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Sustainable development and climate resilience in Eastern India: A policy analysis of the West Bengal SAPCC

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Abstract
West Bengal faces acute climate vulnerabilities, including rising sea levels, erratic monsoons, and frequent cyclones intensified by socio-economic inequalities and dependence on climate-sensitive sectors. In response, the state launched SAPCC 2.0 (2022-23) to make sure that local climate action is in line with national commitments made under the Paris Agreement and the Sustainable Development Goals (SDGs). This study looks at the design, institutional procedures, and sectoral strategies of SAPCC 2.0 in a critical way by using qualitative analysis of secondary data. The results reveal that SAPCC 2.0 is more integrated and open to everyone than the 2012 version. It includes ecosystem-based adaptation, climate budgeting, and sectoral convergence. But it doesn't have clear performance measures, detailed financial information, or integration at the local level, which makes it harder to put into action. Importantly, the paper draws attention to the under-addressed dimensions of social vulnerability, environmental justice, and inclusion. Despite recognizing the importance of community-based approaches, SAPCC 2.0 offers limited engagement with marginalized voices, such as women, indigenous groups, and coastal communities, who are disproportionately affected by climate stressors. By critically analyzing policy documents and secondary literature, the study underscores the need for a more participatory, equitable, and socially responsive framework for climate governance in West Bengal. The study concludes that for SAPCC 2.0 to move beyond technocratic planning and embed a more participatory, inclusive, and justice-oriented approach.

Keywords: SDGs, SAPCC 2.0, Paris Agreement, West Bengal, climate policy, sustainable development, adaptation, resilience, governance

Introduction
The state of West Bengal in eastern India is at a crucial point in the world's conversation about climate resilience and sustainable development. The region is very vulnerable to climate-related threats such as rising sea levels, cyclones, unpredictable monsoons, and temperature changes. It has a wide range of landscapes, from the Himalayan foothills in the north to the environmentally fragile Sundarbans delta in the south. These weaknesses are made worse by differences in wealth and income, a high population density, and reliance on climate-sensitive industries like agriculture and fishing (CSTEP, 2022; India Water Portal, 2022) [1, 14].

In recognition of these risks, India launched the National Action Plan on Climate Change (NAPCC) in 2008, encouraging each state to develop localized climate strategies known as State Action Plans on Climate Change (SAPCCs) (Government of India, 2008) These plans are decentralized tools that help bring climate adaptation and mitigation into regional development frameworks. West Bengal was one of the first states to respond, putting out its first SAPCC in 2012 (Government (Government of West Bengal, 2012). However, SAPCC 2.0 was revised and released in 2022-23 because of problems with data integration, stakeholder involvement, and sectorial clarity. It offers a more refined and inclusive approach to climate resilience and sustainable development (Government of West Bengal, 2023). The updated SAPCC 2.0 outlines strategic interventions across key sectors agriculture, water resources, biodiversity, health, energy, and urban development emphasizing ecosystem-based adaptation, climate budgeting, and institutional coordination.

It also seeks to make sure that India's actions are in line with its international obligations under the Paris Agreement and the Sustainable Development Goals (SDGs), especially SDG 13 (Climate Action), SDG 11 (Sustainable Cities), and SDG 15 (Life on Land) (UNDP India, 2023; MoEFCC, 2023) [27, 28, 21].

Despite these advancements, concerns remain regarding the actual implementation capacity, financing mechanisms, and local community integration within the policy framework. Recent studies point to persistent gaps in district-level planning, lack of dedicated climate funds, and limited real-time data for monitoring (Dubash & Khosla, 2023; Switch ON Foundation, 2024) [5, 24]. These challenges raise important questions about the effectiveness and equity of sub-national climate governance.

In this case, the current study takes a close look at West Bengal's SAPCC 2.0 to see how well it achieves the two goals of climate resilience and sustainable development. The study's purpose is to uncover strengths, shortcomings, and chances to improve state-level climate action in a region that is both environmentally sensitive and vital for development by looking at how it is set up, how it works, and how it is run.

Literature Review

Recent climatic research has shown that Eastern India is extremely vulnerable to climate change. A long-term geospatial study by Halder and Yaseen (2024) [11] revealed that during 2002-2021, the average rainfall in West Bengal decreased by 50.5 mm and land surface temperature increased by 6.3 °C. These alterations have enhanced the risk of droughts, interrupted agricultural rhythms, and unfavorable weather conditions to occur more often. The Centre for Study of Science, Technology, and Policy (CSTEP, 2022) [1] also believes that the temperature would rise by 1-2 °C by 2050 and less predictable rainfall will occur. West Bengal would be among the states most affected. Jha (2020) [18] argues that the region experiences a lot of nonlinear temperature and precipitation variations, and it becomes difficult to plan for the future and prepare for all.

The Sundarbans delta is a UNESCO World Heritage site highly susceptible to saltwater intrusion, loss of biological diversity, and human displacement caused by rising sea levels (Mangalam *et al*., 2024) [19]. The IPCC Sixth Assessment Report (2021) also forecasts that the eastern coast of India will have higher intensity weather conditions like cyclones and storm surges that are more frequent and more intense.

State climate action in India has been increasing faster since the National Action Plan on Climate Change (NAPCC) started in 2008. The NAPCC instructed Indian states to develop State Action Plans on Climate Change (SAPCCs) so that they could address climate challenges in a manner appropriate to them. There is a growing body of study on how well these SAPCCs perform, how well they are built, and how robust the institutions that support them are, especially in weak states like West Bengal.

According to Dubash and Jogesh (2014) [4], since SAPCCs are a big step towards climate-inclusive governance, many of the first drafts were mostly templates and didn't have thorough vulnerability assessments, costing frameworks, or stakeholder participation. The first SAPCC for West Bengal (2012) was like this. It gave broad policy guidelines but didn't go into much depth about how things would work or how they would be monitored. But its updated version, SAPCC 2.0 (2022), is a big step forward because it includes ecosystem-based adaptation, climate budgeting, and ways to put these ideas into action at the local level.

The SAPCC contributes to multiple Sustainable Development Goals (SDGs), including SDG 13 (Climate Action), SDG 2 (Zero Hunger), and SDG 6 (Clean Water and Sanitation). Singh and Pandey (2023) did a comprehensive analysis of how India is implementing the SDGs. They found that while the policy frameworks are strong, there are still problems with funding, data systems, and coordination amongst institutions.

Haokip (2022) [12] research on sustainable development in Northeast India demonstrates the significance of employing traditional knowledge and local government in climate planning. The SAPCC can do better in this regard by engaging the community more intensively. UNDP India (2023) reiterates that SAPCCs have to be integrated into larger plans such as the Sustainable Development Goals (SDGs) and India's Nationally Determined Contributions (NDCs) to the Paris Agreement. The SAPCC 2.0 strategy for West Bengal aligns well with SDGs 2, 6, 11, 13, and 15, which implies that it aligns better with international sustainability standards.

This is based on the Climate Resilience Framework (CRF) developed by the Institute for Social and Environmental Transition (ISET). According to the CRF, resilience is how systems (such as the environment and the economy), agents (such as individuals and communities), and institutions (such as government and policy) interact. The model allows you to examine the SAPCC as a whole and observe to what extent it can modify and evolve (ISET, 2010) [17].

There is increasingly work being done on climate governance in India, but there isn't yet sufficient emphasis on the manner in which SAPCCs, particularly the second generation of West Bengal, address social equality, gendered vulnerability, and the engagement of marginalized groups. Quote that the majority of SAPCCs are technocratic in nature and do not incorporate means of more inclusive governance or chart vulnerabilities. Rao and Parikh (2020) explain that resilience policy in India generally overlooks the manner in which caste, gender, and economic status intersect and hence responds poorly to social issues. In West Bengal, findings by the Switch ON Foundation (2024) [24] and UN Women (2023) indicate that policy structures fail to suit the needs of vulnerable groups, particularly women farmers, tribal groups, and coastal families, who are most affected by climate change. SAPCC 2.0 is designed improved, but it still does not have standalone statistics, tailored plans for socially vulnerable sections, or well-defined means for individuals to participate in governance. This paper bridges that gap by conducting a critical policy analysis of SAPCC 2.0, examining how institutional arrangements influence inclusiveness, resilience, and environmental justice in West Bengal.

Objectives of the study:

- To critically analyze the design and sectoral strategies of the West Bengal SAPCC 2.0 in alignment with principles of sustainable development and climate resilience.
- To examine the institutional mechanisms, governance challenges, and stakeholder participation involved in the implementation of SAPCC 2.0.

- To provide policy insights and recommendations for improving climate adaptation and mitigation efforts in West Bengal, drawing comparative lessons from other Indian states.

Research Methodology

The research design is qualitative, the analytical type based on secondary data alone, with the purpose of critically assessing the second revised West Bengal State Action Plan on Climate Change (SAPCC 2.0). The goal is to assess how effectively the plan supports sustainable development and the state's resilience towards climate change, in view of its own particular ecological, economic, as well as social-political context. The policy evaluation, comparative analysis, and theoretical modeling are merged in the research design.

Data Source

The study relies exclusively on secondary data drawn from a range of credible sources, these include:-

- **Official Policy Documents:** West Bengal SAPCC 2.0 (2023), Department of Environment, Government of West Bengal; National Action Plan on Climate Change (NAPCC); and India's Nationally Determined Contributions (NDCs).
- **Reports of International and National Agencies:** Reports by Intergovernmental Panel on Climate Change (IPCC, 2023), United Nations Development Programme (UNDP India, 2023), and Ministry of Environment, Forest and Climate Change (MoEFCC).

Analysis

This study uses a qualitative, document-based analytical approach centered on policy analysis. It depends on close reading and assessment of principal secondary sources, such as SAPCC 2.0 (2023), government reports, policy briefs, and peer-reviewed scholarly articles. Areas of emphasis were West Bengal's regions most vulnerable to climate change, including agriculture, forests, urban planning, energy, water, and public health. The analysis also examines the effects of these policies on vulnerable communities, such as rural people, women, and forest-dependent groups, highlighting the connection between environmental risk and social inequality. The study employs an analytical framework rooted in environmental justice and inclusive development to illuminate the advancements and shortcomings of SAPCC 2.0 in tackling equity issues within climate governance.

Limitation of the study

The study uses several reliable secondary sources but lacks primary data. The lack of stakeholder interviews or field-based validation makes policy implementation impact measurement difficult. Government department assessment metrics are also limited. However, by triangulating data from many institutional sources and using robust theoretical frameworks, our methodology presents a thorough and academically sound review of the West Bengal SAPCC 2.0.

Findings and Discussion

Alignment of SAPCC 2.0 with sustainable development and climate resilience: The revised West Bengal SAPCC (2022) demonstrates a crucial step forward in terms of long-term planning and integrating several sectors compared to the old one from 2012. The new plan is more complete and fits with India's Nationally Determined Contributions (NDCs) under the Paris Agreement and the Sustainable Development Goals (SDGs) for the whole world. It focuses on techniques that help both adaptation and mitigation in all areas, like climate-resilient agriculture, planting trees, lowering disaster risk, and using less energy.

For instance, in agriculture, the promotion of drought-tolerant crops, organic farming, and sustainable irrigation practices shows a desire to make food systems more resilient to climate change. In the energy sector, the focus on solar irrigation, decentralized renewable energy, and making buildings more energy-efficient all points to aims for sustainable development and lowering emissions.

However, the plan lacks budgeting details and sector-specific measurable targets, making evaluation of progress difficult. Many proposed actions are broad and lack specificity in terms of geographic focus, responsible institutions, or expected outcomes.

Institutional mechanisms and governance challenges

The Department of Environment coordinates the SAPCC 2.0, distributing implementation responsibilities among sectoral departments. While this decentralized model allows for sector-specific expertise, it also leads to fragmented execution due to weak inter-departmental coordination. The absence of a centralized climate data system and limited integration of climate considerations into district-level planning further constrain adaptive governance. Moreover, the plan does not clearly define accountability mechanisms or performance indicators, making it difficult to assess progress.

The SAPCC 2.0 provides institutional frameworks for climate governance but does not explicitly engage civil society, panchayati raj institutions, and grassroots organizations, especially those serving women, tribal communities, and economically disadvantaged groups. The Switch ON Foundation and DRCSC in West Bengal have shown that community-based programs like mangrove restoration, agroecological farming, and decentralized solar irrigation work, although state planning mechanisms typically neglect them (Switch ON Foundation, 2024). This shows a gap between top-down policy frameworks and bottom-up resilience-building, as marginalized people are often treated as passive beneficiaries rather than climate governance stakeholders or decision-makers.

Equity-oriented data and frameworks are missing from the SAPCC. Few gender-disaggregated indicators, social risk mapping, or focused policies address climate change's varied consequences on women, indigenous groups, and low-income households. This oversight limits SAPCC's ability to deliver inclusive and just climate results. Women who are based in the rural and coastal areas of West Bengal manage water, food, and energy resources and are more impacted by climate change than men. The plan does not mention their weaknesses or responsibilities except for "community participation". This renders it less capable to manage climate risks that impact multiple groups.

Conclusion

The new West Bengal State Action Plan on Climate Change (SAPCC 2.0) is a marked departure in the climate policy of the state. It is more integrated, inclusive, and forward-looking in addressing climate concerns. The new one is

nearer to the nation's climate goals and the world's aspiration to be more sustainable than the earlier one. This is especially true for India's Nationally Determined Contributions (NDCs) and the Paris Agreement's Sustainable Development Goals (SDGs). This study analyzed the SAPCC 2.0 from multiple viewpoints with a focus on its strategic formulation, institutional processes, and the extent to which it facilitates climate resilience and sustainable development. It is discovered that the policy framework has significantly changed, especially through the integration of cross-sectoral approaches and participative goals. But issues of large magnitude persist with implementation, with funding, and integration at the grassroots level. Most critically, the plan is silent on mechanisms to actually mobilize vulnerable groups, including women, indigenous peoples, and rural poor, who are the most susceptible to climate change. SAPCC 2.0 would actually aggravate structural imbalances instead of enhancing them if it has no gender-disaggregated data, localized vulnerability analysis, or channels through which people can contribute at the grassroots level.

SAPCC 2.0 must move past top-down planning and embed environmental justice as a core aspect of how it operates if it is to fulfill its full potential. To render the state more socially responsive to climate change, there is a need to build up local government, ensure that money is transparent, and incorporate voices that are often excluded. West Bengal's climate strategy needs to do more than just respond to environmental threats. It needs to tackle social and economic inequalities that enhance people's exposure. Only then will adaptation be effective and fair.

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