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Climate Governance Capacity in Pakistan: Institutional Challenges and Policy Directions

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***Abstract*:** Purpose: Pakistan's National Climate Change Policy identifies institutional capacity building as a central goal, yet the country continues to face acute exposure to climate-related disasters. This study examines how five of Pakistan's principal climate-governance institutions describe their own policy, technical, coordination and human-resource capacity, and what this reveals about the gap between stated policy ambition and institutional readiness. Design: A qualitative research design was adopted. Semi-structured interviews and focus group discussions were conducted with 30 individuals drawn from government and non-government institutions engaged in climate change policy, financing and implementation in Islamabad, purposively and conveniently sampled until data saturation. Data were analysed using thematic analysis. Findings : Across the institutions examined, a consistent set of capacity themes emerged: reliance on modelling and forecasting constrained by limited computational infrastructure; a persistent shortage of trained climate-science human resources; weak coordination both between federal and provincial authorities and among institutions with overlapping mandates; and a financing structure that channels the bulk of climate resources through international donors and multilateral partners rather than sustained domestic budget lines. Policy implications: The findings indicate that Pakistan's climate governance constraint is less a shortage of institutional mandates or policy documents, of which there are many, than a shortage of coordination mechanisms and human-resource investment capable of translating those mandates into consistent practice across federal and provincial levels. Value: Where prior research on Pakistan's climate governance has tended to evaluate national policy documents in the abstract, this study draws directly on how the institutions responsible for implementing that policy describe their own capacity, offering an institution-level account of where the gap between climate policy ambition and institutional practice actually sits.
Keywords: Institutional capacity; climate governance; climate policy; sustainable development; Pakistan; qualitative research

1. Introduction

Climate change is not a problem institutions can simply choose not to face; the question is whether they are equipped to face it. Pakistan's exposure runs across nearly the full range of climate hazards, heatwaves, floods, droughts, earthquakes, and its agriculture-dependent economy, which employs roughly 47% of the national labour force, leaves the country structurally exposed when that hazard profile shifts (Kelkar & Bhadwal, 2007; World Bank, 2015). Repeated disaster losses over the past

decade have placed Pakistan among the ten countries most seriously threatened by climate change impacts, a position that reflects vulnerability rather than emissions responsibility (Hussain & Mumtaz, 2014).

Pakistan's National Climate Change Policy identifies institutional capacity building, developing understanding, improving skill, and strengthening coordination among stakeholders, as one of its central goals, on the premise that government institutions must work efficiently and effectively if the country's broader climate response is to succeed (MOCC, 2012). What counts as institutional capacity has itself evolved: earlier definitions centred on strengthening individual organisations through technical and managerial training, while more recent accounts extend the concept to empowerment, social capital, and the wider governance culture that shapes how institutions actually behave (Segnestam, 2003). Financing capacity matters as much as technical or administrative capacity: climate finance governance research in comparable South Asian settings finds that financing mechanisms can exist on paper while remaining poorly integrated into local-level implementation, with participatory governance largely absent from disaster-related climate finance delivery (Sarker et al., 2021).

Whether Pakistan's own climate institutions have the capacity their policy documents assume is an empirical question this study is positioned to answer directly, by examining how five of the country's principal climate-governance institutions, spanning government, international-partnership and civil-society organisations, describe their own policy, technical, coordination and human-resource capacity.

1.1 Research questions and objectives

Four questions guide the study: how do institutions work in relation to climate change policy; how does institutional expertise cope with climate change in Pakistan; what action plans do institutions maintain for climate sustainability; and what institutional resources exist to support that sustainability. The corresponding objectives are to identify institutional setups and policies regarding climate change, to explore institutional expertise, to examine institutional action plans, and to explore institutional resources for climate sustainability.

1.2 Significance and research gap

Considerable research already exists on adaptive and mitigative strategies for climate change in Pakistan; comparatively little examines the capacity of the institutions responsible for delivering those strategies, using a qualitative approach that draws on how institutions themselves describe their capacity rather than on external policy assessment alone. This distinction matters practically as well as academically: an institution's climate change is not, by itself, the problem policy needs to solve; the problem is what happens when institutional capacity fails to keep pace with the scale of the challenge.

1.3 Scope and limitations

This study is limited to institutions operating at the federal level in Islamabad; provincial-level institutions, which under Pakistan's devolved constitutional structure hold substantial independent authority over climate policy implementation, fall outside its scope. The study also does not capture indigenous knowledge systems or the individual-level needs of communities affected by climate change, both of which would require a different research design to address adequately.

2. Literature Review

2.1 Climate risk and institutional response in Pakistan

Pakistan's disaster exposure spans hydrological, meteorological and geophysical hazards, driven substantially by mountain ranges that produce heavy rainfall and glacier erosion in the country's north, and by a South Asian regional climate pattern that leaves the region more exposed than most developed economies to the downstream effects of global warming (Kelkar & Bhadwal, 2007). Agricultural dependence compounds this exposure: natural disasters over the past decade have contributed to energy shortages and broader economic instability, leaving Pakistan ranked near the bottom of South Asian

economies by per-capita output (World Bank, 2015). Existing research further finds Pakistan's water-management institutions specifically strained by the combined pressure of climate variability and rising demand (Hussain & Mumtaz, 2014).

2.2 What institutional capacity means for climate governance

Institutional capacity, in the climate-governance literature, is treated as a determinant of policy performance in its own right, not merely a precondition for it. Institutions shape climate outcomes in at least three ways: by setting the formal and informal rules that govern economic decision-making, by structuring whose interests carry political weight in policy debates, and by shaping the patterns of understanding that determine which policy options are even considered (Goulder et al., 2018). Effective environmental governance further depends on enabling legal and regulatory frameworks that allow institutions at every level, not only the national level, to act, alongside sustained institutional arrangements for translating international climate finance into local implementation (World Bank, 2010). Financing capacity carries particular weight in this literature: research on climate finance governance in Bangladesh finds that financing mechanisms can be formally adequate while remaining weak in practice, with limited direct community engagement in how climate finance is actually delivered at the local level (Sarker et al., 2021), a pattern with direct relevance to how this study interprets the financing constraints documented in Pakistan's own institutions.

2.3 Institutional capacity and sustainable development

Climate and sustainable development goals are treated in recent policy literature as mutually reinforcing in principle but institutionally demanding in practice: policies calibrated to available resources perform better than those that are not, and comprehending a policy's distributional effects, who bears its costs and who receives its benefits, is treated as essential to avoiding the social and inequality risks that poorly designed climate mitigation policy can create, particularly in contexts marked by poverty, weak governance, or limited institutional capacity to identify and correct adverse effects as they emerge (Markkanen & Kraavi, 2019).

2.4 Research gap

Where this literature offers comparatively little is a study that examines, directly and comparatively, how the specific institutions responsible for Pakistan's climate governance describe their own capacity gaps, technical, financial, coordination-related, rather than assessing national policy documents from the outside. This study addresses that gap.

3. Conceptual Framework

This study's conceptual framework draws on Yusoff's (2011) account of institutional capacity for climate change, which identifies three variables as jointly determining an institution's capacity to curb climate change and support sustainable development: financial capacity, technical expertise in climate change, and the action plans an institution maintains to reduce environmental damage. Institutions with stronger financial resources, deeper technical expertise, and clearer action plans are expected, on this model, to contribute more effectively to sustainable development outcomes; weakness in any one variable constrains what the other two can achieve. This framework structures the thematic analysis presented in Section 5: each institutional profile is read for evidence of financial capacity, technical or human-resource expertise, and concrete action plans, with coordination capacity, the degree to which an institution's efforts connect with those of others, emerging inductively as a fourth, cross-cutting theme.

4. Methodology

4.1 Research design

A qualitative, descriptive research design was adopted, appropriate for developing an in-depth understanding of institutional capacity that a quantitative instrument would be less able to capture, particularly given the study's exploratory objectives and the absence of an established quantitative

measure of institutional climate capacity specific to Pakistan (Creswell, 2003).

4.2 Sampling and participants

Purposive and convenience sampling were used to identify respondents directly involved in climate change policymaking or implementation (Etikan et al., 2016; Taherdoost, 2016). The target sample comprised government officials and non-government professionals working across climate-relevant institutions in Islamabad; recruitment continued until data saturation was reached at 30 participants, drawn roughly five per institution across six institutions, and supplemented by a focus group discussion with university-based climate change experts.

4.3 Data collection

Data were collected through semi-structured, in-depth interviews and focus group discussions. Semi-structured interviews were selected as the primary method because they combine a flexible interview guide with follow-up questioning, allowing open-ended exploration of participants' thoughts, feelings and beliefs about institutional capacity (DeJonckheere & Vaughn, 2019; Guion et al., 2011). Focus group discussions, involving five to ten participants and used specifically with university-based climate change experts, supplemented the interview data with a more discursive, comparative form of evidence (Kumar, 2011).

4.4 Data analysis

Data were analysed using thematic analysis, a process of identifying recurring patterns of similarity and disparity across the dataset and organising them into themes that make the underlying information interpretable (Smith & Firth, 2011). Themes were developed separately for each institution before being read comparatively across institutions to identify the cross-cutting patterns presented in Sections 5 and 6.

5. Results

Interviews and focus group discussions were conducted with five institutions central to Pakistan's climate governance architecture: the Pakistan Meteorological Department (PMD), the Global Change Impact Studies Centre (GCISC), the United Nations Development Programme (UNDP) Pakistan, the Centre for Climate Research and Development (CCRD), and the Civil Society Coalition for Climate Change (CSCCC). A sixth institution included in the original data collection could not be reliably reported here: the underlying material was too degraded in the source record to summarise without risk of misrepresenting what was said, and it has accordingly been excluded rather than reconstructed. Table 1 summarises the capacity themes identified for each of the five institutions reported; each is discussed in turn below, organised around the financial, technical, action-plan and coordination variables set out in Section 3.

Institution	Financial capacity	Technical/human expertise	Coordination
Pakistan Meteorological Department	Computational infrastructure limits model resolution	Basic in-house training only; no dedicated national graduate programme	Federal-provincial information gap; duplicated research effort
Global Change Impact Studies Centre	Dependent on continued government and donor support	Severe shortage of climate scientists and modellers; brain drain	Advises MoCC on policy and international negotiating positions
UNDP Pakistan	Structured national climate budgeting; adaptation funding	Provides technical assistance and capacity-building	Coordinates SDG localisation across federal and

	25–71% of relevant spend, 2010–2014	support	provincial levels
Centre for Climate Research and Development	University-affiliated; project-based research funding	Conducts province-level vulnerability assessment and water-sector research	Limited exchange of findings with other research institutions
Civil Society Coalition for Climate Change	Membership-based; donor and partner funding	Builds evidence-based advocacy capacity across member organisations	Networking platform connecting civil society, academia and policymakers

5.1 Pakistan Meteorological Department

The PMD operates as both a research and a service department, providing meteorological data, climate-change indicators, and adaptation guidance across multiple sectors, alongside meeting Pakistan's reporting obligations under international climate agreements (Rasul, 2010). Four organisational divisions, the National Seismic and Tsunami Warning Centre, the Centre for Drought Monitoring, the Research and Development Division, and the Division for Flood Forecasting, sit under a Chief Meteorologist, and the department has in recent years placed growing emphasis on research into Pakistan's own climate-change indicators.

On technical capacity, PMD participants described a structural constraint rather than a knowledge gap: the department uses global climate models, downscaled to the regional level, but limited computational capacity forces reliance on relatively coarse resolution. Models including HRM, RegCM3, SDSM and PRECIS run on a blade server with 16 processing nodes; a single run at a small domain and larger time step can take months to complete. Participants were direct about what this means in practice: finer-resolution, less biased projections would require substantially greater computing power than the department currently has access to.

On coordination, participants described a structural tension introduced by devolution: provinces now hold significant independent authority over climate policy, and differences in political leadership between federal and provincial administrations can widen the gap between national climate policy and its provincial implementation. Participants were explicit that this is not simply a communication problem but an information gap between the Ministry of Climate Change and provincial authorities that undermines the monitoring and evaluation needed to keep federal and provincial efforts aligned.

On human expertise, participants identified an educational gap at the source: no national university currently offers dedicated graduate or postgraduate training in climate science, leaving PMD to provide only basic in-house training to graduates in mathematics, physics or computer science. Numerical modelling skill in particular was described as scarce, and participants noted that trained staff who gain that expertise frequently move abroad without transferring their knowledge to colleagues, a loss compounded by duplicated research effort across institutions that do not communicate with each other.

5.2 Global Change Impact Studies Centre

GCISC is a dedicated national research centre for climate change, responsible for research and development, capacity building, policy analysis and support to national planners on climate impacts across water, food, agriculture, energy, forestry, health and ecological sectors. Participants described the centre's core policy role as using environmental impact assessment tools to embed climate considerations into Pakistan's development process, and as advising on the country's positioning in international climate negotiations, including the promotion of clean development mechanisms.

On human resources, GCISC participants were blunt about the scale of the constraint: Pakistan lacks the climate scientists, modellers, technicians and negotiators needed to engage effectively in international climate processes, a shortage participants attributed to brain drain, underinvestment in climate education, and limited domestic career opportunities in the field. On institutional capacity building, participants pointed to a specific, addressable priority: strengthening GCISC and university climate-science programmes through financial and technical support, including sending early-career scientists abroad for advanced training. On technology, participants linked Pakistan's capacity gap to the broader international commitment, under the UNFCCC's technology-transfer framework, to move innovative climate technology from industrialised to developing countries, framing this as a policy lever Pakistan has not yet fully used.

5.3 United Nations Development Programme

UNDP Pakistan works with government and communities on development responses to climate change, supporting Pakistan's progress toward its Sustainable Development Goals and international climate commitments while building institutional capacity in environmental management, climate finance, and governance. Participants described a structured, three-phase national budgeting process for climate expenditure: identifying available climate-relevant expenditure, allocating it between adaptation and mitigation according to National Climate Change Policy priorities, and finally assessing what share of total spending each allocation represents. Government funding for adaptation projects, participants reported, ranged between 25% and 71% across the 2010–2014 period, concentrated disproportionately in the water and energy sectors.

On policy, participants described UNDP's role in localising the Sustainable Development Goals at federal and provincial level, supporting Pakistan's Voluntary National Review reporting, and mobilising private-sector investment for climate finance, including through Pakistan's representation at COP26. On programming, participants pointed to concrete initiatives including the Ten Billion Tree Tsunami Programme, now in its third year of implementation, and the Recharge Pakistan Programme, an ecosystem-based flood-risk initiative requiring an estimated USD 150 million in climate-resilient infrastructure investment.

5.4 Centre for Climate Research and Development

Established by COMSATS University Islamabad, CCRD focuses on building Pakistan's technical research capacity in climate resilience, disaster-risk management, and greenhouse-gas mitigation, alongside developing regional and global research networks and advancing climate education. Participants described the centre's core work as conducting province-level vulnerability assessments, examining current and projected exposure to climate-related risk, the relationship between water availability and socio-economic wellbeing, and the viability of specific adaptation options, feeding into provincial water-sector adaptation plans.

On education, participants identified postgraduate climate-change curricula as an area requiring sustained investment: strengthening teaching capacity, developing new curricula, and building academic exchange with international research institutions were all described as necessary to close the gap between Pakistan's water-climate research needs and its current teaching capacity. On coordination, participants described the same underlying problem PMD raised, limited exchange of research findings and lessons learned between academic and research institutions, constraining the development of new policy ideas and sound adaptation strategy.

5.5 Civil Society Coalition for Climate Change

CSCCC is a membership-based coalition, registered under Pakistan's Companies Ordinance, that provides a formal networking platform for civil society engagement in climate policy. Participants described its role as building a broad constituency, spanning academics, researchers, the private sector,

and specialist civil society organisations, and translating research and partner learning into products that feed directly into policy planning.

On capacity building, participants emphasised trust-building as the coalition's central mechanism: strengthening civil-society organisations' ability to engage constructively with government requires structured dialogue at every level, from domestic policy processes to international climate negotiations, and sustained investment in parliamentarians' and lawmakers' own capacity to support climate legislation. On research and advocacy, participants described the coalition's dual role as both an accountability mechanism, tracking implementation of the National Climate Change Policy and publishing its findings, and an evidence-generation mechanism, producing research-based recommendations for context-specific adaptation and mitigation policy that policymakers can act on directly.

6. Discussion

6.1 A common shape across five different institutions

Read across the five institutions examined, capacity is not a single deficit but a set of interlocking ones, and it is government and non-government institutions that carry different pieces of the same constraint. Government institutions, PMD and, to a lesser extent, GCISC, concentrate on policy-making and technical assessment; non-government and international-partnership institutions, UNDP, CCRD, CSCCC, concentrate more on research, advocacy and international representation. Both roles matter, and neither is sufficient alone: PMD's climate models are only as useful as the computational infrastructure behind them, and CSCCC's advocacy capacity is only as useful as its ability to get its research in front of the people making budgeting decisions.

What ties the five institutional accounts together is not any single shared weakness but a shared structural position: each institution described itself as capable within its own remit and constrained by something outside that remit, PMD by computing infrastructure, GCISC by the domestic talent pipeline, CCRD by inter-institutional communication, CSCCC by the distance between civil-society research and government decision-making. None of the institutions examined described their central problem as a lack of climate expertise inside their own walls. All of them described it as a gap between their own capacity and the capacity of the system they operate within.

6.2 Why the human-resource shortage matters more than the financing gap

Financing constraints appear throughout the findings, in PMD's computing infrastructure, in CCRD's project-based funding, in GCISC's dependence on continued donor and government support, but the human-resource shortage GCISC and PMD both describe independently is arguably the more binding constraint, because money alone cannot resolve it on any short timeline. Training a climate modeller or a numerical-modelling specialist takes years; no national graduate programme currently exists to shorten that timeline, and the trained experts Pakistan does produce are, by GCISC and PMD's own account, prone to moving abroad without transferring their expertise to colleagues who remain. This reframes what a financing solution to Pakistan's climate-capacity gap would actually need to fund: not primarily hardware and infrastructure, though those matter, but sustained investment in domestic climate-science education, an investment with a payoff measured in years rather than budget cycles.

6.3 Coordination as the connective constraint

Every institution examined raised some version of a coordination problem, but the shape of that problem differed by institutional type. For PMD, coordination failure runs vertically, between federal and provincial authorities, worsened where political leadership differs across levels of government. For CCRD, it runs horizontally, between research institutions that do not exchange findings, leading to duplicated effort and missed opportunities for shared learning. For CSCCC, it runs between civil society and government, a distance the coalition exists specifically to narrow. These are not the same

coordination problem wearing different institutional clothing; they are three distinct gaps that happen to share a name. A policy response built around a single coordination mechanism would likely address only one of the three, leaving the other two, vertical and inter-research coordination, unresolved.

7. Policy Implications

The findings point toward three priorities. First, closing the vertical coordination gap between the Ministry of Climate Change and provincial authorities requires a standing information-sharing mechanism, not simply a policy directive, since participants across institutions described the gap as informational rather than purely political: provincial and federal authorities do not consistently know what the other is doing. Second, addressing the human-resource shortage GCISC and PMD both identify requires sustained investment in domestic postgraduate climate-science education, not only continued reliance on sending individual scientists abroad for training, since the latter approach does not build the institutional teaching capacity needed to train the next generation domestically. Third, the horizontal research-coordination gap CCRD describes could be addressed through a shared research repository or coordination body linking Pakistan's climate research institutions, reducing the duplicated effort participants across multiple institutions independently raised as a concern.

None of these recommendations require new institutions. Pakistan already has a PMD, a GCISC, university-based research centres, and an active civil-society coalition; each institution examined here is already doing recognisable, useful work within its own remit. What the findings indicate is missing is not more institutional coverage but better connective tissue between the institutions that already exist.

8. Conclusion

This study examined how five of Pakistan's principal climate-governance institutions, the Pakistan Meteorological Department, the Global Change Impact Studies Centre, UNDP Pakistan, the Centre for Climate Research and Development, and the Civil Society Coalition for Climate Change, describe their own institutional capacity, drawing on interviews and focus group discussions with 30 participants. Despite genuine and sustained institutional effort, the findings point to flaws in how climate policy is developed and implemented at the institutional level. Institutions hold differing priorities and interests, which has produced coordination failures rather than a unified national response; organisational coordination, in particular, emerged as one of the most consistently raised concerns across every institution examined. Pakistan's status as a developing country contributes financial constraints to this picture, but the shortage of trained human resources emerged, across multiple institutions independently, as the more binding constraint of the two.

The comparison across institutions, rather than any single institutional profile, is this study's main contribution: it shows that Pakistan's climate-governance institutions are not failing from a shared, singular weakness but from a set of distinct structural gaps, vertical coordination, horizontal research coordination, and human-resource pipeline, that happen to produce a similar practical effect. Treating them as one problem risks a policy response that fixes none of them completely.

This study's scope, limited to federal-level institutions in Islamabad and to the institutions and participants who could be reached within the study's timeframe, means its findings should not be read as a complete national account; provincial climate institutions, which under Pakistan's devolved governance structure hold independent authority over much of climate policy implementation, were outside its scope, and one institutional profile could not be reliably reported here due to source-material limitations. Future research extending this study's institutional, comparative approach to provincial-level institutions would test whether the coordination and human-resource findings reported here hold at the level where much of Pakistan's climate policy is actually implemented. Research examining how the specific coordination mechanisms recommended here, a standing federal-provincial information-sharing structure, a shared research repository, perform once implemented would extend this study's descriptive

account toward a more direct test of what actually closes Pakistan's climate-institutional capacity gap.

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