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Government Legislation and Policy Initiatives for Climate Change Adaptation in Pakistan in 21st Century: Challenges, Gaps, and Recommendations

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ABSTRACT

Pakistan confronts serious climate challenges even with a negligible contribution to global emissions. This study looks into Pakistani government policies and laws pertaining to adapting to climate change in the twenty-first century. Even if programs like the Ten Billion Tree Tsunami Initiative and the National Climate Change Policy highlight efforts, there are still obstacles and inadequacies. Key obstacles identified by the analysis are insufficient financial resources, poor institutional capability, and inconsistent policies within and among policies. Furthermore, the article emphasizes the need for more inclusive participation by vulnerable groups and the inadequate integration of climate issues into larger development plans. The article makes suggestions for improving Pakistan's adaption strategy in light of this assessment. These include prioritizing inclusive and community-driven adaptation methods, obtaining sustainable funding, and developing inter-sectoral collaboration, strengthening institutional capacity, and streamlining policies. Pakistan has the potential to create a more resilient future in the face of climate change by tackling these issues and putting the suggested ideas into practice. This paper has a qualitative policy/ document analysis for federal and provincial climate change policies.

***Keywords**: Climate Change, Policies, adaptation, obstacles, Development, Green financing, climate Governance, Pakistan Policy, Institutional Capacity*

INTRODUCTION

Pakistan has a relatively warm climate and is located in a region where temperatures are rising even more quickly than the global average, rainfall patterns are shifting quickly, and the melting of ice is causing the sea level to rise. Extreme weather events including heat waves, earthquakes, tornadoes, flooding, and droughts are caused by all of these changes. (Rasul & Ahmad, 2012).

Pakistan has started the process of creating National Adaptation Plan in order to increase climate change resistance. Pakistan will improve adaptation components of the Nationally Determined Contributions by utilizing National Adaptation Plan process and its results. (Ministry of Climate Change, 2021)

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The increasing development problem of climate change makes a nation more vulnerable while also impeding its socioeconomic growth. Despite contributing only 1% or less of the world's Green House Gas (GHG) emissions, Pakistan faces a great risk from climate disasters. The country's socioeconomic development requirements and climate profile make it twice as sensitive to the risks posed by evolving climatic threats. This has had severe effects on several industries, especially the water, energy, and food sectors, resulting in resource scarcity. The mainstreaming process in Pakistan is sluggish, according to the literature. Despite the fact that there are many access points, Pakistan's Prevailing Climate conditions pose structural and environmental. Numerous sectorial plans and policies still don't take climate change into account. The actual problems that the nation is facing are institutional flaws, capability shortages, and a lack of information. The knowledge and exposure of policymakers to climate change is inadequate. As a result, most policy processes do not adequately handle related challenges. (Leadership for Environment and Development, 2008).

Climate change research requires clear conceptual boundaries to ensure analytical coherence. In this study, climate change adaptation is understood as policy and governance driven adjustment in natural and human systems to reduce vulnerability to actual or expected climatic impacts. Main streaming refers to the systematic integration of climate change consideration into development planning, sectoral policies, institutional mandates and implementation mechanism across governance levels. Resilience is conceptualized as the capacity f socio-economics and institutional system to anticipate, absorb adapt and recover from climate induced shocks while maintain core function. Clearly defining these concepts allows the study to distinguish between policy formulations, institutional coordination, and implementation, outcomes, particularly across federal and provincial governance structure. (Adger, 2006).

The report depicts the country's vulnerabilities, difficulties, and alternatives for incorporating climate change into planning and policy-making. It looks at Pakistan's approach to developing and implementing policies in response to the threat posed by climate change. In order to increase policy coherence, it analyzes how conducive the environment is to integrate climate change issues into development strategies at various levels of government. It makes the case that incorporating the climate issue into Pakistan's national, provincial, and sectoral socio-economic development policies, planning, and implementation processes will significantly increase the nation's resilience to the country's oncoming climate dangers. (Afzal & Akhtar, 2021)

This study adopts a qualitative and legal document analysis to examine climate change adaptation mainstreaming in Pakistan through a clearly defined three- tier governance framework, comprising federal, Provincial and sectoral level. The analysis is based on purposively selected corpus of National Climate Policies, Provincial framework and key sectoral instrument issued between year 2001 to 2025, as well as document analysis of data based on secondary sources, such as articles published in environmental journals, web resources, policy evaluations, and reports from various non-governmental organizations. Every stakeholder will benefit from this research, especially policymakers, project developers, and development professional on national and international level.

Research Questions

i. How well have Pakistan's current climate change adaptation laws and policy measures addressed the nation's vulnerabilities and strengthened its resilience, especially in relation to water scarcity, extreme weather, and agricultural difficulties?

ii. When taking institutional capacity, financing sources, and social fairness into account, what are the main obstacles and weaknesses in Pakistan's current frameworks for legislation and policy pertaining to climate change adaptation?

iii. What suggestions may be offered for enhancing the effectiveness, inclusivity, and sustainability of government law and policy measures for climate change adaptation in Pakistan?

Theoretical Framework

The Theory of New Institutionalism offers the best theoretical framework for comprehending the procedures involved in developing climate change policy. The theory was developed in 1980 to rectify a number of contradictions in its previous form known as "The Old Institutionalism" which focused mainly on planning, management, and functioning of the formal institutions of public administration. (Lecours, 2005). Rather New Institutionalism based their research on six primary types of institutions, including informal institutions in their analysis and trying to examine the actions of institutional actors, participants in policy process, and political realities (Harguindéguy, 2007).

An Institutional Analysis of climate change policy is closely linked to a comprehensive study of climate change itself. All facets of climate change including its causes, threats, vulnerabilities, effects, perceptions, remedies and response mechanism, are influenced by institutions (Jordan & Riordan, 1997). In addition to teaching how to apply scientific information and its culturally derived interpretation, institutions provide a framework and perspective for characterizing and understanding climate change. They have an impact on abilities, presumptions, viewpoints, decisions and connections of different stake holders, which influences any response to climate change (Oberlack & Neumärker, 2011).

Climate Change Vulnerabilities in Pakistan

There are several major climate change threat to Pakistan identified in a governmental report in 2012. In these threats, glacier melting in Hindukash and Himaliyan mountains ranges, intense floods, frequent droughts, increased siltation of Dams, plant species migration, intrusion of sea water in Indus delta region, increased siltation of Dams, health risks and conflicts over water resources among riparian countries (Government of Pakistan,2012).

Majority of Pakistani population is dependent on agriculture for food and income generation. In the current climate scenario, intensive rainfall and raising temperature could limit Pakistan ability for sustainable agriculture and livestock production. From the country extracted

water 92 percent is used for agricultural purposes which is highly vulnerable due to climate change. Intergovernmental panel on climate change (IPCC) predict that in large basins like Indus there is a continued decline in fresh water availability in Pakistan (Ali et al., 2021).

In Pakistan there are approximately 7000 glaciers and 3044 glacial lakes which is considered a blessing for combating water scarcity, but 36 of those glacial lakes are nowadays a danger due to extreme weather, heavy rain, cloudburst and high temperature. Water resources are no more a blessing but a threat confronting a serious threat of climate change (Government of Pakistan, 2018.)

Raising global temperature enables the atmosphere to retain greater amounts of moisture, which when released abruptly, triggers intense and sudden downpours. The areas such as Hunza, Skardu, Murree, Chitral, Islamabad and Peshawar faced an elevated threat of more frequent and severe cloudburst in the coming years. A combination of factors, global warming, unpredictable monsoon patterns, extensive deforestation and unchecked urban expansion has intensified the destructive impacts of these events. The probability of cloudburst has grown, while lands natural ability to absorb surplus water has been severely reduced (Mushtaq, 2025).

Climate Change is expected to reduce agricultural productivity by 8-10% by 2040. Wheat yields alone may drop by up to 50% by 2050, with other major crops like maize and rice also projected to decline significantly. Raising temperatures above 35°C cause heat stress that limits crop growth and reduces yields (Aatzaz, 2024).

Climate shift increases pests and disease prevalence, threatening crop health and reducing resilience. Heat stress reduces milk production and increases animal mortality, altered water and temperature conditions disrupt fish stocks, impacting livelihood. Provinces like Sindh face climate induced yield variability and income risks, with early changes in crops seasons adding uncertainty to forming return (Lohano & Mari, 2020).

Water scarcity and variability in snowmelt from the Indus Basin critically effect Pakistan's agriculture and food security, which employs a large portion of the population. Climate change induces shift in monsoon rainfall and glacial melt timing, causing flooding and drought cycles that disrupt agricultural productivity. Disaster risk reduction (DRR) and management (DRM) thus become vital in safeguarding communities to flood and landslides which exacerbate health risks and threaten urban settlement in floodplains and costal zones. Pakistan's forests and biodiversity, essential for ecosystem services and livelihood support, face degradation from climate induces stresses. Urban planning remains challenged by rapid urbanization covering with climate risks, whereas energy system continue to rely heavily on fossil fuels, necessitating transition toward clean energy alternatives.(Ministry of climate Change,2021)

Climate Change Legislative and Policy Framework in Pakistan

Pakistan has progressively developed a legislative and policy framework addressing climate change adaptation, marked by critical milestones. The National Climate Change Policy (NCCP) introduced in 2012 was Pakistan first comprehensive document outline broad strategies

for climate resilience and mitigation across the sectors. Subsequently, in 2013 the Global Climate Change Impact Studies Center Act institutionalized climate related research and information dissemination (Government of Pakistan, Ministry of Climate Change, 2012).

The framework for implementation of Climate Change Policy 2014 operationalized specific actions aligned with NCCP objectives. The enactment of National Energy Efficiency & conservation Act 2016 marked the government's commitment to reducing emissions through energy optimization (Ministry of Climate Change, Pakistan Reports, 2018-2019).

A pivotal development was the passage of the Pakistan Climate Change Act in 2017 establishing high level institutional mechanism like the Pakistan Climate Change Council and Authority as well as Climate Change Fund to facilitate financing climate initiatives. Further momentum was gained through Clean Green Pakistan Movement launched in 2018 and the Ten Billion Tree Tsunami Program Initiated in 2019 for widespread afforestation and ecosystem restoration. (Pakistan Climate Change Act 2017)

The NCCP received an update in 2021 to align with Pakistan's commitment under the Paris Agreement and sustainable development agendas. Most recently in 2023 the National Adaptation Plan (NAP) was launched to concretize sector specific adaptation priorities across the country. These mile stone collectively represent the maturation of Climate governance in Pakistan over the last decades (Government of Pakistan, 2021).

Implementation: Institutions, Budgets, Programs, and Coordination

The institutional framework for climate change governance in Pakistan is characterized by a complex multi-tiered structure, where the Ministry of Climate Change lead at the federal level, formulating policy and coordinating initiatives. Provincial departments are responsible for adapting and implementing these policies according to their specific contexts. However challenges persist in institutional coordination and clarity of roles. The Pakistan Climate Change Authority envisioned as a key operational body, was only operationalized in 2014 following judicial intervention, but its effectiveness is curtailed by overlapping and unclear mandates, particularly with the Ministry of Climate Change. The devolution of power under the 18th Amendment further complicate the coordination between federal and provincial levels, often leading to fragmented policy implementation and enforcement gap (Khyber Journal of Public Policy, 2024).

Climate Finance remains a critical bottleneck in Pakistan's climate action. Current allocation stands at under1% of the GDP, which is substantially below international recommendations suggesting at 5% target for effective adaptation measures. The Pakistan Climate Change Fund has been established but it's not yet fully functional, and reliance on international public climate finance, the lowest among comparable developing countries. In the fiscal year 2024-2025 and 2025-2026 climate finance allocation have been improving through the integration of Climate Budget Tagging into national financing management system, with over 8% of Public Sector Development Program budget tagged was as climate related, reflecting the thematic distribution across adaptation and mitigation efforts. Despite this progress, financial flows remain insufficient to meet the massive estimated need of around US$ 348 billion between 2023 and 2030

for adaptation and de-carbonization collectively. (Ministry of Finance Pakistan, 2025, United Nations Pakistan, 2024).

Flagship programs like the Ten Billion Tree Tsunami Programme spearhead Pakistan's efforts to translate climate policy into action. Initiated in 2018 and continuing beyond 2023, this project aims to plant and conserve billions of trees across the country to revitalize forest resources and promote biodiversity. The program, Implemented in collaboration with provincial forestry department also contribute to eco-tourism, community engagement, and green job creation with over 84000 daily wagers employed during the COVID -19 pandemic under this initiative. Through strong monitoring and evaluation setups currently being enhanced, the project has made substantial progress, achieving hundreds of millions of plantings with high survival rates despite financial cuts in initial years (Ministry of Climate Change, 2023).

Climate Budget Tagging has emerged as a significant reform to improve transparency and accountability in climate-related financial resource allocation. It systematically identifies and tracks expenditures aligned with climate objectives through government financial management system such as IFMIS and SAP. This initiatives, which started gaining momentum in late 2023, has been institutionalized at a federal level, engaging thousands of cost centers in adaptation and mitigation sectors. This engagement also facilitate compliance with international financing requirements and support policy based budgeting, with climate budget integration extending to subsidy screening process. However the adaptation at provincial and sectoral level remain uneven, and capacity building efforts continue to be necessary to ensure broader implementation (Budget Division Pakistan, 2025).

Monitoring, evaluation, and reporting mechanism for climate change initiatives in Pakistan remain underdeveloped and inconsistent. While policy mandate exist for establishing Monitoring, Reporting and Verification (MVR) system critical to emissions tracking and compliance with international commitments like the Paris Agreement, the technological and institutional capacity gaps hinder their effectiveness. Coordination Challenges between federal and provincial institutions, limited technical capacity and weak enforcement capabilities further restrict comprehensive climate reporting and adaptive management. These factors collectively limit Pakistan's ability to assess progress systematically and dynamically adjust its climate strategies for improved outcomes (Khyber Journal of Public Policy, 2024: Climate Change Act Pakistan, 2017)

In nutshell Pakistan's climate change governance involves multi-layered institutions led by the Ministry of Climate Change and provincial departments, with recent formalization of the Pakistan Climate Change Authority. Financing remains insufficient and irregular despite financial reforms like Climate Budget Categorization. Key programs show promising results but require enhanced monitoring and capacity. Persistent coordination and institutional capability gaps continue to constrain effective and adaptive climate policy implementation nationwide.

Challenges and Gaps

While addressing Pakistan climate vulnerability there are significant challenges due to institutional fragmentation and ambiguous mandate between federal and provincial bodies, which lead to inefficiencies and operational delay in policy making and execution. There is a complex governance structure in Pakistan comprised of multiple apex councils and commissions intended to ensure coordination for the implementation of Climate change policies. Majority of these bodies fail to convene as legally mandated, undermining intergovernmental dialogue and strategic alignment. Key institutions for fostering coordination between provinces and federal government on climate change and economic policies, the Council of Common Interest (CCI) and National Economic Council (NEC) efficiency is weakening government oversight and implementation coherence. Pakistan Environmental Protection Council and the Pakistan Climate Change Council has missing crucial opportunities as the convened very infrequently to address escalating environmental and climate change systematically. This institutional setup compounding Pakistan vulnerabilities and creates a lack of unified leadership and fragmented response to climate risks (Dawn. 2025, July 16).

A major obstacle to climate change adaptation initiatives in Pakistan is inadequate climate finance which is limiting the scale and sustainability of the said initiative. The overall allocation remain critically insufficient and irregular despite some progress in budget allocation at federal and provincial level. The Climate Change Fund and other financial mechanism have not reached their full potential, and domestic climate finance, especially from private sources remain low. Reliance on Donor-Driven programs and structural economic challenges further restrict Pakistan's ability to mobilize adequate and predictable funding for climate action. These financial barriers restrict investment in resilient infrastructure, technology deployment and capacity building required for effective climate risk management. Furthermore, delay in leadership appointments in essential research and policy institutions delay climate- responsive innovation and evidence based planning (UN Pakistan, 2024).

Another critical barrier to climate risk assessment and planning is, technical expertise shortage across federal, provincial and local government bodies. All the provinces lack specialized capacity and exhibit disparities in institutional readiness to localize national climate strategies, limiting effective adaptation at grassroots level. Without robust technical capacity, climate policies remain superficially designed and inadequately implemented, with limited ability to adapt dynamically to emerging climate risks. Due to weak Stakeholder engagement, including private sector and civil society participation, restricting community based climate resilience initiatives that are essential for vulnerable population. This gap create a cascading effect, limiting broader climate governance improvements and resilience building efforts (NUST Conference Paper, 2025).

Despite Pakistan high vulnerability to climate threats, meaningful community engagement and public awareness in climate adaptation remain insufficient. Limited awareness campaign, educational outreach and participatory planning process have restricted the empowerment of communities to implement adaptation measures. Climate Change is not mainstreamed adequately into local development priorities because of low environmental literacy,

which contribute a gap between national policies and community level actions. Integration of climate adaptation into broader economic and development planning is incomplete, which weakens institutional incentives for climate- resilient growth. This lack of mainstreaming across sectors such as agriculture, industry, and urban planning undermines the potentials to leverage synergies between climate action and sustainable development. Addressing this gap requires enhanced inter-ministerial coordination, sustained political commitment, and inclusive policy frameworks that embed climate consideration throughout fiscal, economic and social planning process (Ministry of Climate Change, 2021).

To summarize, Pakistan faces persistence challenges in climate governance marked by fragmented institution, limited and irregular financing, technical expertise shortages, and insufficient community engagement. Institutional inefficiencies and coordination bottlenecks further exacerbate vulnerability by delaying critical decision and policy implementation. Closing these gaps will require deep institutional reforms, capacity building, financial mobilization and inclusive participation to enable more effective and equitable climate resilience across the country's diverse regions. Strengthening leadership continuity, enhancing intergovernmental coordination, and embedding climate action into all sectors of development remain indispensable priorities for Pakistan's climate adaptive future.

Recommendations for Strengthening Climate Adaptation Governance

Following are the recommendations to overcome the above mentioned barriers and to strengthen climate adaptation governance:

i. Establishment of National Climate Action Council (NCAC): there is a dire need for the establishment of NCAC to unify climate governance across Pakistan's federal, provincial and local level. This centralized body have not only to oversee climate policy implementation but also to ensure accountability and coordination among diverse ministries and agencies. This council would have authority to foster cross sector collaboration by regularly convening multi stake holders meeting in priority areas such as, flood management, renewable energy, and climate smart infrastrucre. By empowering this council with oversight capacity and decision making will create an integrated framework aligning climate goals with sustainable development objectives nationally and provincially. (Khyber Journal of Public Policy,2024)

ii. Strengthening Financial Mechanism: financial mechanism can be strengthened by fully operationalizing Climate Change Fund which will further improve its access to international climate finance. By introducing innovative revenue streams such as Corban taxation on industrial emissions, and public private partnership incentives a sustainable domestic financing framework can be established. These financial reforms will provide predictable long term resources for climate adaptation and mitigation projects by reducing Pakistan dependence on intermittent external funding. Raising funds through better fiscal reforms and offering tax subsidies to the private sector can help expend climate projects in areas like energy, farming, agriculture and urban development. Making climate budget

more transparent with clear tracking mechanism will improve financial accountability and efficient resource allocation.(Ministry of Finance Pakistan, 2025)

iii. Capacity –Building Programs: These program should focus on provincial authorities, local government and community stakeholders, ensuring they develop technical expertise in climate risk assessment and planning. Technology transfer and training will empower local actors to apply climate smart solutions and manage vulnerable ecosystem effectively. Community engagement through education and marginalized group inclusion can promote sustainable adaptation (Global climate Study, 2025).

iv. Strengthening Monitoring System: there is a need to strengthen system for monitoring, reporting and evaluation (MVR) for climate initiatives. Robust data management aligned with national and global standard will improve transparency and adaptive governance. Enhancing MVR capacity enables accurate emissions tracking, financial reporting, and public accessibility, fostering trust and inclusive climate governance. (UN Climate Finance Report, 2024)

v. Involvement of Marginalized Groups: Effective climate resilience depends on involving marginalized groups, especially women and youth. Climate risks can be managed through focusing on gender equality, social inclusion and empowerment to enhance community capacity. Inclusive decision making and livelihood diversification build social capital, increase awareness and encourage climate responsive policies that address diverse population needs. (NDMA Pakistan,2024)

vi. Technology-Driven Climate Solution: Accelerating the shift to renewable energy and technology driven climate solution is critical. Investment in solar, wind, hydro and clean technology diversify energy sources, improve security, and generate green job. Incentives and international partnership will fast track renewable adoption, enabling Pakistan to meet Paris Agreement target while supporting sustainable economic growth (Asia Society, 2024)

CONCLUSION

The evolution of Pakistan's climate change legislative and policy landscape in 21st century reflects significant developments towards structured adaptation governance. The three tier paradigm highlights the need for harmonized attention to climate sensitive systems, robust policy formulation, and effective implementation systems. While foundational policies and institutional frameworks exist, practical challenges in finance, coordination and capacity constrain impact. Addressing these challenges through cohesive governance reforms, financial strengthening, and capacity enhancement is pivotal for enabling Pakistan to manage climate risks and ensure sustainable development in an increasingly uncertain climate future.

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