to provide many kinds of aid, such monetary transfers, weather forecasts, early warning systems, and infrastructure planning, international collaboration is essential. Governments are putting adaptation measures like enhanced flood defenses and early warning agencies into place because they understand how important it is to be prepared for disasters. Substantial funding is still required, nevertheless, as meteorological data is essential but underfunded in sub-Saharan Africa. Global North development partners are crucial for supporting mitigation and adaptation plans because they provide financial and planning help that is adapted to the vulnerabilities unique to each nation. Funding for vulnerability assessments, systematic monitoring, capacity building, planning and execution of sector-specific adaptations, and awareness rising should all be part of this support. A crucial component of adaptation will be regional collaboration. Global warming surpasses national boundaries. The depletion of vital water bodies, such as Lake Chad and the Volta Basin, poses a significant threat to food security and hydroelectric power generation across multiple nations. In the case of Lake Chad, countries including Nigeria, Cameroon, Chad, and Niger face severe repercussions, while the Volta Basin's dwindling resources impact Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, and Togo, highlighting the far-reaching consequences of environmental degradation on regional steadiness and development. Accelerating adaptation can be achieved by the active exchange of information, technology, and efficient institutional processes, particularly through regional efforts (IMF, 2020).

6. Financing Adaptation in Sub-Saharan Africa

Sub-Saharan Africa will have to pay a hefty price for adaption efforts in response to climate change-roughly US$30-50 billion year, or 2-3 percent of the region's GDP-during the next ten years, but far less than regular disaster aid (AFRICA, n.d.). The examination of Post-Disaster Needs Assessments in this chapter reveals that initial

investments in coping mechanisms and resilience yield long-term savings (calculated by lower spending on disaster relief) that are nearly three times greater than initial investments in drought relief and roughly twelve times greater than initial investments in storm relief. The results of Hallegatte and colleagues (2019) are comparable. An active public equilibrium model is employed to analyze the broader benefits associated with enhancing resilience, providing a comprehensive framework to assess its long-term economic and societal impacts. The findings show that, even in the case where resilience is not developed, public debt levels increase by less than 25%, and the post-disaster widening of inequality is significantly restrained. Resilient infrastructure is also 25% more expensive than conventional infrastructure. The cost of developing resilient infrastructure may be decreased by efficiency advantages in operations, management, and construction (Rozenberg and Fay 2019). Certain non-infrastructure adaption strategies might be put into place right now and are less expensive. Programs that help farmers buy better seeds and other crop-protection tools, for instance, and those that give early alerts for weather-related disasters, have comparatively high benefit-to-cost ratios (Hallegatte 2012; GCA 2019). The same is true for prompt and focused social support; according to Del Ninno, Coll-Black, and Fallavier (2016), Ethiopia spent a mere 1.2 percent of GDP yearly and produced amazing outcomes for households experiencing food poverty. Africa has not received enough support for adaptation, especially in light of the financial effects of climate change. In spite of this, little fresh or increased cash has been pledged by the international community. According to estimates from the UNDP and the World Bank, significant efforts are required to address global food shortages and protect existing investments in developing nations from the adverse impacts of climate change, additional contributions of roughly $85 million by 2015 and $10-40 billion annually, respectively, are required. A large amount of these contributions will go into public accounts. The global response to climate change adaptation has remained inadequate. Despite the establishment of international financial mechanisms like the Special Climate Change Fund and the Least Developed Countries Fund, only a fraction of the pledged financial support has been effectively disbursed. Out of the $279 million that was originally committed, only around $26 million has been transferred thus far, which is much less than anticipated. The

Adaptation Fund was created to support initiatives in poor nations under the Kyoto Protocol after the UNFCCC meeting in Bali in 2007. It authorized a $500 million award for poor nations beginning in 2012, with funding provided by a 2% charge on Clean Development Mechanism (CDM) profits (Dinar, 2013). With this promise, funders will have concrete responsibilities and execution deadlines, going beyond mere platitudes. Numerous creative funding methods, including market-based approaches like disaster bonds and micro insurance, as well as carbon and aviation fees, have been put forth. However, beneficiaries' responsibility and their capacity for open and efficient money management are what will determine if adaption measures are successful. African nations must contend with issues such as a lack of resources, capacity constraints, and insufficient accountability and transparency frameworks.

7. Conclusion

India faces complex policy trade-offs in addressing climate change; however, a pathway exists to foster a more sustainable, resilient, and inclusive model of growth. One of India's main development objectives is to keep enhancing the level of living for more than one billion people. It must also play a significant role in lowering global GHG emissions because, in absolute terms, it is now among the biggest polluters. In order to encourage the production and use of renewable energy, the government has put in place a number of measures. These include PLI programs, RPOs, PAT, and, most recently, a carbon trading market. In order to achieve the 2070 net zero target, further work is required. With its huge reliance on the mineral for industrial activity and energy production, which results in large CO2 emissions, the Indian government has a formidable challenge in moving away from coal. More than 20 million people rely on jobs connected to coal. India has responded to this by introducing a number of policy instruments, such as regulatory frameworks, tradable energy certificates, and subsidies for the use of renewable energy. While they have started the shift toward reduced emissions, these measures are not enough to slow the rate at which emissions are increasing. In order to achieve emission reduction targets and take advantage of local debt markets, it is imperative to increase investment in renewable energy, especially through technology transfer and foreign financing. Depending on the chosen policy path, India must weigh the costs and advantages of reaching

its net zero target. Although communities that depend on coal would probably suffer and short-term growth may be adversely affected by lowering greenhouse gas emissions, these costs can be offset by well-designed programs. Benefits include increased production and better health outcomes as a result of lower pollution. Supporting individuals most impacted by the shift through skill development and transfers must be given top priority in policy. Postponing the transition to a sustainable emissions route will result in higher expenses and less overall advantages. India has taken a number of steps to combat climate change, such as encouraging afforestation and renewable energy sources. Nevertheless, 55% of Indians do not have access to commercial energy. India contends that reducing greenhouse gas emissions comes with a high price tag and may impede GDP expansion by requiring a switch from less expensive fossil fuels to more costly non-carbon energy sources. Consequently, poor nations' fundamental development requirements and economic ambitions should not be compromised by attempts to address climate change.

Africa is the continent most vulnerable to climate variability because it lacks the capacity to deal with its economic consequences, even though it contributes very little to global emissions. Therefore, it's critical that Africans comprehend the politics around climate change and give mitigation and adaptation initiatives top priority. Research, technology advancement, adaptation, and mitigation should all be included in these efforts, with industrialized and developing nations pursuing adaptation and mitigation strategies concurrently. 'No-regrets' methods and incentive-based rules are necessary to ensure high-level involvement. All development initiatives should incorporate adaptation strategies without taking away from larger development goals, with a focus on co-benefit models that combine economic growth and environmental sustainability. The deliberate and comprehensive incorporation of climate change considerations into policymaking is essential at all levels of governance and across various sectors, both within national borders and in regional frameworks. African countries have to assess current budget allocations and environmental regulations, enhancing current partnerships and modernizing antiquated programs to satisfy adaption needs. The international community can help Africa by helping to reframe policies to successfully combat climate change.

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