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DISCOURSE

COP AND CLIMATE CHANGE

Pakistan's Road to Resilience

PIDE

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Discourse is a quarterly magazine published by the Pakistan Institute of Development Economics (PIDE). This issue, titled **"COP and Climate Change: Pakistan's Road to Resilience,"** examines the country's escalating climate vulnerabilities, particularly in light of the devastating floods and extreme weather events witnessed in recent years. The rising frequency and intensity of these disasters, coupled with deteriorating environmental conditions, demand urgent and coordinated action from all stakeholders—government, researchers, communities, and global partners alike.

In response to these pressing challenges, this edition brings together the insights of leading experts, researchers, and policymakers.

A centerpiece of this issue is an in-depth interview with **Lieutenant General Inam Haider Malik, Chairman of the National Disaster Management Authority (NDMA).** He discusses the evolution of NDMA, the continuous strengthening of Pakistan's disaster risk assessment and response systems, and the pivotal role of collaborative efforts—local, national, and international—in mitigating the human and economic cost of climate-related disasters. His perspective provides an essential practitioner-level understanding of both the challenges and opportunities that lie ahead. The contributions span a wide range of critical themes, including climate risk and impact assessment, governance and policy frameworks,

Looking beyond the immediacy of climate-induced shocks, this issue also reflects on Pakistan's engagement with global climate negotiations, particularly the Conference of the Parties (COP) process. As a climate-vulnerable developing country, Pakistan's voice in global forums is critical for shaping equitable climate finance frameworks and advocating for loss-and-damage mechanisms. Our contributors examine these themes with a focus on how Pakistan can better leverage international platforms to advance its national climate agenda.

Finally, this edition underscores the need for a paradigm shift in how climate policy is formulated and implemented. Building resilience requires moving beyond reactive measures toward integrated, forward-looking strategies rooted in data, institutional coordination, and community engagement. Through the analyses presented in this issue, we hope to inspire actionable dialogue and encourage policy innovation that strengthens Pakistan's capacity to withstand and adapt to a changing climate.

MESSAGE FROM THE VICE CHANCELLOR

COP and Climate Change: Pakistan's Road to Resilience

Each year, the climate conversation grows louder—but for Pakistan, the consequences grow heavier. From floods to smog, from shifting weather patterns to strained urban systems, climate change is no longer a distant threat—it is a lived reality shaping livelihoods, disrupting development, and exposing deep institutional fault lines.

This edition of Discourse—"*COP and Climate Change: Pakistan's Road to Resilience*"—emerges not just as a publication, but as a call to recalibrate our climate response. Our vulnerability is evident; what remains uncertain is our readiness. Pakistan sits at the epicenter of a climate crisis not of its making, yet it must now build the road to resilience with tools both domestic and diplomatic.

This issue captures a critical moment: as COP30 prepares to move from pledges to payouts, Pakistan's voice must rise with moral clarity, strategic focus, and institutional preparedness. We can no longer rely solely on claims of vulnerability. Effective climate diplomacy now demands demonstrated capacity—to plan, absorb, and deliver transformative climate finance.

The contributors in this volume offer not only deep insights into policy gaps and systemic risks, but also credible pathways for reform, ranging from innovative financing and emissions strategies to disaster governance, local knowledge systems, and climate-smart agriculture. This is knowledge that does not merely describe our problem—it builds our readiness to solve it.

Pakistan's climate struggle is asymmetrical—uneven across regions, classes, and sectors. And yet, within this complexity lies resilience: of communities, of institutions, and of ideas. Discourse brings these ideas together—not in isolation, but in conversation. Because the road to resilience will not be paved by siloed projects or reactive relief—it will be built through coordination, foresight, and grounded policymaking.

This issue is a contribution to that vision. Let it provoke thought, fuel debate, and, most importantly, guide action.

Dr. Nadeem Javaid (SI)
Vice Chancellor, PIDE

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INTRODUCTION: CLIMATE CHANGE AND THE GEOGRAPHY OF INJUSTICE

Climate change continues to be a complex and intractable global problem with the most severe impacts on the most vulnerable - the socially disadvantaged, structurally disempowered, and economically poor peoples and communities of the world. Mainly caused by the human interference, especially the increasingly growing accumulation of greenhouse gases, this process poses a fundamental threat for the stability of ecological systems and human development paths. But the effects of climate change are not homogenous and justly distributed; instead, they are manifested in the spatially differentiated and social-economically charged expressions of vulnerability. Developing countries, ecologically fragile regions and climate-sensitive sectors (such as agriculture, hydrology, public health, and coastal economies) are disproportionately exposed to climate disruptions and extreme weather conditions. The combination of systemic vulnerability and adaptive capacity generates a developmental puzzle that not be solved through one-size-fits-all approaches. To address this complexity, the policy conversation needs to shift toward context-specific research that includes fine-grained climate risk assessments and locally embedded adaptation options. All such methods must be grounded in both scientific evidence and socio-political legitimacy, so that their intervention are not only scientific based, but also culturally and economically feasible.

UNEQUAL EXPOSURE: MAPPING ASYMMETRICAL CLIMATE VULNERABILITIES

The spatial and social asymmetries of climate vulnerability are products of complex and interdependent biophysical, socio-economic, and institutional dynamics. The differential impacts of climate change manifest through geographically specific exposure patterns and uneven adaptive capacities across communities and ecosystems. Low-lying coastal zones are increasingly imperiled by sea-level rise, saline intrusion, and intensified storm surges, threatening both human settlements and ecological integrity. In contrast, arid and semi-arid regions experience progressive desertification, hydrological stress, and land degradation, undermining agricultural productivity and water security. For smallholder farmers, shifting agro-ecological zones and erratic precipitation patterns have destabilized traditional cropping systems, thereby exacerbating food insecurity and rural poverty.

Urban environments, particularly informal settlements and peri-urban areas, face distinct climate-induced risks. The absence of resilient infrastructure amplifies vulnerabilities to heat extremes, flooding, and disease proliferation, resulting in cascading socio-economic impacts. Moreover, vulnerability is not merely spatial but deeply intersectional, mediated by gender, age, disability, class, and access to resources, thus reinforcing pre-existing inequalities and governance deficits. Climate change, in this sense, functions as a **threat multiplier**, compounding socio-political fragilities and developmental disparities, particularly across the Global South where adaptive capacities remain constrained.

These asymmetrical exposures underscore the inadequacy of uniform adaptation prescriptions and necessitate **context-differentiated, justice-oriented policy frameworks**. Understanding the geography of vulnerability demands integrative assessment methodologies that combine climate science with social inquiry, institutional analysis, and participatory diagnostics. Such an approach enables decision-makers to distinguish between site-specific sensitivities and adaptive capacities, thereby informing equitable resilience strategies. Mapping and addressing these asymmetries is therefore not only a scientific imperative but also a moral and political one, essential for reorienting climate governance toward inclusivity, distributive justice, and transformative adaptation that protects the most exposed and empowers the least resilient.

BEYOND GLOBAL MODELS: THE CASE FOR CONTEXT-SPECIFIC CLIMATE RISK ASSESSMENTS

While global climate models and scenarios have substantially advanced our understanding of Earth's changing climate system, their applicability to local and sectoral decision-making remains limited without appropriate downscaling and contextual interpretation. The heterogeneity of climate impacts, shaped by geography, socio-economic structures, and governance systems, demands analytical approaches that move beyond global generalizations toward fine-grained, site-specific risk diagnostics. Comprehensive climate risk assessments must integrate the triad of hazard, exposure, and vulnerability, capturing both biophysical processes and social dimensions of risk. This integrated approach provides the empirical foundation necessary for evidence-based adaptation planning and resilient development policy.

Context-specific assessments are particularly crucial for data-scarce regions such as Pakistan, where climatic and socio-ecological systems are highly diverse, from the glacial-fed basins of the north to the arid zones of Baluchistan and Sindh. In such environments, coupling scientific modeling with indigenous and community-based knowledge enhances diagnostic precision and social legitimacy. Traditional water management practices, for example, offer insights into adaptive behavior that can complement modern hydrological projections. Equally, socio-political factors, such as land tenure systems, institutional capacity, and cultural norms, must be integrated into vulnerability analyses to reflect the real determinants of risk and adaptive potential.

Importantly, climate risk must be understood as a **dynamic and iterative phenomenon**, evolving through feedback between environmental stressors, economic transitions, and governance responses. Thus, localized risk profiles should not only identify priority hotspots but also guide adaptive investments and institutional reforms. By aligning scientific evidence with local realities, context-specific assessments bridge the gap between global knowledge and actionable local policy, ensuring that adaptation strategies are both scientifically robust and socially equitable. This paradigm shift, from global models to localized climate intelligence, marks a necessary evolution

toward climate governance that is responsive, inclusive, and spatially attuned.

RETHINKING ADAPTATION: FROM INCREMENTAL RESPONSES TO TRANSFORMATIVE ACTION

Conventional adaptation practices have largely been reactive, addressing the immediate impacts of climate variability through incremental and often short-term measures. However, in the face of intensifying climate extremes, systemic vulnerabilities, and intersecting socio-economic challenges, adaptation must transcend its defensive posture to become transformative, redefining development pathways and reshaping governance, technology, and societal behavior. Transformative adaptation envisions structural change, where climate resilience is embedded within the foundational processes of economic planning, infrastructure design, and social equity frameworks, rather than treated as an external corrective.

In Pakistan, where recurrent floods, droughts, and glacial melt events threaten both livelihoods and infrastructure, the limitations of incremental approaches have become increasingly evident. For instance, traditional flood protection measures such as embankments and drainage improvements have proven insufficient without parallel transformations in land use planning, watershed management, and governance accountability. Transformative adaptation, therefore, calls for integrated solutions such as nature-based flood management through wetland restoration, the expansion of resilient urban drainage systems, and reforestation in upper catchments to enhance hydrological balance. In the agricultural sector, responsible for the livelihoods of over 40% of Pakistan's population, climate-smart interventions like drought-tolerant crop varieties, precision irrigation, and digital climate advisory systems exemplify how adaptation can merge innovation with sustainability.

Institutional transformation is equally vital. Embedding climate resilience into national and provincial development strategies, as seen in Pakistan's National Adaptation Plan (NAP) process, ensures that adaptation is not project-bound but systemic. Accessing global climate finance mechanisms such as the Green Climate Fund (GCF) and the Adaptation Fund, complemented by domestic fiscal reforms, can accelerate large-scale implementation. Ultimately, transformative adaptation is about reconfiguring development systems, shifting from vulnerability management to resilience creation, anchored in inclusiveness, evidence-based governance, and long-term sustainability.

LOCALIZED ADAPTATION FRAMEWORKS (LAPS): TRANSLATING POLICY INTO PRACTICE

While National Adaptation Plans (NAPs) establish strategic scaffolding for climate resilience at the national level, the materialization of adaptation outcomes occurs within the lived realities of local communities, where climate hazards are most immediate, spatially diverse, and socially differentiated. Localized Adaptation Frameworks (LAPs) therefore represent the operational nexus through which high-level policy visions are translated into grounded, context-sensitive adaptation actions. They serve as the connective tissue between scientific modeling, governance systems, and community agency, transforming abstract policy commitments into tangible interventions that safeguard livelihoods, ecosystems, and local economies.

The design and operationalization of LAPs must be rooted in inclusive, participatory, and co-productive processes that synthesize scientific and indigenous knowledge systems. Engaging local actors, including community-based organizations, traditional institutions, and subnational authorities, not only enhances the epistemic legitimacy of adaptation decisions but also ensures that interventions respond to context-specific vulnerabilities and capacities. This multi-actor co-design process anchors LAPs in local socio-ecological realities, making adaptation both actionable and equitable. Institutional harmonization is equally critical: LAPs should align with prevailing legal, administrative, and development frameworks to avoid duplication, promote policy coherence, and strengthen institutional interoperability. Such vertical (national–local) and horizontal (cross-sectoral) alignment enables coordinated resource allocation and consistent implementation across governance tiers.

To maintain relevance under changing climatic and socio-economic conditions, LAPs must be designed as living frameworks: dynamic, iterative, and reflexive. Continuous updating informed by emerging climate data, evolving risk assessments, and technological innovations allows for adaptive management. Integrating robust Monitoring, Evaluation, and Learning (MEL) mechanisms transforms LAPs into adaptive governance systems that institutionalize feedback loops, promote transparency, and enable evidence-based course correction. Beyond technical design, LAPs carry a normative imperative: they democratize adaptation governance by decentralizing decision-making and redistributing authority toward those most affected by climate risks. In doing so, they embody a transformative governance model that transcends reactive adaptation, fostering anticipatory resilience and socio-ecological justice. Ultimately, LAPs are not merely policy instruments; they are pathways for reconfiguring development under climate stress, institutionalizing equity, and localizing the pursuit of sustainable resilience.

GOVERNING ADAPTATION: INTEGRATION, COHERENCE, AND ACCOUNTABILITY

Effective governance of climate adaptation requires a paradigm that is integrative, coherent, and accountable across scales of action. Localized Adaptation Plans (LAPs), when embedded within robust Monitoring, Evaluation, and Learning (MEL) systems, can function as adaptive governance instruments capable of responding dynamically to evolving climate risks. MEL frameworks enable continuous learning, iterative adjustment, and transparent accountability by linking evidence generation to decision-making cycles. This ensures that adaptation interventions remain scientifically grounded, socially relevant, and financially efficient. However, the transformative potential of LAPs lies in their ability to integrate multiple policy frameworks, bridging local actions with global commitments such as the Nationally Determined Contributions (NDCs) under the Paris Agreement, the Sustainable Development Goals (SDGs), and the Sendai Framework for Disaster Risk Reduction (SFDRR). Such vertical and horizontal policy coherence reduces fragmentation, harmonizes priorities across sectors, and enhances institutional synergy for long-term resilience.

Furthermore, governing adaptation demands institutional arrangements that promote transparency, inclusivity, and multi-stakeholder participation. Integrating community-led monitoring mechanisms within LAPs can democratize adaptation governance by embedding local knowledge, experiences, and priorities into the policy cycle. This participatory accountability strengthens trust between citizens and institutions and ensures that adaptation outcomes are both equitable and context sensitive. To sustain coherence, national and subnational institutions must coordinate through integrated planning and budgetary systems, linking climate adaptation with sectoral policies on water, agriculture, health, and urban development. Globally, LAPs, when governed through evidence-based, inclusive, and iterative frameworks, can become models for context-specific adaptation governance. They embody the shift from reactive responses to proactive resilience-building, bridging science and society, and institutionalizing accountability as a cornerstone of equitable and sustainable climate action.

POLICY AND INSTITUTIONAL PATHWAYS FOR EQUITABLE RESILIENCE

Building equitable climate resilience requires a deliberate reconfiguration of policy and institutional architectures to bridge scientific insight with local realities. Policies must transcend sectoral silos and promote multi-level coherence, ensuring that adaptation is mainstreamed into national development agendas, fiscal frameworks, and local governance systems. Strengthening institutional capacity at subnational levels is pivotal to operationalizing climate action where vulnerabilities are most acute. This entails empowering local governments with technical expertise, financial autonomy, and participatory decision-making mechanisms that amplify the voices of marginalized and climate-affected communities.

Based on the above analysis, the following are recommended to strengthen climate adaptation policies:

- Support the development of regional climate research centers to produce downscaled information and context-specific risk estimations.

- Institutionalize knowledge exchange mechanisms between researchers, policymakers, and practitioners to ensure that the adaptation planning is evidence informed.
- Support inclusive decision-making procedures that incorporate local perspectives, especially those of vulnerable groups, in adaptation planning and implementation.
- Synchronize climate adaptation policies to national development strategies and global obligations to bring harmonious outcomes.
- Mobilize sufficient resources and capacity-development initiatives to empower local governments to plan and track adaptation interventions.

CONCLUSION: TOWARD A JUST AND CONTEXTUALIZED CLIMATE FUTURE

With climate change fundamentally reshaping development trajectories, an urgent paradigm shift in research and policy agendas is required to ensure coherence between scientific evidence, governance structures, and adaptive action. The heterogeneous nature of climate risks across ecological, socio-economic, and institutional landscapes necessitates the formulation of tailor-made, site-specific adaptation strategies that are scientifically robust, contextually grounded, and socially inclusive. Disproportionate vulnerabilities, arising from geographic exposure, livelihood dependence, and systemic inequities, underscore the need for granular risk assessments that integrate climate projections, socio-ecological data, and local knowledge systems. Within this framework, localized adaptation plans must be embedded in the broader national policy architecture to ensure vertical and horizontal policy coherence, resource alignment, and sustained implementation. Participatory and decentralized governance mechanisms are indispensable to ensure ownership, legitimacy, and accountability in adaptation decision-making processes. Adaptation, when designed as a transformative rather than reactive process, can serve as a dual instrument for resilience enhancement and sustainable development, bridging the gap between immediate coping needs and long-term systemic resilience. Ultimately, a scientifically informed, ethically anchored, and participatory adaptation agenda offers a pathway toward equitable climate resilience and inclusive development amid escalating climatic uncertainties and structural fragilities.

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LEADING THROUGH CRISIS

An Exclusive Interview with Chairman NDMA, Lieutenant General Inam Haider Malik

Q1. Thank you very much for giving us your time from your busy schedule. Disaster management is a critical subject in Pakistan and has largely remained reactive. Yet, under your leadership, NDMA has transformed remarkably; this year, losses were reduced to around USD 3 billion despite multiple floods. When you assumed charge, what were the key challenges, and how did you steer NDMA from being reactive to becoming proactive?

Thank you very much for having us and Team NDMA for a candid discourse on disaster management in Pakistan.

We've set the foundations from the geography of Pakistan. The way we are blessed with our hills in the north, spectacular plains, deserts, and coastal areas. We have tremendous diversity, but that also brings parallel and successive challenges. Whatever happens in the mountains flows to the plains, the desert, and the coastline. If managed well, it is a pleasing experience, but if not, it turns into crises and disasters that Pakistan has repeatedly faced.

Pakistan is also a very densely populated country. People struggle to maintain economic viability, and when disasters, whether heavy rains, floods, heat waves, or earthquakes, occur, they multiply financial and social stress. This has been Pakistan's story from the 1950s to 2020.

Our development projects have historically faced resource constraints. Every development initiative we undertake is not built to the ideal standard of resilience, every building is not earthquake-resilient, riverbank communities are not fully protected, and the overall environment remains vulnerable.

Moreover, an absence of early-warning capabilities and a lack of centralized information compounded to the issues at hand. Ideally, if we know a disaster is coming, we should prepare the right teams, train them, and equip them. That did not exist.

Pakistan's disaster calendar is extremely busy: winter hazards, heatwaves by March, forest fires in May, monsoon floods from June to September, fog and smog later, and the constant possibility of earthquakes, cyclones, and pandemics. Given 5 different geographic zones and 12 months, we face nearly 60 potential contingencies.

Climate change has further intensified the frequency and severity of disasters worldwide. Nobody can stop climate change; it is nature out of control. Global temperatures are rising faster than expected, and we have crossed the 1.5°C threshold already.

So, our thought process was to build capability for timely early warnings, become more indigenous, more self-sufficient, and more independent. This was the foundation of shifting NDMA from reactive to proactive management.

Q2. Given the rapidly evolving climate risk, greater intensity, and increased frequency of disasters, what is Pakistan's capacity to cope? How can NDMA help minimize future vulnerabilities?

A: We have both good and bad news. The good news is that we know what is happening and what is going to happen. The bad news is that every year brings more intensity and greater expectations of losses.

Pakistan today is among the most water-scarce nations, ranked around 14th globally, Although,

rivers and dams seem sufficient, per-capita water availability is falling sharply due to population growth and rapid depletion of groundwater. Water needed for domestic, industrial, and agricultural uses are becoming harder to access.

Disasters may originate far away in the Pacific Ocean, the Bay of Bengal, the Arabian Sea, the Mediterranean, the Arctic, or the Antarctic, and still impact Pakistan. If we know we have four months before an external event becomes an internal disaster, we can prepare communities, fortify infrastructure, clean waterways, and plan evacuations.

Risk-informed planning is essential. Communities should avoid encroaching on waterways, cities must be kept clean and limit pollution to reduce smog, and infrastructure must be built resiliently. Only then can future risks be minimized.

Q3. When planning and managing disasters, interagency coordination is critical. How do you view coordination among departments, and how should it improve?

A: Disasters in Pakistan are not NDMA-specific, they concern every agency, every department, and every community. NDMA guides, and provides information; we maintain global intelligence networks, technical teams, and experts in disaster risk reduction and resilient construction. Disaster management is a devolved subject where NDMA represents the federation, and then Provincial and District Disaster Management Authorities at the sub-national tiers. NDMA in coordination with Provinces works towards proactive national preparedness. While provinces primarily rely on their own capacities to manage disasters, the NDMA provides reinforcements from day one whenever an event exceeds provincial capability.

We have centralized global intelligence, access to satellite feeds, modeling softwares, and meteorological data, which helps us, build a Pakistan-wide picture of risks for six weeks, six months, or even further. We share information on a need-to-know basis and update forecasts as disasters approach.

Ultimately, disaster response requires whole-of-system cooperation, industry, the private sector, academia, humanitarian partners, NGOs, UN agencies, Pakistani diaspora, and the international community chip in to form a comprehensive national resilience landscape.

Q4. How do you evaluate the role of Corporate Social Responsibility (CSR) in addressing disaster risk? What improvements are needed?

A: Pakistan's post-disaster needs often reflect pre-disaster poverty and deficiencies. Communities already lack resilient housing and infrastructure; therefore, pre-disaster support is far more meaningful than post-disaster reconstruction.

Keeping in view the massive impacts of disasters in Pakistan, even if industries contribute 1% or 2% of profits, it cannot match major losses like the USD 30 billion in 2022 floods. CSR must be broadened into a wider perspective where it may include contributions from industry, philanthropic organizations, Pakistani diaspora, and private donors ensuring collective finance disaster preparedness. CSR can play a valuable role in disaster risk management in Pakistan.

For example if we know a flood is expected next July, we should ask industries to voluntarily release CSR funds in February, not August, so houses, waterways, and infrastructure can be strengthened beforehand. Prevention is 7 to 10 times cheaper than post-disaster rehabilitation.

Q5. How does NDMA issue forecasts and alerts? Where do you stand today in terms of forecasting capability, and what improvements are needed?

A: We divide the disaster calendar into two seasons, summer hazards (from March to September) and winter hazards (from October to February). NDMA's National Emergency Operations Centre (NEOC) generates Disasters Early Warning (DEW) every three months, in January, April, July, and October. DEW covers immediate and long-term predictions for Pakistan and can also serve neighboring countries.

Once issued, warnings are not static. We hold conferences, re-explain forecasts, and update them continuously. We inform provincial authorities, emergency responders, NHA, police, military, NGOs, diplomats, academia, and industry.
We also provide recommended actions on specific anticipated hazards, what to do today, next year,

and after three years.

Prior to onset of disaster early warnings are disseminated through print, electronic, digital, and social media, places of worship (mosques, churches and other religious centres), NDMA's mobile application (with regional language translations), regular appearances of technical experts on television and coordination with SUPARCO and Pakistan Meteorological Department. NDMA provides long-term early warnings, which is regularly updated through NEOC's modeling and data input from SUPARCO and PMD. NEOC issues early warning close to the disaster, where PMD facilitates the localized forecasting. Together, we continuously update forecasts until the disaster strikes.

Q6. Climate change is a global phenomenon. How important is global cooperation, and where does Pakistan stand in these efforts?

A: Since climate change is global, the response must also be global. Just as we create a Pakistan-specific disaster calendar, the world needs a global disaster calendar, a universal early-warning platform accessible to every country.

The UN has set a goal to ensure global early-warning systems by 2027. Countries with advanced satellite and meteorological capabilities must make data freely available so responders worldwide can prepare. Global cooperation should include, joint early-warning systems, joint search and rescue teams, shared reconstruction methodologies, support for vulnerable countries, relocation planning for nations at risk of submergence. Disaster risk reduction is the ultimate goal. We cannot evade disasters, we can only reduce their impact.

Q7. Regionally, South Asia is highly vulnerable and densely populated. How synchronized are regional responses, and what role should Pakistan play?

A: In dense regions like ours—Pakistan, India, China, Bangladesh, where nearly half the world's population lives. Disasters here have enormous human consequences. Climate impacts do not respect borders - cloud bursts, monsoons, earthquakes affect multiple countries at once. Therefore, regional cooperation is crucial. Immediate neighbors should be the first responders.

Disasters require collaboration—first from closest neighbors, then from medium and distant partners. For example, Iran supported Balochistan forest fire efforts; Pakistan has sent teams to Turkey, Syria, Myanmar, and Thailand. NDMA regularly shares information with neighboring countries. We regularly conduct simulation exercises with domestic and global partners.

Q8. Structural solutions such as dams are costly and time-consuming. What should be Pakistan's priorities in non-structural or nature-based solutions?

A: There are multiple water sources, and dams are only one part of the larger equation. Dams are important but not all solutions lie in building dams, especially where rivers do not flow year-round or Pakistan lacks control over water. We must prioritize, science-informed planning, technical expertise, risk-informed urban planning, encroachment prohibition in floodplains, population management, early evacuation and voluntary temporary displacement.

NDMA evacuated one million people last year and 3.2 million this year from riverine areas before flooding. Voluntary evacuation is far safer and more effective than forced displacement—early evacuation saves both people and livestock. Infrastructure can be saved only if it is sited correctly; in high-risk zones, it is hard to save the infrastructure.

PARAMETRIC INSURANCE: TRANSFORMING THE INSURANCE LANDSCAPE IN PAKISTAN

Alishba Khan

Pakistan stands at the frontlines of the global climate crisis. From scorching heatwaves and prolonged droughts to catastrophic floods that destroy crops, infrastructure, and livelihoods each year, the human and economic toll of climate change is mounting at an alarming pace. Initial assessments from a leading brokerage firm estimate that the 2025 floods inflicted losses exceeding PKR 302 billion on the agricultural sector alone. A stark reminder of the country's vulnerability to extreme weather. As climate shocks intensify, strengthening financial resilience mechanisms has become a national imperative.

Agriculture, the backbone of Pakistan's economy, remains highly exposed to climate variability. Despite contributing nearly one-fifth of GDP and employing about 40 percent of the labor force, the sector's capacity to absorb shocks is limited. Agricultural insurance, in theory, can play a pivotal role in protecting farmers, enabling them to recover from losses and sustain production. Yet, traditional insurance mechanisms have struggled to fulfill this promise. As of 2023, only 9.5 percent of Pakistani farmers were covered by any form of crop insurance. One of the lowest rates in the region. Multiple barriers explain this gap. Existing

insurance products are often ill-suited to smallholder farmers' realities, the premiums are unaffordable for many, claim assessment processes are lengthy and complex, and product design rarely reflects localized risk profiles. Moreover, religious concerns surrounding interest-based contracts deter many Muslim farmers from engaging with conventional insurance. While Islamic alternatives such as takaful exist, awareness and accessibility remain limited. Consequently, rural households remain largely unprotected, perpetuating a cycle of vulnerability and debt. These challenges underscore the urgent need for innovative, scalable, and inclusive financial protection mechanisms, such as parametric insurance.

Parametric (or index-based) insurance represents a paradigm shift in how climate and disaster risks are managed. Unlike traditional insurance, which compensates for verified losses following physical damage assessments, parametric insurance provides payouts based on the occurrence of a predefined event. Triggers are linked to objective, measurable parameters such as rainfall, temperature, wind speed, or floodwater depth. When these thresholds are breached, payouts are automatically disbursed, often within days and without the need for on ground inspections. For instance, if rainfall during a growing season falls below a critical level, indicating drought conditions, insured farmers receive compensation automatically. This model offers several technical and operational advantages. By relying on transparent data sources such as satellite imagery, remote sensors, and meteorological records, parametric insurance minimizes administrative delays, reduces transaction costs, and ensures faster liquidity for affected households. For policymakers, it improves fiscal predictability by pre-defining post-disaster financing. For insurers, it lowers moral hazard and adverse selection risks, as payouts are linked to objective indices rather than subjective claims.

Globally, parametric insurance has demonstrated strong potential in building climate resilience. The African Risk Capacity (ARC), a specialized agency of the African Union, has enabled member states to access sovereign-level parametric coverage for droughts, floods, and epidemics. In recent years, Malawi received a $14.2 million payout to recover from the 2022 drought, while Madagascar secured $10.7 million following Tropical Cyclone Batsarai. Mozambique obtained $2 million in 2025 for drought protection, and Senegal pioneered ARC's epidemic insurance product covering Ebola, Marburg virus, and meningitis. Similar innovation is visible across Asia and the Pacific.

In India, a women's trade union launched a micro insurance product that uses satellite data to trigger heatwave-related payouts. Fiji has provided tax exemptions and subsidies to expand access to parametric disaster coverage, while Indonesia integrates parametric drought insurance into its agricultural modernization strategy. In the Caribbean, the Caribbean Catastrophe Risk Insurance Facility (CCRIF) has delivered rapid liquidity to member states after hurricanes and earthquakes, including significant payouts following Hurricanes Irma and Maria in 2017. These experiences collectively highlight how parametric models can complement disaster management frameworks and enhance fiscal resilience.

For Pakistan, where recurrent climate shocks disproportionately affect low-income and rural communities, parametric insurance could be transformative. Each major disaster exposes the financial fragility of households unable to wait for delayed aid or loans. By linking payouts directly to meteorological indicators, parametric mechanisms provide early and predictable funding, reducing bureaucratic bottlenecks and enhancing transparency. Quick disbursements enable affected families to restore livelihoods, prevent asset depletion, and avoid resorting to high-interest borrowing. For the government, it translates into reduced emergency spending, greater budget stability, and a more proactive approach to climate risk management. Integration with existing financial systems offers further potential. Parametric insurance can be embedded within microfinance, infrastructure protection, social protection, and agricultural credit programs. When bundled with agricultural loans, it serves as a risk management layer ensuring that farmers can meet repayment obligations even after a climate shock. This integration enhances the resilience of financial institutions, prevents loan defaults, and supports continuity of income for rural clients. Additionally, digital finance platforms, scientific models and mobile payment systems can streamline premium collection and payout delivery, improving scalability and accessibility for remote populations.

At a macroeconomic level, parametric insurance strengthens national resilience by transferring part of disaster risk from the public sector to the private and reinsurance markets. It reduces dependence on post-disaster donor funding and emergency borrowing, aligning with Pakistan's fiscal

consolidation and climate adaptation goals. Moreover, parametric instruments can attract blended finance, leveraging public, private, and donor capital to expand coverage. When integrated into frameworks such as Pakistan's Green Taxonomy, National Adaptation Plan (NAP), and Nationally Determined Contributions (NDCs), these instruments can support the country's progress toward Sustainable Development Goals (SDGs), particularly those related to poverty reduction, food security, and climate action. However, realizing this potential requires overcoming several structural challenges. First, the success of any parametric product depends on the quality and granularity of climate data. Reliable, high-resolution weather and hydrological data are essential for calibrating indices and minimizing the "basis risk" the mismatch between payouts and actual losses. Pakistan's weather monitoring infrastructure remains limited, particularly in rural and mountainous areas, constraining accurate index design. Investments in meteorological networks, satellite data integration, and data-sharing protocols are therefore critical.

Second, awareness and trust among potential users remain low. Many farmers are unfamiliar with insurance concepts or harbor misconceptions about their compatibility with Islamic finance principles. Public education campaigns, partnerships with religious scholars, and the expansion of Shariah-compliant (takaful) parametric products can enhance acceptance.

Third, affordability remains a barrier for small-scale farmers. Subsidized premiums, donor co-financing, or public-private partnerships could help bridge this gap. Finally, Pakistan's regulatory framework must evolve to accommodate index-based insurance products while ensuring consumer protection and transparency. The development of clear standards for index design, disclosure requirements, and dispute resolution will be essential for market confidence.

Pilot projects that pool public, private, and donor financing can serve as learning platforms, testing the feasibility of parametric products in high-risk districts and building local technical capacity. Leveraging regional cooperation such as partnerships with African Risk Capacity (ARC) or Caribbean Catastrophe Risk Insurance Facility (CCRIF) could further strengthen institutional design and reinsurance access. With strategic investment or rather re-directing the investments in data systems, regulatory reform, and awareness-building, Pakistan can establish a robust parametric insurance ecosystem that bridges humanitarian relief and financial innovation.

In an era of intensifying climate volatility, Pakistan must shift from reactive disaster response to proactive resilience planning. Parametric insurance offers a practical pathway to achieve this transformation, one that empowers communities, stabilizes public finances, and aligns national policy with global climate resilience frameworks. By embracing this innovative risk-transfer mechanism, Pakistan can safeguard its most vulnerable citizens while building a more adaptive and climate-smart economy for the future.

Ms. Alishba Khan is a Qualified Chartered Accountant with a vast experience of working on issues related to insurance, climate risk finance, carbon markets and sustainable development.

WHAT's NEW AT COP30 –

And How Developing Countries, Especially Pakistan, Can Negotiate More Efficiently

Khalid Waleed

The Belém COP is unlike any other in recent memory. It is the first climate summit held in the Amazon, the world's most important carbon sink and the most visible reminder that the global climate regime is now operating in a world of overshoot, ecological fragility, and rising geopolitical tension. But what is truly new at COP30 is not the rainforest backdrop or the folkloric charm of Belém. Rather, it is the quiet but consequential shift from negotiating the architecture of the Paris Agreement to negotiating its machinery. Climate diplomacy has moved from designing the "building" to wrestling over the plumbing, wiring, and monthly maintenance fees. For developing countries like Pakistan, which are squeezed between climate impacts, fiscal constraints, and rising green trade barriers, this COP offers both new opportunities and new risks.

To understand what is new at COP30, one must start with the New Collective Quantified Goal (NCQG) on climate finance. Agreed at COP29 in Baku, the NCQG is the new global finance target that replaces the famous USD 100 billion pledge. It sets USD 300 billion per year in public climate finance by 2035, with an overall expectation of USD 1.3 trillion annually mobilised for developing countries from all sources. In technical terms, this ushers in the "post-100 billion era" of climate finance. In political terms, it raises the stakes for every developing country delegation: finance is now the yardstick by which mitigation ambition, adaptation progress, and climate diplomacy will be measured. COP30 is the first implementation COP of this new goal, and therefore much of the negotiation energy is directed toward embedding the NCQG into the operational decisions of funds, boards, and transparency frameworks.

One of the central institutional innovations under review is the Fund for Responding to Loss and Damage (FRLD). Last year, the Fund was operationalised alongside the Barbados Implementation Modalities, a set of initial pilot interventions designed to help vulnerable countries respond rapidly to climate disasters. At COP30, the debate is no longer about whether the Fund should exist—this battle was won—but how it should work, how quickly it should disburse funding, and how directly vulnerable countries can access its resources. For developing countries, the demand is clear: the Fund must prioritise direct

access, meaning national agencies in states like Pakistan can apply for support without navigating multilateral intermediaries. This is not a trivial administrative issue. For a country hit by the 2022 & 2025 floods, and recurrent glacial lake outburst floods, delays of even three months can translate into lost crops, disease outbreaks, and irreversible social losses.

Another major negotiation is the Global Goal on Adaptation (GGA) and its associated Baku Adaptation Roadmap (BAR). The GGA aims to establish global benchmarks for adaptation—essentially, a global indicator system to track resilience, vulnerability reduction, and adaptive capacity. The difficulty, of course, is that adaptation needs vary dramatically across countries: the Maldives fears sea level rise, Kenya fears drought, Pakistan fears all hazards in the same week. The tension at COP30 lies between those who want to swiftly adopt a full set of indicators now and those who argue that more technical work is needed to avoid oversimplification. For Pakistan, this negotiation is critical. Poorly designed indicators could gloss over the specific vulnerabilities of the Indus Basin, the Himalayan–Karakoram glacier system, and the agriculture-dependent rural economy. A well-designed set, however, could help Pakistan articulate a more precise, evidence-based case for targeted adaptation financing.

One of the most politically charged debates at COP30 involves Unilateral Trade Measures (UTMs)—a polite UNFCCC term for climate-motivated trade restrictions such as the EU's Carbon Border Adjustment Mechanism (CBAM). Many developing countries argue that UTMs can impose hidden climate taxes on their exports, undermining competitiveness and violating the principle of Common But Differentiated Responsibilities (CBDR). The push in Belém is to establish a formal negotiation space on UTMs to ensure that new trade barriers do not substitute for genuine climate finance and technology support. For Pakistan, this is no academic debate. CBAM-like measures could directly affect textile, steel, and cement exports, sectors that are already struggling with high energy prices and volatile global demand. Efficient negotiation for Pakistan requires linking UTMs firmly to the finance discussions: if the global trading system is imposing new carbon-based restrictions, it must also provide the capital and technology to help countries decarbonise.

Closely connected to this is the debate on Article 2.1(c) of the Paris Agreement, which calls for making all financial flows consistent with climate-resilient, low-emission pathways. At first glance, the objective seems harmless—and even desirable. But without safeguards, Article 2.1(c) could become a backdoor route for imposing new conditionalities on developing countries by rating agencies, IFIs, and private investors. Many developing states worry that misinterpreting "financial alignment" could lead to higher borrowing costs, reduced access to credit, and premature exclusion of transitional energy options such as natural gas. COP30 has seen broad agreement that Article 2.1(c) must be implemented in a bottom-up, nationally determined, and non-punitive manner. This language preserves a critical negotiating line for Pakistan: no international actor should have the discretion to raise Pakistan's cost of capital on the grounds that its finance flows are insufficiently "aligned."

Mitigation, always a centrepiece of COPs, has taken on a slightly different flavour this year. The Mitigation Work Programme (MWP)—created to accelerate global emission reductions—has been the site of sharp disagreements. Some parties insist on including explicit references to the 1.5°C temperature limit and on integrating key messages from global dialogues on forests, energy transitions, and industry decarbonisation. Others argue that 1.5°C references are politically sensitive and that sector-specific recommendations risk creating pressure for targets that developing countries have not agreed to. The debate may sound esoteric, but it has real-world implications: if the MWP becomes a tool for naming and shaming, without adequate financial and technological support, it can become a source of diplomatic pressure on countries like Pakistan that are struggling with structural constraints.

To truly understand the new dynamics at COP30, it is useful to examine how the negotiation process itself has evolved. Surprisingly, this COP has been efficient in procedural terms. Agendas were adopted swiftly. Contact groups convened without the usual theatrics. And for issues like the SCF workplan, Article 9.5 finance reporting, or Adaptation Fund reforms, draft decision texts have emerged early in the second week. But efficiency for whom? Developing countries remain concerned that some of the most important issues—Article 9.1 (developed country finance obligations) and UTMs—have been moved into Presidency-led consultations, which are inclusive but politically

softer and lack the legal status of negotiated agenda items. Efficiency in process, therefore, may come at the cost of negotiating leverage for the Global South.

For Pakistan, COP30 presents both an opportunity and a challenge. The opportunity lies in the fact that finance, adaptation, and equity—Pakistan's long-standing priorities—are at the centre of the agenda. The challenge lies in the fact that negotiating space is compressed, political alliances are fluid, and technical language can obscure power asymmetries. A smart Pakistani strategy must therefore operate on multiple fronts simultaneously. First, Pakistan must anchor every intervention in the NCQG logic: if the world expects greater ambition from developing countries, then finance must flow predictably, accessibly, and without hidden conditions. This means pushing for explicit references to NCQG commitments—particularly the requirement to triple annual outflows from climate funds—in all decisions relating to the GCF, GEF, Adaptation Fund, and Loss and Damage Fund.

Second, Pakistan should treat UTMs and Article 2.1(c) as economic issues, not just environmental ones. This means insisting on language that protects Pakistan from increased borrowing costs, arbitrary trade restrictions, and financial discrimination. It also means proposing a structured forum under the UNFCCC for discussing UTMs in relation to development rights. Pakistan can draw on its own experience: a textile exporter cannot meet CBAM-like requirements without concessional finance for energy efficiency, industrial heat decarbonisation, and renewable integration.

Third, Pakistan must work strategically within the G77, LMDCs, and targeted issue-based alliances. On adaptation, alignment with mountain states—Nepal, Bhutan, and the Mountain Group—can amplify Pakistan's cryosphere concerns. On loss and damage, coordination with AOSIS and LDCs helps demonstrate that Pakistan's vulnerabilities mirror those of small islands, even though its geography differs. And on just transition, Pakistan should position itself as a credible case study for coal-to-clean energy repurposing and tariff reform, which could unlock innovative financing partnerships within the Just Transition Work Programme.

Fourth, Pakistan's negotiators must come prepared with concrete text, not just principles. In UNFCCC negotiations, the party that proposes text effectively controls the centre of gravity. Whether it is a proposal on access modalities for FRLD, methodological clarification for GGA indicators, or safeguards under Article 2.1(c), proactive drafting creates advantage. Even a simple paragraph can shift negotiations, especially in open consultations where consensus positions are fluid.

Finally, Pakistan must remember that COP30 is not an endpoint but an inflection point. The Belém COP is shaping the operational tools of the climate regime: how money flows, how progress is measured, how markets function, and how trade and climate policies intersect. These tools will define Pakistan's climate and economic trajectory for the next decade. COP30 is therefore not merely about representing Pakistan's current interests but about helping design the architecture within which Pakistan must operate for years to come.

In many ways, COP30 reflects the new reality of climate diplomacy: less drama, more spreadsheets; fewer headline announcements, more methodological guidelines; and a shift from promises to pathways. For Pakistan, efficiency will be defined not by the number of speeches delivered but by the precision with which it aligns its negotiating positions with its structural needs—lower cost of capital, resilient infrastructure, equitable trade treatment, and a just transition away from stranded fossil-fuel assets. If Pakistan seizes the moment, COP30 could become a catalyst for domestic reform and international partnerships. If not, it risks being yet another COP where procedural efficiency masks substantive inequity.

As the Amazon humidity settles over the negotiation halls in Belém, one thing is clear: the global climate regime is being rewired in real time. For Pakistan and other developing countries, the task is not just to participate but to shape this emerging order. And if diplomacy is the art of turning constraints into advantages, then COP30 may yet offer a surprisingly fertile ground—no pun intended—for planting the seeds of a fairer climate future.

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CBAM AND THE NEED FOR AN EMISSIONS TRADING SYSTEM IN PAKISTAN

Syed Sawal Bacha and Muska Mukhtar

Often when carbon markets are mentioned, carbon credits are followed in the chain of thoughts, and most climate change professionals in Pakistan intuitively are directed towards Voluntary Carbon Market (VCM). Hence in most policy discourses, the significance of compliance carbon markets is often undermined. Not only is the emissions coverage of global compliance markets is far greater, at 12 million tonnes of CO_2 equivalent (12 GtCO2e)[1], compared with 3.4 GtCO2e[2] emissions offset by the VCM globally. In financial terms, global compliance carbon markets dwarfs voluntary carbon markets having a market value of $781 billion[3] in 2024, while the VCM had a total market value of around $15 billion[4] in the same year.

Pioneering the effort to curb emissions by putting a price on carbon, the European Union established an Emissions Trading System (EU ETS) in 2005. A 'cap' on emissions was set on sectors covered under the EU ETS, which is set to decline, aiming for net zero by 2040. The EU ETS continues to expand its scope and currently applies to sectors including shipping, aviation, power generation, chemicals, metals, cement and paper and where installations exceed the 20 Megawatt (MW) thermal input threshold for combustion. Regulated entities must purchase EU Allowances (EUAs) and surrender an amount each year equal to their verified emissions.

1ICAP (2025). Emissions Trading Worldwide: Status Report 2025. Berlin: International Carbon Action Partnership.
2Forest Trends' Ecosystem Marketplace. 2025. State of the Voluntary Carbon Market 2025. Washington DC: Forest Trends Association.
3Nordeng, Anders, for European Carbon, EU ETS Team. "2024 Year in Review EU ETS: Flattening out." Veyt, 15 January, 2025. https://forums.swift.org/t/if-vs-available-vs-if-available/40266.
4Grand View Research, Voluntary Carbon Credit Market Size: Industry Report, 2030 (San Francisco, CA: Grand View Research, June 2025), 12.

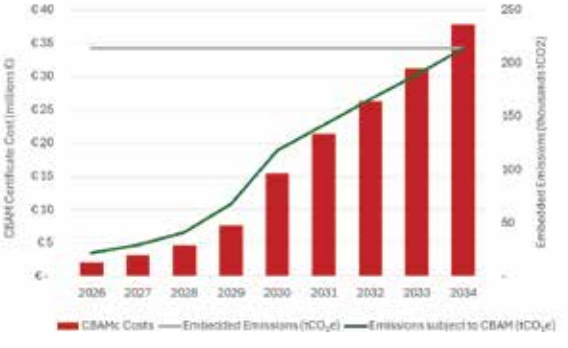
EUAs, the currency of the EU ETS, function as tradable allowances. By assigning a monetary cost to every tonne of CO_2 emitted, the scheme creates a financial incentive for regulated sectors to decarbonise.

EUAs, can either be procured in auctions on a dedicated platform (in this case the European Energy Exchange (EEX), referred to as the primary market, or on a digital energy or commodity exchange, also known as the secondary market. However, the financial volume of EUA traded on the secondary market is much larger. A recent report[5] highlighted that EUAs worth €644 billion were traded over exchanges like Intercontinental Exchange (ICE) and European Energy Exchange (EEX) in 2024.

Alongside the primary market and the secondary market, these EUAs are also allocated for free to protect some sectors under the risk of carbon leakage. Carbon leakage refers to the phenomenon where emission intensive sectors move their production outside the EU to avoid the stringent carbon pricing mechanism.

To level the playing field for EU producers, the EU came up with the Carbon Border Adjustment Mechanism (CBAM). CBAM puts a price on the embedded carbon in imported goods. It covers sectors such as aluminium, iron and steel, cement, fertiliser, electricity and hydrogen. Importers of these goods in EU who fall above the 50 tonne imported per year inclusion threshold must purchase and surrender CBAM certificates equivalent to the imported embedded emissions in the product each year.

Figure 1: CBAM Costs



Source: Redshaw Advisors

The price of this CBAM certificate is calculated as the weekly average of the EUA auction clearing price. Since the price of EUAs is forecasted to increase up to €150 per unit by early 2030s, CBAM compliance cost is also set to exponentially increase. CBAM cost forecasting models indicate that a Turkish steel producer exporting 100,000 tonnes to EU, may have to pay more than €15 million in 2030 to comply with the mechanism. By 2034, that figure exceeds €35 million each year.
However, CBAM is designed in such a way that this monumental compliance cost can be discounted if the exporting country has an ETS in place. An ETS at home country which effectively prices carbon will still increase the overall costs for producers complying with CBAM, but the carbon revenues will be retained at the home country rather than being handed over to the EU in the form of CBAM certificates. Following the EU's decision to introduce a CBAM, many CBAM exposed countries like Turkey, China and India are moving towards establishing an ETS aligned with the EU ETS.

Under the current landscape, Pakistan is not severely impacted by CBAM since textiles fall out of the current scope of CBAM. However, it is set to expand to other sectors by 2030. In 2022, Pakistan generated $2.3 billion[6] in revenue from textiles export to the EU. Should CBAM be broadened to cover textiles, Pakistan may have to choose between jeopardising a key export sector or meeting CBAM requirements and absorbing potentially substantial additional payments to the EU.

To mitigate the financial risk of CBAM, retain carbon revenues within Pakistan, abate industrial emissions and place a price on carbon emissions, Pakistan needs a national ETS.

Although the authors recognise that industries exposed to CBAM in Pakistan are clustered in Punjab, to mitigate the financial costs incurred due to CBAM, Pakistan would still need a national ETS. This is because fragmented, localised or provincial ETSs do not meet EU expectations for a unified carbon pricing mechanism capable of supporting carbon price discount under CBAM, and undermines national emissions-mitigation efforts.

5Mordor Intelligence, Voluntary Carbon Credit Market Size, Share & 2025-30 Outlook (Hyderabad, India: Mordor Intelligence, September 2025).
6Arisa. Trends in Production and Trade, Cotton, Textiles and Garments from Pakistan. Arisa, Sept. 2024.

Developing a national ETS in Pakistan would require substantial planning and preparation. Typically, an ETS begins with a two-year Monitoring, Reporting and Verification (MRV) phase to help policymakers set emissions benchmarks and determine an appropriate inclusion threshold. After the MRV phase, a cap is introduced which is gradually reduced over time to move towards net-zero emissions. High-emitting installations are brought into the system, with compliance obligations applied accordingly.

In certain cases, free allowances may be allocated to sectors considered vulnerable, such as emerging industries or those at risk of carbon leakage, to ease the financial burden of compliance. These allowances are distributed based on benchmarks set at the average emissions of the 10 percent most efficient installations in each sector. As a result, the most efficient operators receive all or almost all of the allowances required for compliance, while less efficient installations must either reduce their emissions or purchase additional allowances to meet their obligations.

Pakistan can learn lessons from other ETSs. Out of 38 ETSs globally, 24 allow domestic voluntary carbon credits for compliance, with South Korea being the only one accepting international credits. Typically, up to five percent of a compliance obligation can be met using domestic voluntary carbon market credits. This means that, in addition to holding allowances issued by the relevant authority or platform, regulated entities may use carbon credits to cover a small share of their compliance requirement under the ETS.

If implemented in Pakistan, this would create a strong demand signal for voluntary carbon market project developers and could foster the growth of both compliance and voluntary carbon markets.

Pakistan's absolute emissions are estimated at approximately 585 $MtCO_2e$ in 2024[7], which is relatively low compared to larger emitters like China or India, but its industries are notable for their pollution levels. In addition to reducing emissions, Pakistan's ETS could set a precedent by placing a direct price on pollution and help curb industrial pollutants.

For the ETS to be effective, liquidity must be prioritised. Carbon allowances should be traded on a transparent digital exchange where, in addition to covered entities, speculators should also participate. This would enable banks and investment funds to enter the market, enhancing liquidity and reinforcing the credibility of the system.

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7Enerdata. "Pakistan's New NDC Targets 50% Cut in GHG Emissions by 2035 Compared to BAU." Daily Energy & Climate News, 29 Sept. 2025

OPERATIONALIZING CLIMATE JUSTICE IN PAKISTAN:

Aligning National Action with Global Commitments at COP30

Sehrish Irshad

CLIMATE JUSTICE AS THE CORNERSTONE OF NATIONAL RESILIENCE

Since the world is preparing to attend COP30, the discussion on climate action in the world is becoming more and more characterized by the concept of justice, such that the most uninjured by climate change do not bear the heaviest weight. Climate change has become one of the greatest issues in the world of the twenty-first century that challenges not only the scientific and economic capacity, but also the ethical character of the global cooperation. The issue of climate justice approaches the dilemma as a moral and fairness problem, identifying the perpetrators of the damage, who pays the price, and who enjoys the solution. To Pakistan this framing is very personal.

The significant and the well-documented case of Pakistan's climate vulnerability illustrates the extent to which the floods of 2022 have devastated the country and the indirect suffering of more than 33 million people. The destruction was certainly not uniformly shared with regard to the geographical distribution of the people affected by the floods as around 70% of them were living in rural areas of Sindh and Balochistan where less than 15% of the

national adaptation budget was allocated. Despite Pakistan being listed as one of the world's top ten most climate-affected countries, it accounts for only 0.9% of global greenhouse gas emissions. Swells in monsoon rain and floodwater in 2025 impacted 6.9 million+ individuals, caused economic devastation in nearly 70 districts, thus reiterating not only the scale of recurring climate shocks but also the considerable gaps in the implementation of resilience and adaptation programs. In these examples, it is clear that climate injustice is not a theory in the sky but rather a lived and visible and political reality. Since international attention has shifted to COP30 in Belem, Brazil the debate has moved beyond the idea of emission targets to fair transitions and adaptation lead by the locals. To Pakistan, it is a crucial moment to implement the concept of climate justice to build international support as well as to find internal unity in responding to climate.

UNEQUAL EXPOSURE TO CLIMATE RISKS

Climate threats have not taken the same impact on all communities. The geography, socioeconomic level, gender, and availability of resources determine vulnerability. Low-income individuals like them are often found in risky areas like floodplains or desert areas or in coastal areas where they face danger of flooding, droughts, storms, and sea-level rise. Women, children and the oppressed generally incur extra expenditures due to the societal responsibilities, restricted movement, and restricted access to decision-making rooms. This initial form of climate injustice highlights institutional inequality that contributes to climate threats to certain communities. Viability of climate justice involves consideration of vulnerability measurements in the planning and adaption prioritization to the most vulnerable individuals.

UNEQUAL DISTRIBUTION OF CLIMATE ACTION COSTS

The need to mitigate and adapt to climate change may in itself result in inequities. Switching to low-carbon technology, renewable energy projects, or resilient infrastructure are all financially and socially expensive, and are often disproportionately paid by the poor areas. Richer individuals, groups or places can be in a better position to cover these expenses or have subsidies and incentives but poor communities can suffer economically, displacement or limited access to support systems. The latter face highlights the importance of equitable finance, all-inclusive policy development, and measures that can prevent the expansion of climate action to the existing social imbalances.

UNEQUAL ACCESS TO CLIMATE BENEFITS

Climate justice deals with sharing of benefits of mitigation and adaptation. Renewable energy, resilient infrastructure to climate change, insurance, and post-disaster aid are often available to groups of people who are wealthier or politically connected and less privileged communities have fewer chances to build resilience. Climate vulnerability Reduction interventions can end up increasing the existing inequities in case equity is not given due consideration. The third face of injustice reaffirms the necessity of developing inclusivity, participation, and focus of climate solutions to reach previously marginalized regions.

Taken together, these three faces provide a comprehensive structure for understanding the interface between climate change and social, economic, and political unevenness. Through examination of exposure, cost burdens and benefit distribution, policymakers and researchers can more effectively identify systemic inequities and develop policies that promote just climate action.

PAKISTAN'S CLIMATE JUSTICE LANDSCAPE

Pakistan has been a key champion of loss and damage finance at the global level since its leading role in guiding discussions on COP27, which resulted in the formation of this week's fund. Elaborating on this phenomenon, it was Pakistan which offered to organize the first ever back-to-back special panel discussions on climate financing in the history of the United Nations Framework Convention on Climate Change (UNFCCC) process during the COP29 (2024, Baku).

The demand for "climate reparations" from Pakistan is based on a moral view which means that countries that have emitted the most greenhouse gases in the past have an ethical obligation to support the most vulnerable to climate change. Nonetheless, the concept of climate justice is accompanied by a requirement for internal accountability, which guarantees that the funds coming from foreign aid are carefully directed to those regions suffering the most from climate change-induced losses, as opposed to being consumed by red tape.

In addition to that, building up regional interactions with nations having similar climate vulnerabilities like Bangladesh, Nepal and Sri Lanka could be the beginning of the South Asian Climate Justice Alliance. This alliance would amplify the collective voice of the region's low-emission yet very vulnerable countries, thus empowering them to more effectively demand just climate actions and finances at COP30 and beyond.

COP30 AND THE ROAD AHEAD

The global climate agenda is moving towards a more equitable, just, and resilient future. During the upcoming negotiations of new commitments under the UNFCCC process, the discussions are expected to revolve around themes like equitable energy transitions, the starting up of the Loss and Damage Fund, and raising funds for adaptation. For Pakistan, these matters are significant gateways to connect local priorities with larger global agendas and push forward the resilience-building projects.

1. PROMOTING A JUST ENERGY TRANSITION

Equitable energy transitions are a priority for emerging economies. Privilege is given to the community-seeking renewable energy projects as the case in Pakistan. The proposed solutions in areas such as Thar prove that energy security, environmental sustainability, and equitable development can be achieved at the same time, thus creating room for discussion on the future of fair energy transitions.

2. ENHANCING ACCESS TO LOSS AND DAMAGE FINANCE

The development of robust monitoring, reporting, and verification (MRV) systems is very important for the countries to be transparent and to be ready to take climate funds. The upgraded institutional systems will be able to demonstrate accountability, increase the trust of the donors, and accelerate the release of grants, especially when it comes to the periods following climate-related catastrophes.

3. INTEGRATING NATURE-BASED SOLUTIONS AND INCLUSIVE DEVELOPMENT

Restoring forests and managing ecosystems are some of the nature-based initiatives that have been recognized as the most important measures for climate adaptation. Pakistan's projects, such as the Living Indus Initiative and Recharge Pakistan, can be tied to international financial mechanisms to enhance environmental resilience. At the same time, the integration of local communities' production of goods and services, especially women, indigenous groups, and disadvantaged populations, guarantees that climate actions being taken are socially inclusive and thus, no one is left behind.

TOWARD AN EQUITABLE CLIMATE FUTURE

Pakistan needs to institutionalize climate justice by incorporating an equity indicator in the National Adaptation Plan (NAP) and establishing a Climate Justice Committee in the Ministry of Climate Change. The community level adaptation and mitigation need to be put at the forefront of international finance and the benefits should be monitored clearly to guarantee accountability. It is necessary to make sure that all international assistance and UN donor funding is to be channelled through the Government of Pakistan to ensure that help is offered to the most in need communities.

Climate planning must be inclusive and gender

responsive in that there must be at least 30 percent women representation in climate committees and gender issues incorporated in all provincial policies. Just transition strategy must provide trainings to high carbon industry workers and provide microfinance to the impacted populations. Vulnerability assessments should be part of municipal master planning to make cities resilient to disasters. Green Climate Fund and the Loss and Damage Facility climate money must be devolved to help with adaptation activities that are led locally. Be open about allocation by allocating a minimum of 40 percent of cash to poor groups. All these measures can assist Pakistan in advancing an example of climate governance which is egalitarian, clear, and resilient.

Consequently, climate justice in Pakistan is a major then on the surface a Normative Commitment; it is a very important plan for the worlds and the country's survival and for the people's stability and peace. The floods and droughts have scratched the earth and they are now seen as triggers of the inequalities in the areas where people have been exposed, where they can recover, and where they can have opportunities. With COP30 approaching, Pakistan has to make a decision: to stay as a symbol of victimization or to take the path of a pioneer in the just implementation of climate measures through inclusive, transparent, and fair actions. Justice in the very oust sense will not be when the resort for the weak is just a matter of government policy or when the least privileged of Pakistanis a woman from Tharparkar, a farmer from Sindh, or a family from an informal settlement in Karachi, Buner, Gwadar start to think of their survival not as a big favour but as their right.

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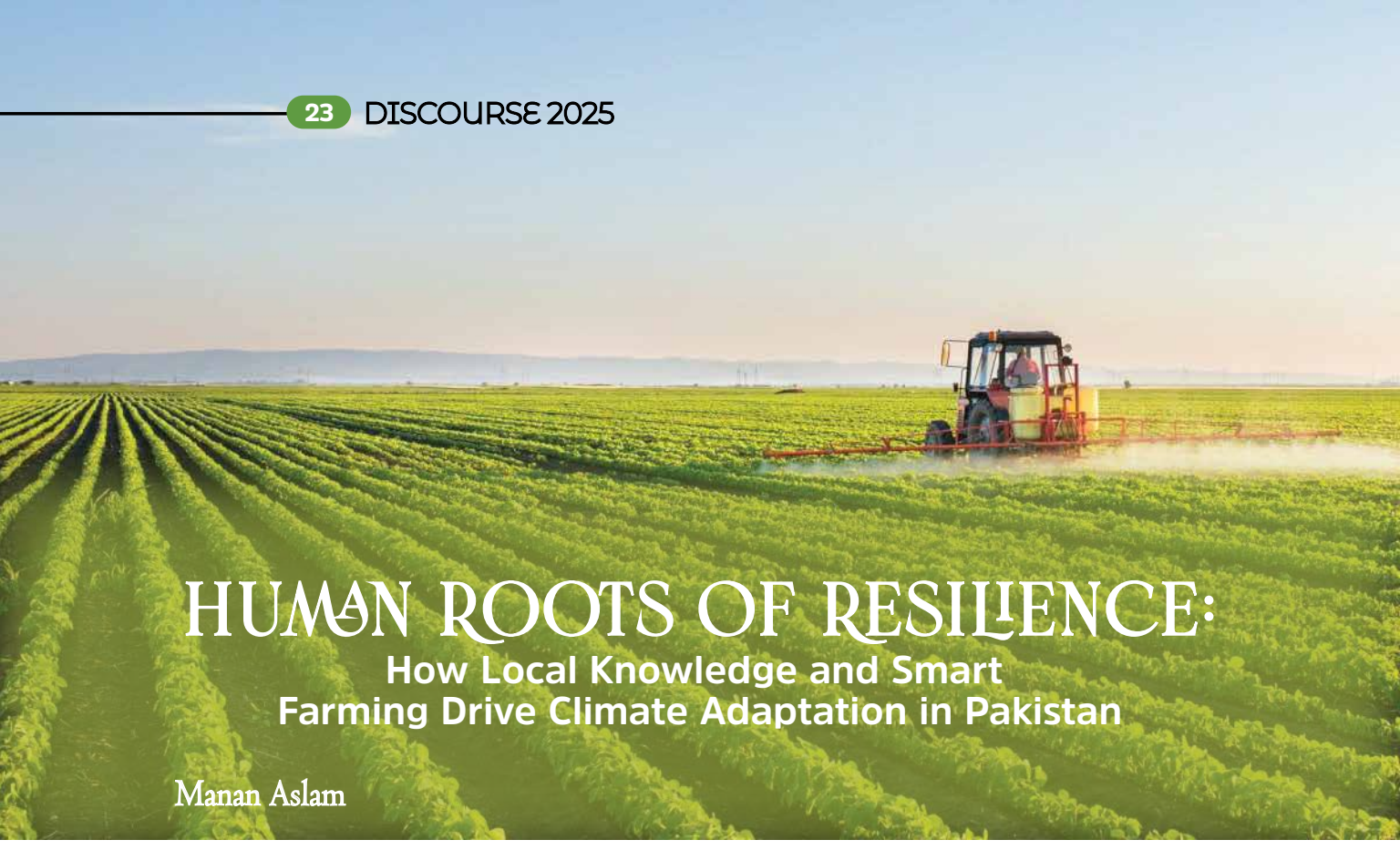

HUMAN ROOTS OF RESILIENCE:

How Local Knowledge and Smart Farming Drive Climate Adaptation in Pakistan

Manan Aslam

INTRODUCTION

Agriculture is the backbone of Pakistan's economy, yet it is also among the most affected sectors by climate change. Frequent floods, prolonged droughts, shifting rainfall patterns, and rising heatwaves are already undermining food production. The floods of 2022 and 2025 devastated millions of lives, destroyed crops, and exposed the fragility of Pakistan's food system. For small farmers who rely on timely rains and predictable seasons, climate change has turned ordinary uncertainty into a persistent and harsh challenge.

Because of this, it has become essential for the entire country to strengthen its resilience. Effective management, strong local agrarian institutions, and knowledgeable communities now present opportunities to improve farming practices and enhance the capacity of rural populations to endure extreme weather. From farm workers disseminating local warnings to community meetings and farmer groups, human action can connect farmers with practical knowledge, ICT tools, and warnings that safeguard both lives and livelihoods. When these people-driven initiatives become part of the national agenda and agrarian development, they can serve as the strong, enduring roots of a climate-resilient farming future.

PEOPLE ARE THE KEY TO SMART FARMING

Smart farming has three central goals: increasing food production, improving resilience to climate change, and reducing environmental pollution. Local communities and trained personnel are the driving force behind all three. Field officers and volunteers can deliver localized weather updates, pest warnings, and market information directly to farmers, enabling them to make informed decisions promptly.

The training provided by Bakhabar Kissan and the field staff of Digital Dera helps farmers in Punjab and Sindh receive tailored advice. This includes guidance on irrigation timing, fertilizer use, and how to deal with plant diseases, all based on the personal visits and expert insights. Local radio, town meetings, and digital advisory services are now important ways for landholders to share farming tips, weather warnings, and success stories, often led by local leaders and influential farmers.

Equally important, the records maintained by trained field workers and analyzed by experienced government staff enable the assessment of soil structure, crop health, and rainfall trends. Farmers who receive such insights from their local officers can adjust sowing schedules, safeguard livestock, or select drought-resistant seed varieties—enhancing their ability to adapt. Skilled individuals thus serve as a crucial bridge between science and the field, translating complex climate data into actionable advice for those who need it most.

LOCAL IDEAS AND FAIR ACCESS

Pakistan hosts numerous agricultural experts, institutions, and non-profit organizations that generate new solutions to farming challenges under climate stress. This environment allows young leaders, researchers, and farmers to collaborate in developing localized responses to agricultural problems.

In Multan and Faisalabad, young researchers and local innovators have built low-cost weather stations and collect the information themselves. These initiatives, led by the community, make sure the weather information is correct and useful for their specific area. In Gujranwala, small farmer groups are experimenting with improved irrigation methods and crop health monitoring systems—reducing waste through better training and innovative agrarian practices. Similarly, partnerships between universities and farmer advocacy organizations are promoting solar-powered irrigation systems, which reduce water and fuel waste through efficient operation and maintenance.

Despite these encouraging developments, a significant gap in agricultural knowledge and resource access prevents widespread adoption. Many small farmers—especially women—lack access to ICT tools, agricultural loans, and farm mechanization equipment. In some regions, weak local leadership and limited government outreach further hinder the flow of reliable information. To address these challenges, the country needs targeted government reforms, comprehensive community advisory programs, and strong collaborations between public institutions, local NGOs, and farmer associations. Without equitable access, the benefits of modern farming will remain confined to a few, rather than strengthening entire communities.

GOVERNMENT POLICIES FOR CLIMATE-READY FARMING

Pakistan's government recognizes the importance of human systems and effective governance in addressing climate change, yet implementation remains inconsistent. The National Climate Change Policy (2021) and the National Adaptation Plan (2023) both emphasize institutional reforms as essential for success. However, coordination and trust among the Ministry of Climate Change, local agricultural departments, and farming groups remain limited.

For policies to be effective and sustainable, developing farming skills and strengthening community engagement must become core components of agricultural planning. This requires not only capital and equipment but also a clear vision that integrates human capacity-building with climate and food security goals. National and provincial governments should collaborate to establish "Agricultural Innovation Centers" within agricultural universities, managed by expert trainers. These centers could serve as hubs where local communities and researchers jointly design training modules, information materials, and ICT tools to support smallholder adaptation.

Investment is another critical factor. The high upfront cost of adopting new practices often deters farmers. Local cooperatives and community banks could fund training and advisory services to help smallholders adapt. Agricultural banks might also introduce special "resilience loans" to finance irrigation systems, solar energy solutions, improved seed varieties, and ICT equipment.

Moreover, Pakistan urgently needs a unified information management mechanism. At present, weather and agricultural data are collected by multiple agencies using inconsistent methods. Establishing a national data center, managed by trained personnel, could help public institutions, private companies, and researchers collaborate more effectively. Clear data-sharing protocols would enhance evidence-based decision-making and reduce duplication of efforts.

PEOPLE'S ACTIONS FOR EFFICIENCY AND POLLUTION REDUCTION

While preparing for climate impacts is vital, behavioral changes and improved management can also significantly enhance resource efficiency and reduce waste. Trained farmers who follow optimized irrigation schedules conserve both water and fuel. Expert advice on soil health and fertilizer application minimizes runoff, lowering pollution levels. In livestock farming, properly maintained management records enable farmers to monitor animal health, track feed use, and reduce greenhouse gas emissions through better nutrition practices.

Local farmer cooperatives and community-supported marketing groups are also helping shorten supply chains by connecting producers directly with buyers. This reduces transport-related emissions and post-harvest losses, which are major contributors to waste. By embedding people-led solutions and sound management practices throughout the agricultural process, Pakistan can advance its commitments under the Paris Agreement while producing food more efficiently and sustainably.

BUILDING STRONG RESILIENCE THROUGH LOCAL YOUTH

New agricultural practices work best when they originate from local needs and are led by people with a vested interest in success. When communities own and manage their solutions, results are more effective and enduring. In many villages, local youth are emerging as "communication leaders", individuals adept at sharing information and using ICT tools to assist farmers. They help farmers interpret weather forecasts, adopt new technologies, and identify market opportunities, significantly increasing the adoption rate of modern practices.

Women's participation is equally critical. Although they perform most of the farm labor, women often face barriers to training and resources. Targeted programs that provide access to ICT tools, education, and local support can yield transformative results. Women-led initiatives not only strengthen household resilience but also challenge traditional gender norms, promoting social empowerment alongside climate adaptation.

CHALLENGES AND THE WAY FORWARD

Despite notable successes, Pakistan still faces long-term challenges in mainstreaming climate resilience. Weak government institutions, limited access to affordable ICT tools, and poor coordination among stakeholders continue to pose obstacles. Many farmers rely more on traditional knowledge or peer advice than on scientific data. Low literacy levels, limited trust in official institutions, and the gap between observation and on-ground practice further slow the diffusion of innovation.

Addressing these issues requires collective effort. Investment in rural education and agricultural training must become a national priority, complemented by initiatives promoting solar and clean energy use. Public awareness campaigns can help small farmers understand the tangible benefits of informed farming. Most importantly, the government must view human expertise and community engagement not as peripheral efforts but as central pillars of agricultural and climate policy. Only a whole-of-government approach, supported by local organizations, research institutions, and the private sector, can transform human potential into lasting resilience.

CONCLUSION

Integrating human capacity with advanced farming methods presents a unique opportunity for Pakistan. As climate-related challenges intensify, strong institutions and active community participation offer a path from vulnerability to resilience. Through timely information, expert guidance, and better organization, trained local leaders empower farmers to adapt their practices, manage risks, and protect livelihoods.

However, this transformation will not occur spontaneously. It requires strategic investment in people, clear policy direction, and inclusive participation. If implemented wisely, people-centered agriculture can turn Pakistan's climate vulnerabilities into opportunities for innovation and growth. By empowering local

leaders, equipping farmers with knowledge and practical skills, and embedding human-driven approaches into climate adaptation efforts, Pakistan can emerge as a regional leader in climate-resilient agriculture. The goal is not merely to survive climate change, but to build a smarter, stronger, and fairer future for rural Pakistan.

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PAKISTAN's STRUGGLE IN DISASTER AND CLIMATE GOVERNANCE

Zartasha Inayat

INTRODUCTION

The Floods 2025, which caused damage of Rs. 822 billion, are not an isolated event but reflect a flaw in how Pakistan plans, builds, and governs. The torrents may have receded, but what remains is a reminder that the country continues to manage disasters rather than prevent them. Each monsoon brings the same cycle of emergency relief, flood camps, donor pledges, and reconstruction drives. While all this is commendable, it cannot replace the need for meaningful investment in preparedness and resilience. Thus, it is essential to analyse the role of both federal and provincial governments in resource allocation and government performance.

1. GOVERNMENT RESPONSE AND INSTITUTIONAL PERFORMANCE

Over the years, Pakistan has set up a series of commissions and plans in the wake of every major flood. However, most of these documents have remained reactive rather than reformative. The National Flood Protection Plan-IV (NFPP-IV), prepared in 2017 with a projected cost of Rs 332 billion, was meant to address these calamities. The document aimed to modernize flood forecasting, strengthen embankments, and improve provincial coordination. However, even now, less than 1/3rd

of the plan has been implemented, and the progress updates have not been published since 2021.

The National Disaster Risk Management Plan 2022-2030, along with its updated framework under NDMA's Resilience Roadmap, is also meant to integrate early warning systems and community preparedness. However, the feasibility of both can be reflected by the fact that the most flood hit areas were not provided by the early warnings before the floods and communities were left stranded amid the floods. This reflects the financial gaps, weak adoption of the plans by provinces and limited federal monitoring.

1.1 Review of Annual Budget allocations for Disaster Management

In fiscal terms, while the federal budget 2025-26 have seen an increase in climate adaptation and mitigation budget, it does not reflect the urgency to address the recurring floods. The principal body for flood protection and management, Water Resources Division saw a sudden decline from Rs. 184.6 billion in FY2024-25 to Rs. 133.4 billion in FY2025-26, a 27% cut. Meanwhile, the combined budget for NDMA and the Cabinet Division for disaster response and rehabilitation stands at less than Rs. 20 billion in the current budget. Despite facing one of the worst economic disasters in form of 2022, which cost our economy $30 billion, three years later we still stand at a place with no dedicated flood recovery fund or transparent mechanism for tracking post flood reconstruction spending.

The following budget allocations are made for respective areas closely related to flood management.

Table 1: FY2025-26 Federal Budget Allocation for Key Disaster Management Authorities PKR. Million

Area	FY2024-25	FY2025-26	% Change in FY2024-25 and FY2025-26
National Disaster Risk Management Fund	2000	1,100	-45%
Climate Change Division	5,257	2,784	-47.05%
National Food Security & Research Division	23,928	4,254	-82.2%

Source: Federal Budget FY2025-26

The above presented numbers paint a worrisome picture of de-prioritization of institutions that are central to flood preparedness and management.

The 45% reduction in NDRMF moves the fiscal system away from the goal of anticipatory financing. The sharp reduction in its budget undermines the institute's ability to pre-finance flood protection works and crowd in donor funds, directly weakening the country's disaster preparedness capacity.

A similar contraction is similarly visible in the Climate Change Division's development budget, which fell by 47% compared to the previous year. Even though the division's mandate extends beyond climate adaptation to include coordination of flood risk governance, hydrometeorological upgrades and environmental regulation, it remains chronically underfunded. This trimming weakens the federal government's "coordination spine", the technical and institutional linkage between NDMA and Pakistan Meteorological Department (PMD) and the provinces.

The most alarming cut is in National Food Security and Research Division, whose development budget collapsed by 82%. This reduction directly affects Pakistan's capacity to recover from agricultural losses following floods. Research programs under the division such as development of flood tolerant crop varieties, saline soil management and post flood fodder rehabilitation are essential to restoring productivity in flood affected areas. The Post Disaster Needs Assessment 2022 suggests that agricultural losses accounted for nearly 40% of total flood related damages. Thus, cutting research funding in this area not only delays recovery but also increases future fiscal burden through higher import dependence for food and feed.

Taken together, these reductions reveal a bias in Pakistan's fiscal structure, where post disaster relief, in terms of emergency and relief camps, are more favoured than pre disaster protection. Majority of the disaster funds are spent reactively after events, rather than allocating predictable resources beforehand. This year's budget reinforces this pattern. Instead of strengthening prevention through NDRMF, enhancing coordination via Climate Change Division, or supporting agricultural resilience through NFS&R, the government has chosen to scale them back.

2. FEDERAL-PROVINCIAL DISCONNECT IN DISASTER MANAGEMENT

Pakistan's fiscal response and preparedness for the disaster remains fragmented and reactive. Flood management is a provincial responsibility under the 18th amendment. However, the provincial coordination and fiscal commitment across the provinces continues to vary sharply on the matter. Similarly, while provincial development budget collectively exceeds the federal one, their projects rarely align with the country's Nationally Determined Contributions (NDCs) or climate resilience priorities. In practice, provincial development remains fragmented and short term.

Pakistan's climate policy entered its third cycle of global commitments to Climate Change, where Pakistan submitted its third NDC to UNFCC. NDC 3.0 pledges $565.7 billion in climate finance requirements through 2040. The document also reiterates long standing goals such as strengthening flood protection, improving water governance, advancing climate resilient agriculture and enhancing early warning systems. Yet the track record of NDC 1(2016) and NDC 2(2021) highlights the limits of top-down climate policymaking. Both were federal exercises designed for devolved subjects, disconnected from fiscal and institutional capacity of provincial governments that must ultimately deliver these objectives. Similarly, in terms of solely addressing floods and water management authorities, federal flood commission works under the federal government. However, the lack of the commission's coordination with provinces and using outdated data in designing National Flood Protection Plan (NFPP) and National Water Policy is evident from the lack of preparedness of provinces in the recent floods. The floodplain maps in the NFPP are designed in 2016, using satellite data, however, only Punjab and Khyber Pakhtunkhwa have updated the maps marginally, while Sindh, one the most hit provinces every year by floods, still relies on almost a decade old map for the flood planning.

3. CLIMATE FINANCING AND FISCAL PRIORITIES

The analysis of floods cannot be separated from the investment in climate. Drawing the analysis by comparing the numbers for federal budget FY2025-26 with FY2024-25, the numbers highlight that overall investment in areas of climate adaptation, mitigation and supporting areas has been increased.

Table 2: FY2025-26 Federal Budget Allocation for Climate PKR. Million

Area	FY2024-25	FY2025-26	% Change in FY2024-25 and FY2025-26
Adaptation	46,625	85,435	83.3 %
Mitigation	212,861	603,000	183.3 %
Supporting Areas	18,887	28,331	49.9 %

Source: Federal Budget FY2025-26

The above table suggests that the focus of the budgetary allocation is inclined heavily towards climate mitigation instead of climate adaptation. However, it is a phenomenon that needs to be understood that Pakistan's current climate challenge needs attention in adaptation more than mitigation. For a country contributing less than one percent to global emissions yet ranked among the top ten most climate-vulnerable nations (Germanwatch, Global Climate Risk Index 2024), a mitigation-heavy strategy risks misallocating scarce fiscal resources.

The following table presents a similar picture, where the budget under the disaster preparedness, while overall dominating the budget, has decreased by 30% this year. The overall trend reflects a reactive rather than proactive disaster management approach. While funds for response are rising, the decline in preparedness implies reduced emphasis on resilience-building. A more balanced allocation, strengthening preparedness and recovery, would enhance long-term disaster resilience.

Table 3: FY2025-26 Federal Budget Allocation for Disaster PKR. Million

Disaster	FY2024-25	FY2025-26	% Change
Preparedness	47434	33163	-30.08
Response	12999	15876	22.13
Recovery & Rehabilitation	444	1142	157.20

Source: Federal Budget FY2025-26

While mitigation efforts remain important for aligning with global commitments, adaptation is where Pakistan's survival and fiscal stability lie. A balanced approach, where carbon pricing revenues are earmarked for local resilience programs and provincial adaptation funds, is essential. Unless the country recalibrates its climate financing architecture toward protecting lives and assets from recurring climate shocks, mitigation will remain a distant aspiration overshadowed by the cost of unmitigated disasters.

CONCLUSION AND RECOMMENDATIONS:

The 2025 floods reaffirm that Pakistan's vulnerability to climate related disasters remain rooted in fiscal misalignment and governance weakness, as much as it does in intensifying climate crisis. Pakistan's fiscal priorities must reflect its lived climate reality. The focus of climate spending should shift, or at least balance more decisively toward adaptation. Investments in early warning systems, irrigation modernization, coastal protection, and resilient housing yield immediate social and economic returns, while also reducing the long-term cost of disasters.

The reforms are needed both at fiscal and institutional front. Climate Adaptation must be embedded across all development sectors and not treated as a separate agenda. Similarly, the government should require a defined share of PSDP and ADP funds to be directed to climate resilient infrastructure which has ability to withstand the floods. Provincial governments' development spending exceeds the federal development spending; thus, provincial governments should be incentivized to participate in Climate Action through fiscal transfers. The National Finance Commission should incorporate a climate resilient performance Grant to reward provinces that meet measurable land use and flood mitigation targets.

Encroachments along rivers and floodplains have magnified the flood damage. Provinces must strictly enforce zoning under their Environmental Protection Acts to prohibit new riverside developments and penalize unauthorized construction. Disaster Management and Climate Resilience remain share responsibilities. Provinces must be formally integrated into federal policy formulation through joint planning. Similarly, provinces should also be required to submit their NDCs based on their challenges and risk assessment of that province and those NDCs should be integrated into federal NDC which is submitted to UNFCC every five years. Just like the provincial and federal coordination, Interdepartmental coordination is essential. Flood resilience demands integrated action between irrigation, agriculture, energy and infrastructure departments.

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CLIMATE RISK AND VULNERABILITY ASSESSMENT OF PAKISTAN

Dr. Muhammad Usman

Pakistan is among the countries most vulnerable to the potential impacts of climate change. The country's complex geography, ranging from coastal plains and fertile riverine basins to arid deserts and glacier-fed high mountains, when combined with deep socioeconomic inadequacies, makes it a mosaic of exposure and vulnerabilities in which climate risks are amplified. Over the last two decades, Pakistan has witnessed an increase in the level of floods, heatwaves, droughts, GLOFs and coastal hazards. Understanding Pakistan's vulnerability to climate-related hazards requires an understanding of physical hazard with drivers and dynamics, differential exposure of people and assets, underlying socioeconomic vulnerabilities and evidence-based tools (risk mapping and modeling) used to translate those elements into actionable risk information to ensure planning and adaptation.

HAZARD DRIVERS AND CLIMATIC TRENDS

Situated at the juncture of various physical drivers that amplify climate risks, Pakistan receives most of its summer rainfall from a highly variable and erratic South Asian monsoon. This leads to flashier, more intense rainfall events when storms do occur and longer dry spells between them. At the same time, rising temperatures increase the capacity of the atmosphere to hold moisture, which further intensifies extreme precipitation. The high HKH region faces unprecedented heat and warming, which is accelerating glacier melt and may increase the natural hazards of glacial lake formation and sudden breaches, generating floods downstream. On one end, sea level rise and storm surges threaten

the low-lying Indus delta and urbanized coastal zones, including Sindh and southern Balochistan; on the other end, the arid south and sections of central Pakistan face worsening heatwaves and droughts. Overall, such climatic shifts are in line with global and regional assessments that show South Asia as a climate hotspot for high exposure to temperature rise, extreme rainfall, and sea-level change.

Exposures to climate hazards are large and varied in Pakistan. The Indus River system forms the agricultural heartland of the country; major floods in the Indus basin threaten life, crops, infrastructure, and industry. Urbanization is often unplanned and focuses on floodplains, low-lying peri-urban zones, and informal settlements, amplifying exposure to vulnerable populations via both riverine and urban flash flooding. Populations along the coastline in Sindh and southern Balochistan are exposed to sea-level rise, saltwater intrusion, and cyclonic storm surges that damage housing, fisheries, and livelihoods. Rural and mountainous communities in the north face living downstream of glaciers and steep mountain slopes at risk from landslides and GLOFs. Infrastructure has been built or lies within many multi-hazard corridors: roads, bridges, irrigation canals, power grids, and communication lines that keep getting destroyed and raise the costs of recovery while undermining long-term development. The concentration of assets and people in hazard-prone corridors multiplies systemic risk when a shock cascades across multiple systems.

SENSITIVITY AND ADAPTIVE CAPACITY

Sensitivity refers to the degree to which a system is affected by climate stimuli; adaptive capacity is the ability to adjust, cope, and recover. Pakistan exhibits high sensitivity in key sectors, which include agriculture, highly dependent on seasonal water flows and natural irrigation; water resources, where the Indus system and glacier melt are central; and public health, regarding heat stress and vector-borne diseases. Adaptive capacity is uneven: some urban centers and national agencies have technical capacities and resources, while rural smallholders, informal settlements, marginalized social groups, and many local governments lack finance, technology, and institutional reach. Coupled with poverty, food insecurity, gender inequities and limited social safety nets, the current situation deepens sensitivity and constrains the ability to adapt, thereby increasing vulnerability to climatic shocks that could easily lead to long-term losses. International analyses and country profiles consistently emphasize how Pakistan has disproportionate vulnerability relative to its low contribution to global greenhouse gas emissions.

MAJOR CLIMATE IMPACTS

Pakistan's climate vulnerability cuts across multiple, interconnected sectors, with significant implications for national resilience and sustainable development. Retreating northern glaciers have perturbed seasonal river flows, first caused increased runoff and flood risk but eventually portended long-term summer water unavailability. Intensified monsoon patterns and prolonged dry spells increase flood and drought risks, putting a strain on irrigation systems, hydropower generation, and water governance in the face of growing competition among agricultural, domestic, and industrial users. Highly sensitive to climate variability, the agriculture sector is taking hits in productivity as heat stress shortens crop cycles, erratic rainfall and floods damage fields and erode soils, while sea-level rise pushes salinization in coastal lands. Smallholder farmers, having no access to irrigation, credit, or climate information, are highly vulnerable to income and food insecurity. Human health is increasingly at risk due to more frequent and intense heatwaves, which heighten mortality and disease burdens, while floods spread waterborne diseases and disrupt healthcare delivery. The expansion of vector habitats further exacerbates the risks of diseases such as dengue and malaria. Critical infrastructure and urban systems continue to suffer recurring damage from floods and landslides that destroy roads, bridges, and power lines; poor urban drainage brings along lengthy flooding and service disruptions, especially in remote or mountainous areas, where access and repair are hard. Meanwhile, Pakistan's ecosystems and biodiversity are deteriorating due to the erosion of coastal mangroves, inland saltwater intrusion, and degradation of mountain forests and pastures, weakening natural buffers formerly moderating floods, droughts, and soil erosion. This cumulative ecosystem decline diminishes the nation's adaptive capacity and multiplies the social and economic toll of climate extremes. Taken together, these pressures outline a complex web of vulnerabilities, demanding integrated, cross-sectoral responses that combine improved water governance, climate-smart

agriculture, resilient infrastructure, strengthened health systems, and ecosystem restoration to secure Pakistan's future in an era of accelerated climate change.

RISK MAPPING: METHODS, DATASETS AND PRODUCTS

Climate risk mapping translates hazard, exposure, and vulnerability data into spatially explicit depictions of risk to inform planning and investments. Core components and methods used in Pakistan include:

Hazard mapping: Historical observations, meteorological reanalysis, and climate model outputs (CMIP6 projections) are considered for characterizing extremes, such as 1-in-100-year river discharge, extreme rainfall intensity, and temperature exceedances, while long-term trends include temperature increases and sea-level rise. Glacier and mountain hazards involve remote sensing-satellite imagery and DEMs, and field surveys focused on mapping glacier extents, moraine dams, and glacial lakes to identify sources that could give rise to GLOFs.

Exposure datasets: population grids, land use/land cover, infrastructure layers including roads, power lines, and hospitals, agricultural areas, in conjunction with economic asset valuations, are combined with the hazard footprint to estimate who and what is exposed.

Vulnerability and sensitivity layers include the spatialization of socio-economic indicators relating to poverty, age structure, and types of housing; sectoral sensitivities on crop types and irrigation dependence; and institutional capacities that define the presence of local disaster management committees and access to early warning.

Integrated risk models: The overlay of hazard, exposure, and vulnerability in GIS will result in multi-hazard risk maps. Probability modeling converts hazards into expected annual damages and scenario-based losses along different warming pathways. Scenario analysis (near-term versus long-term; moderate versus high emission) supports planning over multiple horizons.

The country's agencies - NDMA and provincial DMAs - and international partners have generated country and provincial risk profiles and hazard atlases using combinations of these methods. National initiatives aim at standardizing hazard layers - flood, landslide, GLOF, drought, cyclone - and maintaining dynamic risk maps fed by meteorological and hydrological monitoring.

CASE STUDIES

Floods: The 2010 floods affected millions and caused billion-dollar losses; 2022 again produced unprecedented inundation across the Indus basin, displacing tens of millions and damaging infrastructure and crops on a massive scale. Recent monsoon seasons have produced intense rainfall events whose severity has been attributed in attribution studies to anthropogenic warming—indicating that climate change is already amplifying Pakistan's flood hazard. The pattern is clear: when extreme rainfall intersects with vulnerable land management (deforestation, encroachment on floodplains), the scale of damage escalates.

Heatwaves: Record temperatures have expanded the frequency and intensity of heatwaves, particularly in the southern parts of Punjab and Sindh. Heatwaves reduce labor productivity, increase mortality among the elderly and infants, and add to drought stress on agriculture. The combined heat and humid conditions also test urban infrastructure and power systems against higher demand for cooling.

INSTITUTIONAL FRAMEWORKS AND EXISTING INITIATIVES

In Pakistan, a variety of policies and institutions address climate and disaster risk, including the National Climate Change Policy of 2012 and successive Nationally Determined Contributions that establish national targets for mitigation and adaptation; the National Disaster Management Authority and provincial DMAs coordinate disaster risk management and early warning; the National Institute of Disaster Management supports research and capacity building; and sectoral agencies in water, agriculture, and energy integrate climate considerations into planning. International finance and technical partners support climate risk assessments, adaptation planning, and investments in resilience, including

flood early warning systems, climate-resilient infrastructure, and community-based adaptation programs. Yet despite these efforts, financing, coordination across scales, and long-term maintenance of monitoring networks remain significant gaps.

LIMITATIONS AND CHALLENGES IN RISK MAPPING

Many regions have a lack of high-resolution, long-term hydrometeorological and glaciological data; socioeconomic and exposure datasets are often outdated or inconsistent across provinces. The institutional fragmentation means that pieces of data and responsibilities are held by multiple agencies; standardized protocols for hazard mapping and risk assessment are lacking, which restricts integrated planning and national aggregation.

The dynamic glaciers, subsidence, and shifting monsoon patterns would also need near real-time monitoring with fresher maps, which is resource-intensive. Map production is an initial task, but maintaining monitoring networks, data management platforms, and early warning dissemination systems over time requires sustained funding and institutional will.

PRIORITY ACTIONS TO STRENGTHEN VULNERABILITY REDUCTION AND RISK MAPPING

A proposed National Multi-Hazard Geospatial Platform will host hazard, exposure, and vulnerability datasets on an open-access basis for planners, researchers, and decision-makers. It should be integrative at the provincial level and updated regularly. Stronger observation networks and remote sensing, with enhanced meteorological, hydrological, and glaciological stations, will advance real-time hazard detection and forecasting. Downscaled climate projections will be developed to inform climate-resilient infrastructure and agriculture, while people-centered vulnerability mapping will integrate social factors and local knowledge. Risk maps must be mandatory in land-use planning and public investment, prioritizing decisions driven by considerations of resilience. Robust early warning and anticipatory action systems with links to pre-approved financing, prepositioned emergency commodities will enable timely evacuations and supplies. Nature-based solutions, such as the restoration of mangroves, wet lands and watersheds, will protect with low-cost, sustainable solutions. Further capacity building and coordination among institutions and innovative, equity-based climate financing will guarantee just adaptation for vulnerable communities.

CONCLUSION

Pakistan's climate-vulnerable profile is defined by a mix of increasing physical hazards with high levels of socioeconomic exposure and sensitivity. Risk mapping, supported by robust data, multi-hazard models, and people-centered vulnerability indicators, transforms this complex scientific information into tools for practical decision-making, investment prioritization, and the mobilization of anticipatory action. Devastating floods and heat events in recent times have shown that climate change has already caused amplification of risk in the country, and therefore, bridging data, capacity, and financing gaps must be urgent priorities if the country is to transition from reactive recovery to proactive resilience. This is the way to reduce loss and build a safer, climate-resilient Pakistan: strengthening national geospatial platforms, monitoring networks, early warnings, and integrated policy frameworks while keeping the most vulnerable communities at the center.

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WHY POLICY MUST LOOK BEYOND CROP BURNING TO TACKLE SMOG

Ayesha Sultana

Every year, as September approaches, television screens, newspapers, and social media feeds in Pakistan fill with public awareness messages warning against rice crop residue burning. These campaigns have shaped the perception that farmers alone are responsible for the smog blanketing Punjab — as if the smoke from their fields were the only cause of the country's growing air pollution crisis.

However, this view represents only one side of a complex picture. Nearly two-thirds of Pakistan's population lives in Punjab, and its three most populous cities — Lahore, Faisalabad, and Gujranwala — are all suffocating under heavy smog. While crop residue burning does play a role, the main drivers of air pollution in these urban centers are rapid industrialization, uncontrolled urban sprawl, an ever-growing number of vehicles running on low-quality fuel, brick kilns, and widespread deforestation.

A 2018 study by the Food and Agriculture Organization (FAO) on smog and air pollution in Punjab found that transportation contributes 43 percent of PM2.5 emissions, industries 25 percent, and crop residue burning around 20 percent. Despite this, much of the public debate continues

to center on agriculture, unfairly placing the burden of blame on farmers.

Instead of merely condemning farmers, it is essential to understand the economic and logistical pressures driving this practice. Pakistan's population is growing at around 2 percent annually, now exceeding 220 million, which has placed enormous strain on its agricultural sector to produce more food. To meet rising demand, farming intensity has increased across Punjab — particularly in the rice-producing districts of Lahore, Faisalabad, Narowal, Sheikhupura, Nankana Sahib, and Hafizabad. Together, these six districts cover about 14,700 square kilometers and are home to roughly 22 million people.

The smog-affected belt of Punjab is renowned for producing non-basmati rice varieties that generate large volumes of residue. Farmers face extremely tight planting schedules and limited access to affordable, alternative residue management technologies. In the absence of government support, burning remains the quickest and cheapest option to prepare fields for the next crop.

The financial burden of manual removal or mechanical incorporation of crop residues is significant. Studies have shown that avoiding burning can raise production costs by as much as 35 percent. For smallholders operating on razor-thin margins, the added expense of hiring labor or renting machinery is simply not viable. Time constraints also compound the problem: many farmers have barely one or two weeks between harvesting rice and sowing wheat — a window too narrow to allow labor-intensive field clearing.

Moreover, burning is perceived by many farmers as beneficial. It helps remove weeds and pests, either by destroying them directly or altering their habitats. The ash left behind is believed to enrich the soil with potassium, supporting the growth of the next crop.

Over the years, the extent of residue burning in Punjab has fluctuated significantly. The following data illustrate the total area under fire from 2011 to 2021.

Table 1: Trend of Crop Residue Burning in Punjab

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total Area under fire (km^2)	72.87	75.16	42.72	50.63	46.68	62.50	46.68	110.96	36.39	87.82	207.29

Source: (Goheer et al., 2024) "Assessing smog trends and sources of air pollutants across northeastern districts of Punjab, Pakistan using geospatial techniques". International Journal of Environmental Science and Technology, 1–18.

The area affected by burning more than doubled between 2020 and 2021 — from 87.82 km^2 to 207.29 km^2 — marking the highest recorded value in the dataset. This steep rise underscores the persistence of burning practices and the absence of effective interventions.

Figure 1: Comparison of Fire Events (2011-2020) in Punjab

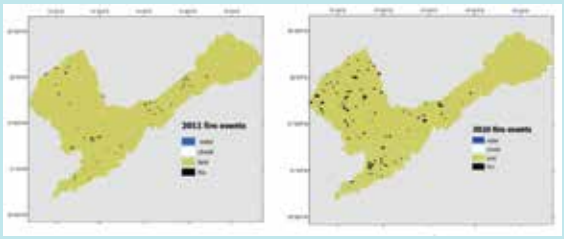

Figure Adopted from: "Assessing smog trends and sources of air pollutants across northeastern districts of Punjab, Pakistan using geospatial techniques". International Journal of Environmental Science and Technology, 1–18.

Smog is hardly unique to Pakistan or even to agricultural economies. History offers many examples where industrialized nations grappled with severe air pollution long before the issue of crop residue burning arose.

In 1952, London was engulfed by the Great Smog, a catastrophic event that killed over 4,000 people within days (later studies suggest the toll may have reached 12,000). The disaster shocked the world and prompted the British government to enact the Clean Air Act of 1956, a landmark law that redefined environmental policy.

The Act introduced several key reforms:

1. Relocation of polluters: Major industries and power plants were moved outside the city center.
2. Smoke-free zones: Specific areas were designated where burning certain fuels was banned.
3. Industrial regulation: Coal burning in factories within city limits was prohibited, and chimneys were required to be at least 200 meters tall.
4. Penalties for non-compliance: Strict punishments, including potential relocation of factories, were imposed for violations.
5. Residential reforms: The government helped households transition from coal to gas or electric heating, promoting cleaner domestic energy use.

Figure 2: Pollutants Levels Trends in London's Air

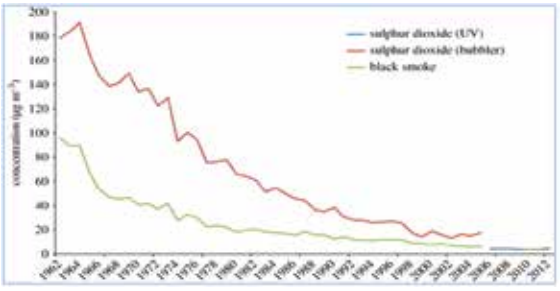

Figure Adopted from: "Causes and treatment of air pollution in modern Greater London". Eco Cities, 3(1), 1–11.

The Clean Air Act was later strengthened in 1968, mandating tall chimneys for industries to disperse pollutants higher into the atmosphere. By 1974, new rules limited sulfur content in industrial fuels. These reforms collectively transformed London's air quality, proving that sustained regulatory effort can yield dramatic results.

CHINA'S INTEGRATED APPROACH

More recently, China has demonstrated that even in rapidly industrializing nations, decisive policy action can reverse air pollution trends. A study by the University of Chicago found that between 2013 and 2021, air pollution in China fell by 42 percent, in stark contrast to South Asia, where it continued to rise. The global average decline in pollution during this period was largely attributed to China's efforts.

Figure 3: Global Decline in Pollution Due to China

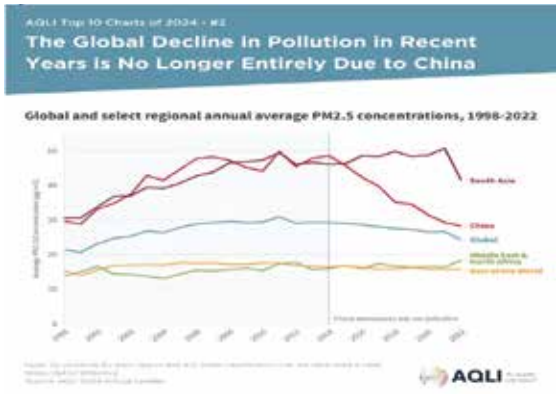

Figure Adopted from: (The Global Decline in Pollution in Recent Years Is No Longer Entirely Due to China | EPIC, 2024)

This progress is projected to add 2.2 years to the average life expectancy in China. However, pollution rose again in 2023 after a five-year decline, with PM2.5 concentrations increasing by 6.3 percent nationwide and 14 percent in Beijing. In response, China unveiled a new air quality plan in December 2023, setting ambitious targets:

1. Reduce PM2.5 levels by 10 percent (compared to 2020) by 2025.
2. Limit severely polluted days to less than 1 percent of the year.
3. Cut coal use by 10 percent in the Beijing–Hebei–Tianjin region and 5 percent in the Yangtze River Delta.
4. Phase out small coal-powered generators and boilers.
5. Increase renewable energy share to 20 percent by 2025.
6. Promote electric vehicles and ensure 80 percent of major highway stops have fast-charging stations.
7. Shift freight transport toward rail and waterways.
8. Ensure 90 percent of long-distance coal transport in northern regions moves by train.

China's strategy is comprehensive, targeting industry, transportation, and energy sectors simultaneously — an approach Pakistan can learn much from.

PAKISTAN'S PARTIAL EFFORTS

The Punjab government has taken some steps in the right direction. Initiatives such as the Metro Bus, Speedo Bus, and Orange Line Train aim to reduce vehicular emissions. Tree plantation drives under the Clean Green Pakistan Movement and bans on stubble burning are also notable. However, these isolated efforts have not produced measurable improvements in air quality.

A major obstacle remains the lack of coordination between federal and provincial governments. Since smog predominantly affects Lahore — the provincial capital — the federal government often treats it as a local issue. The slow implementation of the National Climate Change Policy (2012) highlights this indifference.

Pakistan needs a nationally coordinated approach spanning transportation, industry, agriculture, and urban planning. The FAO's analysis indicates that

transportation is the leading source of pollution in Punjab, suggesting that reducing vehicular emissions must be the top priority. A phased transition of government fleets to zero-emission vehicles, or at least a reduction in their numbers could serve both symbolic and practical purposes.

Industries and brick kilns, the second-largest contributors to pollution, require stringent regulation. The government could adopt a digital monitoring system similar to Bangladesh's to track high-emission sources. Relocating polluting industries beyond city limits and establishing smog-free zones could replicate the success of London and New York's clean air policies.

To address the agricultural dimension, Pakistan should move from punitive measures toward supportive incentives. Providing subsidies, low-interest loans, or shared machinery programs could help farmers adopt cleaner technologies. Crop residues, especially from rice, can also be repurposed for bioethanol, biogas, and biofuel production, generating rural income while cutting pollution. Encouraging the development of value-added industries that use crop residues would further motivate farmers to abandon burning.

The Environment Protection Department (EPD) in Punjab issues daily air quality reports, but these often understate pollution risks and lack comprehensive pollutant data. Inconsistencies in reporting — such as changing pollutant categories between years — and limited monitoring sites undermine evidence-based policymaking. Strengthening monitoring systems, standardizing data, and improving transparency are essential for long-term air quality management.

Smog is not just an environmental issue; it is a public health emergency, an economic burden, and a governance challenge. History shows that countries that successfully tackled smog — from London to Beijing — did so through decisive legislation, enforcement, and coordination.

Pakistan must now move beyond seasonal blame games and punitive crackdowns on farmers. What is needed is a comprehensive Clean Air Act, robust institutional collaboration, and sustained political will. Only then can the country ensure cleaner air, healthier citizens, and a more sustainable agricultural future.

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BRIDGING THE CLIMATE FINANCE GAP:

Pakistan's Evolving Landscape & the Road Ahead

Namra Saleem

Pakistan stands at the frontline of the global climate crisis. Ranked among the top 5 most climate-vulnerable nations despite contributing less than 1% to global greenhouse gas (GHG) emissions, it faces recurring economic shocks from floods, droughts and heatwaves. The 2022 super-floods, followed by the recent 2025 monsoon floods, have reaffirmed how climate extremes can undo years of development gains. According to "A Preliminary Assessment of Flood Damages in the Economy of Pakistan (2025)", the cumulative damages from the 2022-25 floods have exceeded Rs. 822 billion (US$2.9 billion) across key sectors, with agriculture, power and transport suffering the heaviest losses.

Findings from the Post-Disaster Needs Assessment (PDNA) 2022 estimated total damages at US$14.9 billion and economic losses at US$15.2 billion, equating to approximately 6% of GDP. Flood-induced supply disruptions pushed inflation up by 4% while national poverty rates rose by an estimated 3.7-4.0%. The agriculture sector alone accounted for 25% of total damages and 36% of total losses, underscoring the vulnerability of rural livelihoods.

These extreme weather events have intensified Pakistan's fiscal burdens. Recovery needs and reconstruction now demand US$16-17 billion, while annual climate adaptation and mitigation costs are projected to surpass US$40-50 billion . As of 2025, Pakistan's climate finance architecture continues to evolve, comprising public institutions, international donors, and private investors; yet, general weaknesses persist in project readiness, fund absorption and coordination.

Simultaneously, Pakistan's submission of its latest NDC framework (NDC 3.0) marks a turning point in aligning national ambition with global climate goals. It raises Pakistan's mitigation ambition to reduce GHG emissions cumulatively by up to 50% by 2035 (of which 17% will be conditional) and deepens adaptation commitments, signaling a stronger linkage between high-impact disasters (like floods) and climate-finance mobilization.

high-impact disasters (like floods) and climate-finance mobilization.

POLICY FRAMEWORK FOR CLIMATE FINANCE

Pakistan's climate finance governance has matured over the past decade through overlapping yet integrated policy instruments. These policies from the institutional core:

- National Climate Change Policy (NCCP) 2021
- Framework for Implementation of Climate Change Policy (2022-2030)
- National Adaptation Plan (NAP 2024)
- Pakistan Carbon Markets Policy, and
- National Climate Finance Strategy (NCFS)

The Climate Finance Unit under the Ministry of Climate Change & Environmental Coordination (MoCCEC) acts as the national coordination hub for multilateral and bilateral funding, mainly the Green Climate Fund (GCF), Global Environment Facility (GEF) and Adaptation Fund (AF).

Provincial governments, especially Sindh & Punjab, have established Climate Change Authorities (CCAs) with Provincial Climate Finance Frameworks (PCFFs) to align local projects with national and global goals. Under IMF's Resilience and Sustainability Facility (RSF), Pakistan introduced the Climate Budget Tagging (CBT) tool in FY26, requiring all PSDP projects to be categorized under adaptation, mitigation, or support. This reform aims to improve fiscal transparency and ensure consistency between climate goals and budgetary allocations.

CLIMATE BUDGET FY26: ALLOCATIONS AND CONTRADICTIONS

The Federal Budget 2025-26 marks Pakistan's first comprehensive climate-tagged budget under IMF supervision (the breakdown of allocation is signified in the table below).

However, despite a climate-forward narrative, contradictions remain between rhetoric and resource allocation.

Table 1: Climate-Tagged Budget Allocations for FY26

Category	Allocation (FY26) Rs billion	Focus Area
Adaptation (Resilience)	85.43	Flood resilience, agriculture, food systems
Mitigation (Clean Energy)	603	Hydropower, solar, wind, EV transition
Supporting Areas	28.33	Capacity, research, institutional reform
Energy Subsidies (Green)	529	Renewable energy and clean fuel support
Industry Sector	9.0	Cleaner production, efficiency upgrades
Transport Sector	7.3	E-vehicles, public transport
MoCCEC Budget	2.7	Climate coordination, research capacity
Environment Protection	3.1	Pollution abatement, waste management

Source: Ministry of Finance (Budget in Brief FY26); Dawn (2025)

However, the Ministry of Climate Change's budget saw a reduction from Rs. 3.5 billion to Rs. 2.7 billion, while funds under environment protection dropped from Rs. 7.2 billion to Rs. 3.1 billion. Former Climate Minister, Malik Amin Aslam, called the budget "a repackaging of old spending in new climate language,"[2] nothing that adaptation (the country's most pressing need) remains grossly underfunded.

Despite the adoption of climate tagging, the allocation pattern reveals skewed priorities, with adaptation (critical for resilience) receiving only 12% of total climate-related allocations. Experts have also highlighted policy contradictions, including the imposition of a carbon levy on fossil fuels and taxation on solar panels and hybrid EVs, which offset climate-friendly transitions.

INTERNATIONAL CLIMATE FINANCING FLOWS

Pakistan received US$533 million roughly in climate-related financial flows through multilateral and bilateral sources (Table 2). However, the inflows remain modest compared to the US$348 billion requirement identified in the updated NDCs 3.0 for mitigation and adaptation up till 2030.

1Profit Pakistan Today. (2025). https://profit.pakistantoday.com.pk/2025/08/13/pakistan-needs-40bn-50bn-annually-to-tackle-climate-risks-says-oicci-report/

2Article by Zaki Abbas in Dawn. (2025). Analysis: Budget 2025-26 – Climate budget a 'walking contradiction'. Available at https://www.dawn.com/news/1917401/analysis-budget-2025-26-climate-budget-a-walking-contradiction

Table 2: Major Climate Finance Inflows to Pakistan

Mechanism	Amount (US$ million)	Funding Type	Category
Green Climate Fund (GCF)	331.7	Grants & Loans	Adaptation & Mitigation
World Bank (IDA/IBRD)	13.9	Concessional Loans	Adaptation
Asian Development Bank (ADB)	43.4	Loans & TA Grants	Mitigation
Global Environment Facility (GEF)	34.8	Grants	Adaptation
Adaptation Fund (AF)	16.0	Grants	Adaptation
Bilateral Donors (Japan, Germany, UK, USA)	93.0	Grants & Co-financing	Adaptation & Mitigation

Source: MoCCEC[3], Transparency International Pakistan[4], ADB[5], World Bank[6] and GCF Data Library[7]

Cumulative trends show that around 54% of total climate finance supports adaptation projects, mainly in agriculture, water, and resilience, while 46% targets mitigation, focused on renewable energy (RE) and transport. Despite these gains, Pakistan's access to global climate funds remains constrained by limited project readiness, limited fiduciary systems and pipeline development capacity, slowing progress under the NDC 3.0 (2025) framework.

PAKISTAN'S GCF PORTFOLIO WITH REGIONAL COMPARISON

As of 2025, the Green Climate Fund (GCF) has approved over US$13 billion in projects globally, with developing countries in South Asia actively leveraging the fund to support their climate resilience and mitigation efforts. Pakistan, despite being among the climate-vulnerable nations, has received comparatively modest financing of around US$ 331.7 million for 11 projects, routed primarily through intermediaries like UNDP, ADB, FAO, JS Bank, and WWF. While, nations like India and Bangladesh have secured larger allocations owing to stronger institutional capacity, coherent climate policies, and proactive engagement with the GCF secretariat. The table below provides a comparative outline of GCF-funded projects and total approved financing for selected South Asian economies.

Table 3: Pakistan's GCF Projects & Financing: Countries' Comparison

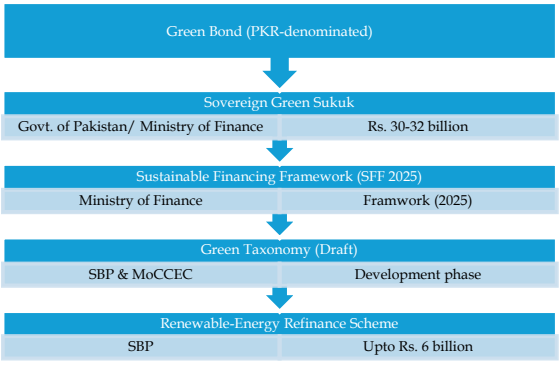
Countries	No. of Projects	Targeted Themes	Financing 2025 (US$)
Bangladesh	10	Adaptation, Mitigation, Cross-cutting	464.3 million
India	15	Adaptation, Mitigation, Cross-cutting	1.0 billion
Sri Lanka	5	Adaptation, Cross-cutting	106.1 million

Source: GCF, Data Library

DOMESTIC CLIMATE FINANCE MECHANISMS AND EMERGING INSTRUMENTS

Pakistan's domestic climate finance ecosystem has gradually diversified over the past decade, evolving from scattered project funding to a structure portfolio of sovereign, market, and other concessional instruments. These include green bonds and sukuk, central bank refinance schemes, and pooled climate funds that blend domestic and global resources. The State Bank of Pakistan's green refinance & taxonomy initiatives, Ministry of Finance's Sustainable Financing Framework (2025), and the undergoing request of Pakistan Climate Change Fund (PCCF) under the MoCCEC together mark a shift toward institutionalizing green finance. They reflect an emerging ecosystem that integrates fiscal policy, financial regulation, and private sector mobilization to scale climate investments aligned with Pakistan's NDC 3.0 targets.

Figure 1: Major Domestic Climate-Finance Instruments in Pakistan



Source: Profit Pakistan Today[8], The News[9], SBP and Finance Division

THE WAY FORWARD

To bridge the climate finance gap, Pakistan must focus on institutional and financial reforms.

3MoCCEC. https://mocc.gov.pk/Detail/YjIxNjFmNzAtYjUxOS00MTY2LWIzN2It-NDlkZmFiYTYzYmQz
4Financing Climate Action. https://transparency.org.pk/PUBLICATION/Financing-Climate-Action-Enhancing-Effectiveness-And-Transparency-In-Pakistan%27s-Climate-Governance-Frameworks.pdf
5ADB. https://www.adb.org/where-we-work/pakistan/overview
6WB. https://ida.worldbank.org/en/country/pakistan
7GCF. https://data.greenclimate.fund/public/data/countries
8Profit. (2025). https://profit.pakistantoday.com.pk/2025/03/22/pakistan-launches-first-pkr-denominated-green-bond-to-boost-climate-finance/
9The News. (2025). https://www.thenews.com.pk/print/1316514-pakistan-launches-first-sovereign-green-sukuk

Establishing a Climate Finance Taxonomy and operationalizing the National Climate Investment Platform (NCIP) will help streamline funding flows and improve project alignment. The Climate Finance Unit (CFU) should serve as a central coordination body for donor engagement and provincial integration. Mobilizing private investment through green Sukuk, EESG incentives, and carbon market frameworks under Article 6 can significantly expand financing sources. Firming up transparency through digital MRV systems, standardized reporting, and provincial capacity building will ensure efficient tracking and accountability.

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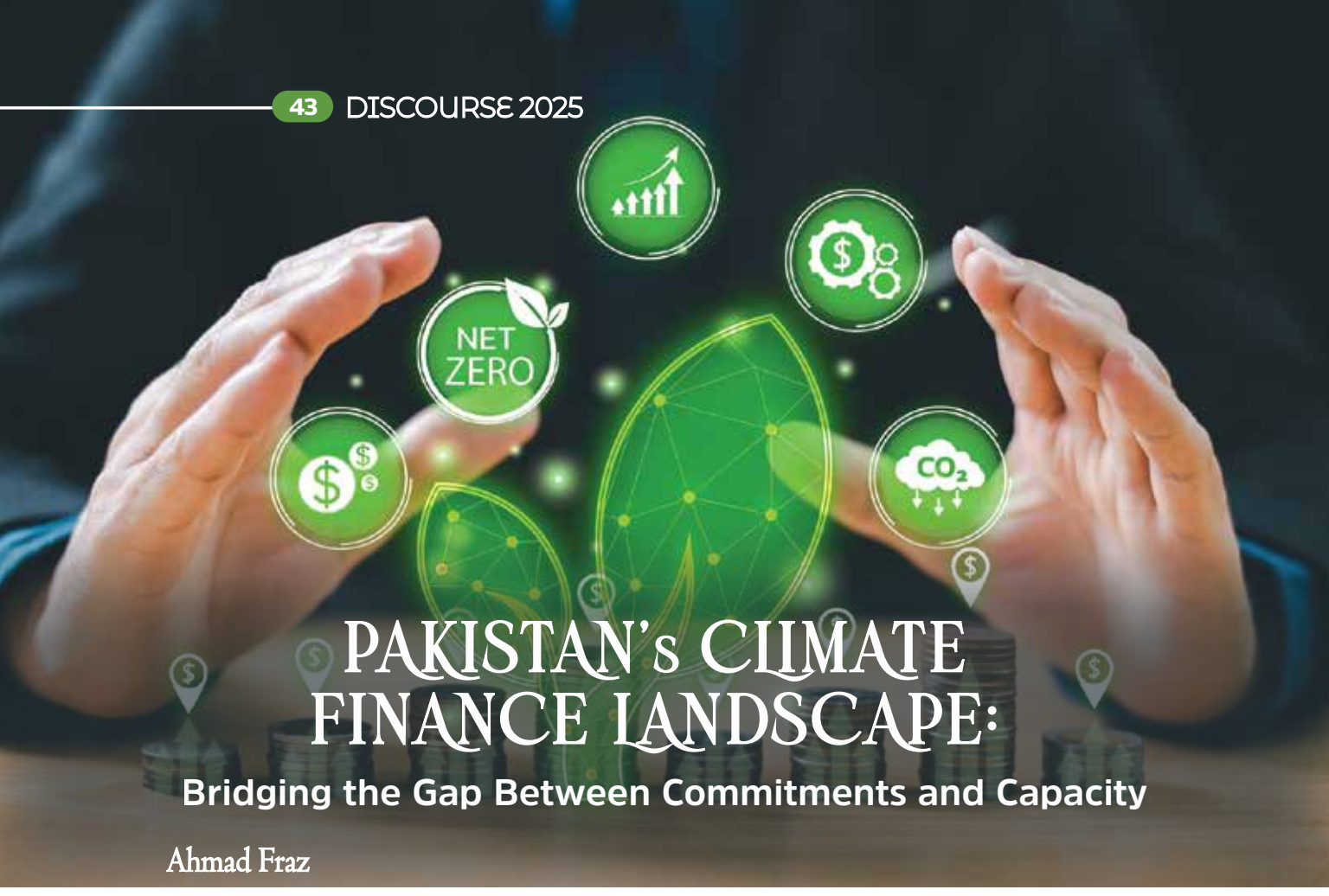

PAKISTAN's CLIMATE FINANCE LANDSCAPE:

Bridging the Gap Between Commitments and Capacity

Ahmad Fraz

1. INTRODUCTION: SETTING THE CONTEXT

Pakistan stands on the frontline of the global climate crisis, where environment vulnerabilities are becoming a challenge. The devastating floods of year 2022 has displaced more than 33 million people and cause economic losses more than 30 billion USD[1]. Climate change presents a profound threat to ecosystems, human well-being, and the stability of the global economy. The climate challenge has become human as well as an economic reality as recurring heatwaves and droughts are threating the agriculture, water, energy and food security.

It is worth mentioning that Pakistan is responsible for less than one percent of global greenhouse-gas emissions, but it is among the top ten climate-vulnerable countries in the world according to the Global Climate Risk Index 2023, due to floods, drought and cyclones. At COP 26 the government of Pakistan has committed to reduce emissions and strengthen adaptation by up to 50% by 2030, with 15% using country's own resources and 35% subject to the availability of international grant finance. Achieving carbon neutrality requires active participation from financial institutions, innovation-driven environmental systems, and aligned fiscal policies. But the question remains: how can Pakistan fund this transformation?

To translate the goals into realities requires sizeable funds. It all depends upon how Pakistan can effectively finance its response to climate change. Climate finance has become the central agenda for Pakistan's development, that refers to the flow of funds that will be used to mitigate and adapt the climate change.

1 International Labour Organization (2022) reprot. Pakistan floods 2022: Post-Disaster Needs Assessment.

2. THE CLIMATE FINANCE LANDSCAPE IN PAKISTAN

Pakistan's climate-finance system is a mix of domestic efforts, international support, and emerging financial instruments.

Domestic Sources:

Most climate-related spending flows through the Public Sector Development Programme (PSDP). These allocations are often hidden inside broader projects without proper climate tagging or monitoring. Federal and provincial governments finance irrigation efficiency, renewable energy, forestry and flood-protection schemes. But coordination between the Ministry of Climate Change (MoCC), the Planning Commission and provincial departments remains weak.

Private-sector engagement is quite low. Commercial banks and corporations rarely treat environmental investment as a business opportunity. Pakistan's financial markets are still learning to value sustainability. A few encouraging steps have been taken, for example, the State Bank's Green Banking Guidelines and renewable energy financing schemes have started to push banks to lend in this space.

International Sources:

Pakistan receives support from multilateral and bilateral sources like the Green Climate Fund (GCF), Global Environment Facility (GEF), Asian Development Bank (ADB), World Bank, and the International Monetary Fund (IMF) via its Resilience & Sustainability Trust. For example, the World Bank approved a USD 213 million project to strengthen flood resilience. However, Pakistan's access to international finance remains modest. GCF has sanctioned projects worth approximately $16 billion globally, yet Pakistan received a modest $304 million, while comparable economies have considerably larger portfolios.

The document, submitted to the UNFCCC to the COP26 climate summit estimates that Pakistan will require over USD 101 billion by 2030 to meet its adaptation and mitigation needs. The recent report of Dr. Shamshad Akhtar the former finance minister, in collaboration with Memosh Khawas highlights that a massive climate financing gap exists[2]. While the country requires 348 billion USD between 2023 to 2023 to confront the climate crisis. Yet current annual climate-related spending is between USD 1.4 to 2.0 billion annually The report warns that this shortfall poses a serious threat to the country's economic stability and long-term sustainability.

3. GLOBAL AND REGIONAL COMPARISONS

Globally, climate-finance flows reached around USD 1.3 trillion in 2022, but less than 4 % of that went to South Asia. India, for instance, has developed a comprehensive green-finance ecosystem including sovereign green bonds worth about USD 2 billion, a domestic carbon-market framework, and specialised green banks.

Bangladesh has operationalised a Climate Fiscal Framework and a Climate Change Trust Fund, which directly allocates money from the national budget to adaptation programmes. In contrast, Pakistan still lacks a clear national climate-finance strategy or a dedicated fund. Pakistan is still treating climate finance as project-based aid rather than a long-term development instrument.

4. GAPS AND BOTTLENECKS

Climate finance in Pakistan faces many institutional and financial barriers.

Institutional Fragmentation:

Many agencies operate with overlapping mandates, resulting in duplication and lack of coherence. There is no unified national climate-finance coordination mechanism linking federal, provincial and local entities.

Limited Absorptive Capacity:

Public institutions lack technical expertise to design bankable projects or meet international fiduciary standards. Pakistan's experience with the large post-disaster recovery packages after the 2022 floods highlights how needs assessments do not automatically translate into funded, implementable projects.

2 Climate Financing and Policy Recommendation (2024)

Fiscal Constraints:

Pakistan's fiscal space is highly constrained, with debt-servicing and stabilization priorities consuming large parts of the budget. Climate investments often lose priority against immediate macro-fiscal demands.

Private-Sector Hesitancy:

Without clear incentives, a green taxonomy or de-risking instruments, the private sector remains reluctant to engage in climate-related ventures.

Poor Data and Tracking:

There is no national system to track climate-finance inflows and expenditures, making monitoring, gap-analysis and accountability difficult.

Shariah-compliant green instruments:

The intersection of Islamic finance and green finance is gaining traction globally. "Islamic finance shares similar underlying principles as that of sustainable finance, i.e. financial stability and economic growth, poverty alleviation and wealth distribution, social inclusion as well as environmental preservation. This has therefore allowed for Islamic finance to capitalize on these similarities to become a natural vehicle to propagate the elements of green finance."[3]

Pakistan has the institutional base of Islamic banking sector, Shariah-compliant instruments to tap this niche, but has yet to scale its green Islamic finance instruments to match regional peers. From the Islamic-finance angle the lack of shariah-compliant green instruments and absence of a green-finance ecosystem (promotors, providers, coordinators, users) restricts the mobilisation of capital that might otherwise enter Pakistan's market.

3 Green Finance An Islamic Way to Rescue the Nature (2002), P & R Vol.3 Issue 2, Policy and Research PIDE.

5. OPPORTUNITIES AND EMERGING MECHANISMS

There is still a strong ray of hope. Pakistan can redesign its climate-finance architecture to attract both domestic and international investors and to channel Islamic-finance flows.

Green Bonds and Sukuk:

Pakistan has experience issuing Islamic-finance instruments and sovereign sukuk. A natural near-term step is the introduction and scaling of green sukuk (Shariah-compliant green bonds) to attract institutional investors seeking ESG-compliant instruments. Regionally, India's sustainable-debt market reached cumulative aligned issuance of roughly USD 56 billion by end-2024, illustrating the potential scale available in South Asia if policy and market conditions are right.

Carbon Markets and Climate Credits:

One of the most promising frontiers is carbon markets, where countries and firms earn climate credits for reducing or removing greenhouse-gas emissions. These credits can be traded or sold to countries or companies that need to offset emissions under global frameworks.

Under the Paris Agreement's Article 6, countries can cooperate through carbon-trading mechanisms. Internationally, several standards and agencies certify carbon credits: UNFCCC's CDM and Article 6 Mechanism; Verra (Verified Carbon Standard); Gold Standard Foundation; Climate Action Reserve; American Carbon Registry.

To earn carbon credits, Pakistan must register projects that verifiably reduce emissions. Such as renewable energy, reforestation, energy-efficiency, and waste-management projects with these agencies. Once verified, credits are issued and can be sold in voluntary or compliance markets.

Where Pakistan Stands:

Pakistan remains struggling to tap the potential carbon markets. Under the carbon markets Article 6, so far Pakistan does not have any project. However, Pakistan currently has 18 voluntary

carbon projects registered under Kyoto Protocol Clean Development Mechanism (CDM), while India has over 1,600 CDM projects and Vietnam over 250. The potential is enormous, especially in forestry, agriculture, waste and renewables.

Encouragingly, the Ministry of Climate Change has drafted a National Carbon Market Framework, designed to establish a domestic registry, streamline project approvals, and attract both local and international investors. After the implementation of this framework it can provide the institutional foundation for Pakistan to generate and trade verified carbon credits with global climate finance flows.

How Pakistan Can Portray its Positive efforts:

Pakistan has already taken important steps toward addressing climate change, but not able to effectively communicate it to the world. For instance, the Living Indus Initiative is a big example of restoration of ecosystem, which was aimed to revive the natural environment of Indus Basin as well as to improve the lives of the communities that depend on it. Similarly, the Recharge Pakistan Project is helping replenish depleted aquifers by using excess flood's water and storing it underground. The Billion Tree Tsunami also an ambitious effort of reforestation that was aimed to improve biodiversity, reduce soil erosion, and capture carbon naturally.

Based on the above achievement, Pakistan should collaborate with the international carbon credit certification bodies such as Verra and Gold Standard and get early registration for these high impact projects. It would help Pakistan to get carbon credits that may help in attracting climate finance. By establishing a Carbon Credit registry for Pakistan would enhance transparency and traceability, and build the investor confidence in these green initiatives taken by the country.

By presenting these initiatives with evidence of transparency, measurable outcomes, and credible verification, Pakistan can reshape its global climate narrative. Instead of being seen only as a country at risk, it can position itself as one that is taking responsible, faith-aligned, and forward-looking actions to protect its people and the planet.

6. WHAT PAKISTAN HAS DONE AND WHAT IT MUST DO

Pakistan has taken positive initiative in the context of green economy. The National Climate Change Policy (2021) provides a framework for adaptation of sustainable agriculture, renewable energy and ecosystem restoration initiatives. The National Adaptation Plan is under process and on the financial side, State Bank has also issued guidelines for green banking. Meanwhile, the Ministry of Planning, Development and Special initiatives (MoPDSI) has begun integrating climate-indicators into PSDP appraisal forms under URAAN Pakistan 5 E's Framework. However, Pakistan still has to improve its institutional capacity and improve the coordination among different ministries that will help to create the opportunities for the private investment in green sector by providing financial incentives. It needs to,

- Establish a National Climate Finance Strategy that sets clear financing targets and defines institutional roles (MoCC, MoPD&SI, Finance Division).
- Create a Pakistan Climate Fund or Green Bank to pool domestic and international resources and offer concessional loans.
- Introduce green budgeting at federal and provincial levels to tag and track spending.
- Develop a climate-finance tracking system for transparency and accountability.
- Engage the private sector through guarantees, blended-finance and tax incentives.
- Strengthen research and data capacity to design projects that meet international funding standards.
- Foster partnerships with academia and local governments to make climate finance people-centred.
- Launch green sukuk / shariah-compliant green bonds, design frameworks aligned with Islamic finance and issue pilot projects for renewables and environment-friendly assets.
- Promote green equity for Shariah-compliant firms: allow tracker stocks and green-certified firms to raise capital in Pakistan's stock market under Islamic-finance criteria.
- Establish an Islamic Green Finance Advisory Centre to help banks, corporates and funds develop compliant instruments, access global Islamic green capital and meet certification standards.

Pakistan must also bring a human face to its climate-finance story. It is not just about numbers; it is about the farmer in Sindh whose crops were destroyed by floods, the woman in Thar who walks miles for water, and the young engineer in Lahore who wants to innovate in renewable energy but lacks funding. Climate finance must connect to these real lives.

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PAKISTAN's CLIMATE ADAPTATION DILEMMA, MALADAPTATION, CONSEQUENCES, AND GOVERNING GAPS

Inshrah Minahil

INTRODUCTION

As the world progresses towards newer technologies, advanced AI systems, modern tools, and machinery, it is still tangled in the same race of survival. The newest threat to survival that is the result of the exploitation of the same world we live in is called Climate Change. And as the trend of the rich being on the safe side while the poor bear the cost of the rich. The same story goes on for Pakistan; an underdeveloped country depending on agriculture, textile, and leather for its economy, grappling with the intense effects of climate change in the form of SMOG, floods, GLOF, droughts, etc.

Pakistan is mostly an arid and semi-arid country, with approximately 80% of its area falling in these categories. Since independence in 1947, many natural resources of Pakistan have been damaged, and a large portion is under significant risk every year due to natural disasters, the lack of planning, awareness, and control before, during, and after the disaster events.[1]

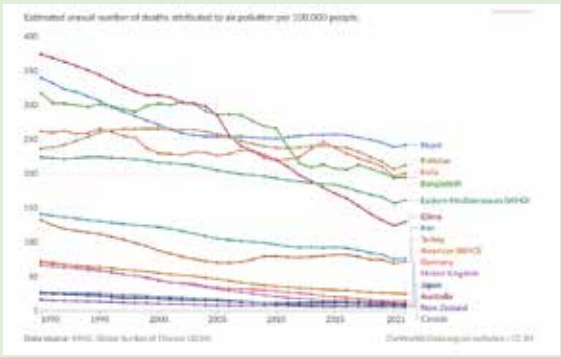
Pakistan's population suffers more from climate change despite contributing less than 1 % to global greenhouse gas emissions. Rapid industrialization, fossil fuel use, plastic use, and deforestation worsen the situation.[2] Pakistan is one of the most vulnerable countries, especially in Southeast Asia, experiencing floods and droughts as a result of climate change. Variation in climate adversely affects the agriculture sector, groundwater, nutrition, soil quality and soil organic matter, health conditions, and poverty.[3]

1(Iqbal,et al., 2014).
2(Adnan,et al., 2024)
3(Fahad,et al., 2019)

In the climate finance vulnerability index shown below, Pakistan has financial vulnerability of 90.2, while the climate risks are up to 37.7, ranking it 145th[4] globally, making both climate risks and financial vulnerability relatively high. This positioning reflects a situation where the country is regularly exposed to hazards like floods, air pollution heat stress, while its economic capacity to manage and recover from these impacts remains limited. The presence of multiple high-risk hazards suggests that climate challenges overlap rather than occur in isolation.

Hence, we experience more frequent heatwaves, dust storms, and stagnant air events. Cities like Lahore, Karachi, and Peshawar are experiencing toxic smog for longer periods each year. This directly increases respiratory and cardiovascular diseases, making clean air not just an environmental concern but a growing public health emergency. The rising death toll given in the graph below shows how polluted air is already costing Pakistani lives.

Figure 1: Death Rate from Air Pollution – 1990 to 2021



Source: Our World in Data [5]

NATIONAL ADAPTATION PLAN TO COMBAT THE EFFECTS OF CLIMATE CHANGE

In general, when any climate-related natural disaster occurs, people look towards local governments and related agencies for immediate relief aid and transitional recovery assistance.

Over the past decade, Pakistan has faced many natural disasters. Unfortunately, the past natural disasters show that the local and the central government departments and the related national agencies could not provide immediate relief and recovery to the affected people during an emergency[6]. Local governments can better react to the risks of environmental changes. They can produce positive results in terms of reduction of local pollution, collection of waste, natural resources management, and economic growth in a situation where local data and funding for adoption are available, and adaptive responsibilities are clear[7]. Building effective adaptation strategies to control environmental degradation that is operative from the local to the national government level will support the country's economy.

Pakistan came up with its first-ever seven-year National Adaptation Plan (NAP) spanning from 2023 to 2030. The plan aims to address the detrimental consequences of climate change on the country.[8]The NAP serves as a national framework to adapt to the impacts of climate change. It focuses on building resilience in key sectors, improving coordination between institutions, and integrating climate adaptation into development planning. It also provides a pathway for Pakistan to access international climate finance and support vulnerable communities.[9]

Pakistan's NAP framework, given below, emphasizes that climate resilience must grow from both social and economic strengths. The vision highlights community-level wellbeing and ecological protection as mutually reinforcing goals, showing that adaptation is not just technical; it is about quality of life. The six core pillars reflect a balanced approach: creating green employment, ensuring fair access to development, protecting ecosystems, aligning governance with climate priorities, enabling resilient infrastructure, and encouraging responsible private-sector behavior. Meanwhile, the foundation layer underscores persistent challenges that must be addressed for adaptation to work, such as inequality, weak institutional coordination, and limited investment in innovation. Overall, the framework signals a shift from reactive disaster response to long-term, inclusive, and development-linked adaptation planning.

4Pakistan - Climate Finance Vulnerability Index (CliF-VI)
5IHME, Global Burden of Disease (2024) (Our World in Data)
6(Mayo, et al., 2013).
7(National Climate Change Adaptation Research Facility, 2012).
8Examining Pakistan's First National Adaptation Plan - Centre for Strategic and Contemporary Research
9Pakistan's Climate Change Plan: Adaptation Strategy 2025 - Bloom Pakistan

Figure 2: Framework of the National Adaptation Plan[10]

The adaptations to prevent the consequences should be taken with high sensitivity towards the local residents, the weather patterns, the economic reliance of the sector, the conventions followed, the crops, the animals, etc. Not only should the adaptation be timely delivered, but it should be efficiently done as well. It should aim to improve the quality of life affected as well as prevent any chains of hazards that can be brought up by the change happened. The National Adaptation Plan provides a framework, but the precision of implementing that plan is dependent on the government and stakeholders involved.

MALADAPTATION

The Intergovernmental Panel on Climate Change defines Maladaptation as;

"Actions that may lead to increased risk of adverse climate-related outcomes, including via increased greenhouse gas (GHG) emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future. Most often, maladaptation is an unintended consequence."[11]

Actions that focus on sectors and risks in isolation and on short-term gains often lead to maladaptation if long-term impacts of the adaptation option and long-term adaptation commitment are not taken into account.

The implementation of these maladaptive actions can result in infrastructure and institutions that are inflexible and/or expensive to change For example, seawalls effectively reduce impacts to people and assets in the short-term but can also result in lock-ins and increase exposure to climate risks in the long-term unless they are integrated into a long-term adaptive plan. Maladaptation especially affects marginalized and vulnerable groups adversely (e.g., Indigenous Peoples, ethnic minorities, low-income households, informal settlements), reinforcing and entrenching existing inequities.[12]

In Pakistan, the risk of maladaptation becomes particularly relevant when climate responses are driven by urgent needs but limited resources. Short-term fixes such as rapid infrastructure repairs after floods or expanding groundwater extraction during drought may offer immediate relief, yet unintentionally deepen future vulnerabilities. When adaptation efforts overlook social equity or long-term ecosystem impacts, they can place already disadvantaged groups at even greater risk, reinforcing the same fragility the policies aimed to reduce. This makes it crucial for adaptation planning to reflect the broader vision set out in Pakistan's NAP, ensuring that climate strategies are flexible, inclusive, and aligned with sustained resilience rather than quick, isolated solutions.

For this, Pakistan must prioritize indigenous research, context-specific data, and traditional knowledge that genuinely reflect local vulnerabilities. Without strong home-grown evidence and participation from affected communities, adaptation risks becoming misaligned with ground realities, ultimately recreating the very challenges it seeks to solve. Pakistan is suffering from a scarcity of domestic, indigenous research which could help identify psychosocial epidemiological patterns and viz a viz, the development of culturally appropriate policies and interventions.[13]

10unfccc.int/sites/default/files/resource/National_Adaptation_Plan_Pakistan.pdf
11Annex II: Glossary | Climate Change 2022: Impacts, Adaptation and Vulnerability
12Summary for Policymakers | Climate Change 2022: Impacts, Adaptation and Vulnerability
13(Khalily, 2010).

MALADAPTATION IN PAKISTAN

1. Thar coal power development:

Thar's coal extraction and power generation were promoted as an energy security solution, but the project has intensified water scarcity for local communities while locking Pakistan into fossil-fuel infrastructure incompatible with long-term adaptation goals. The groundwater over-extraction and discharge of brine water threaten the already arid ecosystem and vulnerable Thari populations, a clear example of short-term economic gain creating long-term environmental and social vulnerability.

Dawn News reported;

"Speaking at a press conference at the Karachi Press Club, local activists shared the findings of a recent report that raised questions about the claims of the Engro Corporation Ltd — which owns stakes in the coal mining and coal-based power plants — that their operations are not harming the drinking water or the integrity of subsoil and water aquifers in Block II of the Thar coal area.

The activists Abdul Aziz Halepoto, Abdul Hamid Somro, Lachman Borano, Leela Ram, Sooraj Jaipal, Neehal Mehranpoto, and Preetam Mehgawar raised concerns over the poisoning of drinking water for local communities and said they were now suffering from health complications due to the toxic water not being disposed of properly.

They called on the government to take notice of the report on water quality and take action to save the people of Thar."[14]

The report shared by Meezan University of Engineering and Technology's Soil and Water Pollution Control Laboratory clearly reported high levels of fluorides, arsenic. Lead levels were also found to be way higher than the prescribed standards of the World Health Organization (WHO).

Prior to coal operations, the baseline mercury levels were below detectable levels, while current levels are elevated by up to 94 times in excess in drinking water. The report is based on the tests conducted by Mehran University of Engineering and Technology's Soil and Water Pollution Control Laboratory, which is approved by the Sindh Environmental Protection Agency (Sepa).. The report also raised questions about Sepa's willingness and capacity to monitor Thar coal activities adequately and cast doubt on the adequacy of the approved Environmental Impact Assessment (EIA) for Thar coal mining and power plants.[14]

2. Karachi Urban Expansion & Drainage Canal Encroachments:

Karachi's rapid urban growth has relied on informal land reclamation, covering natural drainage systems (nalas) and wetlands. Infrastructure that was meant to improve connectivity and housing has instead heightened exposure to floods, as witnessed during the 2020 and 2022 monsoon disasters. Vulnerable settlements built along nullahs were disproportionately harmed, illustrating how maladaptation entrenches inequality.

Arif Hassan reported;

"Due to a lack of housing, informal settlements developed along the nalas into which sewage was discharged. After the mid-1960s formal sectors also began using nalas for disposal. Sludge from sewage clogged the nalas and their tributaries, and during the heavy rains of 1978-79, much of the housing along the nalas was washed away.

After that, informal settlement residents started to informally purchase solid waste from the municipal authorities and compact it along the nala edges to secure them and to create land for their homes. Nala widths decreased substantially from 20-40 meters to less than ten, and four to five meters in some places."[15]

14Concerns raised over 'poisoning' of potable water in Thar - Pakistan - DAWN.COM

15Urban flooding: the case of Karachi | International Institute for Environment and Development

3. Thatta and Coastal Embankments (Indus Delta):

Hard-infrastructure defenses such as sea walls and embankments in the Indus delta were designed to protect coastal communities from storm surges, but poor maintenance and lack of ecosystem integration have led to land subsidence, accelerated erosion, and saltwater intrusion. Mangrove loss reduces natural climate buffers and increases vulnerability, especially for small-scale fisherfolk.
Dam construction and mismanagement of water by the government have significantly reduced river flows, causing the delta to shrink, and threatening both human life and its ecology. The absence of flowing freshwater allows seawater into the delta, destroying the soil and the aquifers, making it unfit for humans, animals, or crops.[16]

POLICY RECOMMENDATIONS

- Establish a centralized climate adaptation authority that aligns policies and adaptations with a Human Centered Design Approach.
- Expand Climate-Resilient Infrastructure through blended finance.
- Implement the Loss and Damage Fund at the national and provincial levels without bias.
- Women-led community disaster response units in flood-prone districts.
- Upgrade digital early-warning systems and ensure last-mile delivery through local bodies, mosques, radio, and SMS.
- Expand climate education in schools and technical institutes.
- Local-level climate data hubs supporting municipalities in risk-informed decisions.
- Enforce coastal setback zones and restore mangroves for nature-based resilience in the Indus Delta.
- Open-data portal for climate-related infrastructure and fund utilization.
- Urban climate-proofing: resilient drainage, heat-safe housing materials, and cool-roof mandates.

CONCLUSION

Pakistan's climate story is not just about rising temperatures or melting glaciers; it is about people trying to live, breathe, and earn a livelihood in changing conditions that they never created. From farmers watching their crops wither to families choking on smog in big cities, climate change is slowly tightening its grip on everyday life.
Bangladesh, an underdeveloped country wrestling with the same effects of climate and being on a relatively similar economic level, is still ahead in Climate adaptation readiness. For example, a study found that in Bangladesh, 71.8 % of low-income households reported awareness of climate change, and 61.1 % used early warning systems, compared with 58.5 % awareness and only 21.7 % use of early warnings in Pakistan.[17]

Similarly, Bangladesh has advanced its institutional capacity via its National Adaptation Plan and coastal resilience programs, positioning it ahead of Pakistan in integrating adaptation into development pathways. Meanwhile, Pakistan has established strong foundations (e.g., NAP framework) but continues to face significant governance, coordination, and financing gaps that hinder full implementation. The country has finally begun mapping a clear direction through its National Adaptation Plan, which recognizes that resilience must be built from the ground up in homes, in local governments, and in the environments we depend on.

But planning alone does not keep communities safe. The examples of Thar, Karachi, and the Indus Delta show how well-intended projects can go wrong when decisions ignore local needs or long-term consequences. When adaptation is rushed, poorly monitored, or driven by short-term economic gain, it ends up making people even more vulnerable, especially those already living on the margins.

16Ignored by Pakistan, the Indus delta is being lost to the sea | Dialogue Earth

17Climate Change Awareness and Adaptive Behavior in low-Income Communities: Comparative Analysis of Pakistan and Bangladesh | Physical Education, Health and Social Sciences

Pakistan doesn't need to reinvent the wheel; there is a lot to learn from neighbors like Bangladesh, where community awareness and preparedness have become essential tools for survival. What Pakistan needs most now is consistency: stronger coordination between institutions, steady climate finance that actually reaches the ground, and genuine involvement of the communities who know their vulnerabilities better than anyone.

Climate adaptation here is ultimately about dignity, the right to breathe clean air, to be safe from floods, and to have stable food and livelihoods. If Pakistan can shift from reacting to disasters toward preventing and preparing for them, its future doesn't have to be defined by vulnerability. Instead, it can be shaped by resilience, local wisdom, and the determination of its people to protect the land they call home.

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ROAD MAP FOR GILGIT BALTISTAN DISASTER RISK REDUCTION POLICY (GB-DRR POLICY)

Wajhullah Fahim

Gilgit Baltistan hosts more than 13,000 glacial peaks. These are the main water reservoirs for our agricultural, industrial, and household usage. The rapid rise in average temperature exponentially increases the melting of these water reservoirs. Over the last 80 years, the average temperature in this region has increased by 1.4°C, nearly twice the national rate of 0.7 °C.

Such a rapid increase in average temperature has intensified both the frequency and intensity of climate-induced disaster events, such as GLOF, flash floods, and Soil erosion. Following the guidelines of the Sendai Framework of Disaster Risk Reduction, Pakistan has decentralized its national disaster management authority. Under this reform, the government of Gilgit-Baltistan formed the "Gilgit-Baltistan Disaster Management Authority (GBDMA)" in 2017. Now this authority is responsible for policy formulation and managing disasters and their associated risks. However, GBDMA has failed to develop a comprehensive policy for disaster risk reduction (DRR) in Gilgit Baltistan.

Under the current circumstances and to build Gilgit Baltistan climate resilient, a comprehensive DRR policy has become a necessity of time. The policy at least consists of the following main pillars,

- Disaster Risk and Vulnerability Assessment
- Disaster Preparedness
- Community Engagement
- Early Warning System
- Institutional Coordination
- Financing
- Integration with Climate Change Adaptation (CCA)
- Inclusion of Gender and Vulnerable Groups

DISASTER RISK AND VULNERABILITY ASSESSMENT

Disaster risk and vulnerability assessment is an important pillar for DRR. It makes livelihoods, communities, and ecosystems resilient to disaster events. Activities such as multi-hazard vulnerability and risk assessment should be conducted up to the tehsil level across Gilgit-Baltistan. Such a step can be helpful in zoning and mapping of disaster-vulnerable regions, and thus, better planning and resources would be possible. Construction activities and land encroachment near the ancient water flow route emerged as the main reason for damage from the recent floods. Zoning and mapping will help in identifying such illegal activities, and disasters can be managed more effectively.

DISASTER PREPAREDNESS

In DRR, disaster preparedness consists of planning and implementation measures to improve community and governance capacity to anticipate, respond, and recover from disaster events. It ensures sufficient stocks of food and medicine, as well as 24/7 availability of rescue services. Different developmental measures, such as a functional early warning system, an emergency response plan according to the type of disaster events, and public awareness campaigns, are also components of disaster preparedness. Thus, effective disaster preparedness will not reduce the immediate impacts of a disaster, but can also help to make the community and ecosystem climate and disaster resilient in the long term.

COMMUNITY ENGAGEMENT

Gilgit Baltistan is a mountainous and geographically isolated region. In such a region, without direct engagement of the local community in the decision-making process, DRR-related initiatives cannot be equitable, locally driven, and capable of addressing the diverse vulnerabilities within society. The local community is well aware of indigenous and contextual knowledge about coping with disasters. Inclusion of their knowledge and feedback in policy-making ensures a sense of ownership, develops trust with government authorities, and promotes social cohesion. Furthermore, current implementing projects, such as GLOF-II, have failed to deliver desired outcomes due to the non-cooperative behavior of the local community. Under this project, early warning systems and community-based disaster risk management centers to be constructed in different valleys of Gilgit Baltistan. However, the majority of disaster-prone valleys in Gilgit Baltistan lack such a type of development. The main reason for this failure is the non-inclusion of the local community during the decision-making stage.

EARLY WARNING SYSTEM

In today's era early warning system (EWS) comprises technological and AI-powered sensors and gauges. In the case of Gilgit Baltistan, EWS needs to be equipped with the latest technology and also indigenous techniques. In the past, people predicted disaster events by identifying different signs. Sudden cloud formation, heavy rainfalls, specific roaring sounds, and unusual animal movement are common signs of disaster events[1]. Unfortunately, the current generation cannot recognize and identify these signs. Now the government needs to arrange human capacity sessions to familiarize the current generation with these signs.

INSTITUTIONAL COORDINATION

GBDMA has a prime responsibility to manage climate-induced disaster events. But, without horizontal and vertical coordination with other government departments, non-government agencies, and the local community, climate-induced disaster events cannot be managed. Both government and non-government agencies have different responsibilities in managing disaster events, as highlighted in Table 1.

The traditional way of information sharing (file sharing) and the top-down approach in governmental offices are the main factors in weak institutional coordination and collaboration in Gilgit Baltistan[2]. So, for effective management of extreme weather events, all governmental offices should be digitalized. In this way, information sharing will be possible without sludge. In addition, the digitalization of GBDMA can be helpful in information assimilation for the public.

1https://www.aljazeera.com/news/2025/10/13/how-indigenous-knowledge-is-aiding-pakistans-fight-against-climate-change
2https://thesis.pide.org.pk/thesis/evaluation-of-disaster-risk-management-a-case-study-of-gilgit-baltistan/

INTEGRATION WITH CLIMATE CHANGE ADAPTATION (CCA)

Without integrating DRR with CAA, the climate-induced vulnerability of the community and ecosystem is not possible. In PC-I environmental sustainability report is necessary to submit before mega development projects. But it is not implemented in the majority of cases. The GBDMA should be responsible for carrying out environmental sustainability and low-carbon development pathways, ensuring long-term climate security for the region. This activity should not be limited to development projects, but also to every construction activity across Gilgit Baltistan. By aligning DRR with CCA, it can also be a helpful tool to enable access to global climate finance in Pakistan and Gilgit-Baltistan.

FINANCING

Sustainable and efficient financing is an important pillar for DRR initiatives. It helps in investing in structural and non-structural measures. In the disaster-prone region of Gilgit Baltistan, sustainable financial resources are critical. There are numerous climate change and disaster financing avenues for Gilgit Baltistan. First of all, it should be compulsory to allocate 5-10% of every MPA's APD for developing disaster-resilient developmental schemes. The second way is to attract foreign financing. This region is producing power only from hydro. Since hydro energy is renewable energy, a carbon credit market can be established in Gilgit Baltistan. In this regard, more R&D is required. Another way is a Public-Private partnership. Many multinational organization and international development donors and organization, such as UNDP, WWF, and World Bank, show their interest in investing in disaster-resilient Gilgit Baltistan. So, the government should take the necessary steps to develop transparent and accountable financial management in Gilgit Baltistan.

INCLUSION OF GENDER AND VULNERABLE GROUPS

Due to its unique geography and high social disparities, women and disabled persons are highly vulnerable to extreme weather events. In the decision-making process, representatives from both women and special person should be part of the team. Awareness and capacity development sessions should be conducted in multiple formats, such as in local languages, visual, and audio formats. The safe shelters should be inclusive with separate sanitation facilities for males and females.

IMPLEMENTATION ROADMAP

Policy without an implementation roadmap cannot deliver its desired outcomes. Here, I have proposed three different implementation roadmaps for the GB-DRR policy in Gilgit Baltistan.

Table 1: Implementation of Roadmap for GB-DRR Policy

First: Short Term (1-2 years)			
Objectives	Key Actions	Departments	Expected Outcomes
Establishment of legal Framework	• Approval of GB-DRR policy from Assembly and Cabinet	GB- LPD, GB-HP, GBDMA	Legal framework and coordination mechanism are operational
Baseline Data of hazard mapping and zoning	• Conduct hazard, vulnerability, and risk assessment • GIS mapping	GBDMA, PMD, SUPARCO	Hazard and risk database established
Finance	• Allocation of ADP for CAA projects	GBDMA, GB-FD	5% of the ADP allocation
Second: Medium Term (3 years)			
Community-based DRR	• Establish DRR Committees in all tehsils. • Conduct awareness campaigns • Empower women-led DRR groups	GBDMA, GB-LG&RD, UNDP	Establish community DRR networks
Enhance preparedness and response	• Develop District Emergency Response Plans • Conduct biannual mock drills • Stockpiles of food, medicine, and emergency kits.	GBDMA, GB-HPD, Rescue-1122	Improved readiness and reduced disaster impacts.
Promote inclusive planning	• Ensure re-F presentation of women, elderly, and differently-abled persons in DRR activities. • Construct inclusive safe shelters.	GBDMA, GB-P&D, GB-ESWD, UNDP	Gender-sensitive DRR implementation.
Third: long-term (5 years)			
Promote Climate Resilient Development	• Enforce DRR-integrated building code • Anti-land encroachment operations • Strengthen flood protection works	GBDMA, GB-P&D, GB-WD, GB-LG&RD	Develop climate climate-resilient development framework
Sustainable financing mechanisms	• Develop Carbon market • Create GB Climate & DRR Fund.	GBDMA, GB-FD, UNDP, WD	Dedicated DRR financing system
Integrate DRR with CCA	• Development projects align with CCA/DRR goals.	GBDMA, GB-EPA,	Climate-resilient growth model for GB
Monitoring and Evaluation	• Publish annual reports.	GBDMA, Academia	

GBDMA= Gilgit Baltistan Disaster Management Authority,
GB-LPD= Gilgit Baltistan Law and Prosecution Department,
GB-HPD= Gilgit Baltistan Health and Population Welfare Department,
GB-HP= Gilgit Baltistan Home & Prisons Department
PMD= Pakistan Meteorological Department,
SUPARCO= Space & Upper Atmosphere Research Commission,
GB-FD= Gilgit Baltistan Finance Department,
GB-LG&RD= Gilgit Baltistan Local Government, Rural Development and Census Department,
UNDP= United Nations Development Programme,
GB-P&D= Gilgit Baltistan Planning and Development,
GB-F= Gilgit Baltistan Food Department,
GB-ESWD= Gilgit Baltistan Education, Social Welfare and Women Development,
GB-WD= Gilgit Baltistan Works Department,
WD= World Bank,
GB-EPA, = Gilgit Baltistan Environmental Protection Authority

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COP 30 AND PAKISTAN's CLIMATE DIPLOMACY STRATEGY

Anjeela Khurram

INTRODUCTION

Pakistan consistently ranks among the top ten countries on the Global Climate Risk Index (Eckstein et al., 2021). The high vulnerability (ND-GAIN score 0.515) and low readiness of Pakistan (ND-GAIN score 0.273) urge a great need for investment and a great urgency for action. Extreme floods, heatwaves, and droughts have caused frequent losses, threatening national stability and development. The need is to contextualize Pakistan's climate challenges within the global agenda to outline the justification for prioritizing climate resilience and to inform policy engagement at COP30.

The extreme weather conditions have threatened Pakistan's food security, economy and social stability (World Bank, 2022). The **national-level statistics** (Table 1) show Pakistan's climate-related damages and losses. **The climate change has caused the extreme monsoon rainfall, which as one report was ~21% above normal across Pakistan in August, 2022 . Due to flood, about** 892,075 hectares of cropland was potentially damaged , which would result in f**ood basket shock.**

Table 1: Losses from Natural Disasters in Pakistan

Events	Indicator	Figures
2025 Flash Flood[3]	Total Deaths	922
	Total Injuries	1,047
	Homes Damaged	7851
	Livestock Lost	6184
	Roads Damaged (km)	671.58
	Bridges Damaged	239
	Rescue Operations	4594
	People Rescued	2.414,129
	Relief Camps	1,631
	People Sheltered	93,886
	Medical Camps	704
	Patients Treated	224,870
2024 Heatwave[4]	Fatalities	568+
	Hospitalizations	7,900+
2022 Flood [5]	Population affected	33 million
	Damages	$14.9 billion
	Economic Losses	$15.2 billion
	Need for rehabilitation & reconstruction	$16.3 billion
	Housing	$ 5.6 billion
	Agriculture & Livestock	$ 3.7 billion
	Transport & Communications	$ 3.3 billion
	Fatalities	1730
	Health crisis Displaced people	8 million
	Loss in GDP of FY 2022	**2.2%**

3As on Sep 9, 2025 retrieved from https://www.ndma.gov.pk/sitrepm

4"PDMA Sindh: Situation Report for heatwave 2024 (as of 25 June 2024) - Pakistan". ReliefWeb. 26 June 2024. Retrieved 16 Sep, 2025

5https://pc.gov.pk/web/press/get_press/1264#:~:text=The%20Post%2DDisaster%20Needs%20Assessment,7%20million%20to%2014.6%20million.

CLIMATE FINANCE

To support developing countries financially to address climate impacts, the recent Conferences of the Parties (COPs) have made significant strides. At COP27, the Loss and Damage Fund has been established. Subsequently, at COP28 an agreement to create a funding mechanism for L&D has been made. The L&D funding mechanism has been finalized at COP29 (Figure 1). In this respect, the **New Collective Quantified Goal on Climate Finance** (NCQG) has been formally **agreed upon at COP29 to replace the** previous financial target under the Paris Agreement. The NCQG sets an **annual finance target of US $300 billion by 2035** for adaptation, mitigation, and resilient development in developing nations. An additional layer of up to US $1.3 trillion per year by 2035, primarily anticipated from private sources will support the most vulnerable countries.

Figure 1: Evolution of Loss & Damage Funds at COPs

The NCQG has not yet disbursed any funds, as the disbursement modalities and mechanisms are likely to be negotiated at **COP30. It is the peak time for Pakistan to present its case at COP30.** Pakistan's high vulnerability and low readiness raise the need to voice for climate justice embedded in equity and human rights. Pakistan is one of the least contributors of emissions, but still suffers the most. This makes Pakistan legitimate for Loss and Damage claims and concessional finance and grants. The Fund for Responding to Loss and Damage (FRLD) operationalized at COP28 offers an institutional forum for countries confronting climate-induced damage like Pakistan. The current flash flood statistics (Table 1) show that Pakistan has faced severe humanitarian and infrastructure losses and macroeconomic disruptions. This makes Pakistan's case urgent and entitled for the initiation of rapid-access windows under the FRLD to get finance for recovery and resilient rehabilitation. Pakistan should develop its negotiation capacity regarding Loss and Damage claims (Doelle, 2019). To serve this purpose, Pakistan should invest in legal and technical expertise to harness its negotiation capacities to build its case around climate justice. Given its climate vulnerability, framing negotiation capacity for **Loss and Damage (L&D) at COP30 (2025, Belém, Brazil)** is crucial for Pakistan. At national level, Pakistan Climate Change Act 2017 should be consistent with the global commitments such as the Paris Agreement (UNFCCC, 2015).

CLIMATE RESILIENCE AND FINANCE: EMPIRICAL EVIDENCE

To achieve climate resilience, Pakistan needs adaptation finance and mitigation plans (Khan et al., 2020). According to World Bank (2022), Pakistan's financing gap for adaptation is about $7–14 billion annually. In the face of its vulnerability to climate change impacts such as floods and droughts, Pakistan's need for climate finance is crucial to mobilize its limited resources for climate action. Pakistan's financial capacity for climate action is limited. In FY2024–25, only 7.7% of the Running of Civil Government (ROCG) and 15.3% of the Public Sector Development Programme (PSDP) have been allocated climate-sensitive initiatives (Dawn, 2024). Though in the fiscal framework, still this allocation is disproportionate keeping in view Pakistan's estimated investment need of $348 billion till 2030. Pakistan's limited financial capacity hinders its ability to implement large-scale climate initiatives, highlighting the urgency of securing climate finance at COP30. The existing financing mechanisms often fail to achieve the goals of adaptation, mitigation, and sustainable development of developing countries for many reasons. For instance, Pakistan has faced $30 billion economic losses and damages after 2022 floods, but international climate finance received has been in the form of loans not grants, exacerbating Pakistan's debt crisis. Another structural obstacle is the bureaucratic complexity of availing funds like the Green Climate Fund. This necessitates innovative approaches to channel resources effectively and equitably toward climate-resilient pathways. In case of Pakistan, green finance initiatives hold significant potential to drive investments in sustainable projects critical for Pakistan's transition to a low-carbon economy (Ullah & Ullah, 2024).

The total investment to tackle climate challenges till 2030, Pakistan needs around $348 billion; $196 billion (56%) for de-carbonization and $152 billion (44%) for adaptation and resilience. A shocking eight times gap of the average annual total climate finance needs for Pakistan until 2030

brings Pakistan at a disadvantageous position as compared to other countries (Table 2). Though Pakistan is the second highest deserving country for adaptation finance in terms of GDP per capita, yet receives lesser international public adaptation finance flows than many countries such as Bangladesh and Philippines with stronger GDP per capita profile (Akhtar & Khawaja, 2024). Pakistan is obviously underserved in terms of climate financing gap (Table 2). Besides, the gap for mitigation financing needs is five times as compared to adaptation financing needs at sixteen times (Akhtar & Khawaja, 2024).

Table 2: Country Peer Group Climate Finance Flows & Gap Comparison

	South Africa	Kenya	India	Pakistan	Indonesia	Nigeria
Absolute financing flows (US$ billion)	3	2	44	4	5	2
Flows per capita (US$)	56	46	32	17	17	9
Absolute financing flows gap (US$ billion)	17	7	170	34	27	20
Gap (expressed as multiple of flows)	5x	3x	4x	8x	6x	10x
Gap (expressed as % of GDP)	**5%**	**7%**	**6%**	**8%**	**3%**	**5%**

Source: Akhtar & Khawaja (2024) Note: Based on climate financing gap as per National NDCs and CPI country reports (2018–2021)

The point of contemplation is that how can Pakistan afford not to be proactive, when the estimated cost of climate inaction can hit $250 billion by 2030 and $1.2 trillion by 2050 (FCDO, 2024). The textile can face 250,000 jobs lost due to climate induced disasters, while 70% annual GDP loss in upstream cotton production and 35% loss in downstream in textile value chain by 2050 is estimated (FCDO, 2024). An up to 47% drop by 2050 in crops yields resulting in an annual 8% loss in agriculture crops GDP by 2030, and an 18% annual loss of livestock GDP by 2030 are estimated (FCDO, 2024). Approximately 90 million people by 2030 and 400 million people by 2050 across Pakistan would be displaced by floods and the cost of displacement would be $80 billion by 2050 (FCDO, 2024). This estimation will aggravate Pakistan's socio-economic fragility, showing that cost of inaction is more than cost of prevention.

Multilateral and bilateral climate funds play significant role in Pakistan to support climate resilient development trajectories. For instance, Green Climate Fund (GCF) has been financing 2 multi-countries ($300 million) and 8 direct country projects. GCF finances 25% of Pakistan projects of $1 billion value. The Karachi Green BRT with a project value of $583 million is the largest project where GCF is sharing 10% finance. Similarly, the Global Environment Fund (GEF) has been financing 12 projects in Pakistan with a grant value of approximately $37 million and a co-financing value of approximately $200 million. Though Pakistan has a substantial share in GCF and GEF, however, its per capita GCF financing is low than those of many countries such as Bangladesh, Kenya etc. and its GEF per capita financing is also very less i.e. $0.16 (Akhtar & Khawaja, 2024).

Pakistan's disadvantageous position shown in comparison with other countries necessitates the need to make its advocacy and policy stringent to get optimal share. In 2023 ADB's loan and grant amount to $1.6 billion for Pakistan in 2023. While in 2024, ADB has approved a $500 million policy-based loan to support climate change and disaster risk reduction and resilience in Pakistan (ADB, 2024). However, the international climate finance through multi-lateral agencies reduces ownership of recipient countries over climate financing.

Pakistan should prioritize its strategic areas to be well geared towards leveraging climate financing sources. To adopt ESG[7] standards and Zero Emissions[8], Pakistan can incentivize the investors and businesses. Given Pakistan's fastest solar adoption rate, it can attract technology transfer and financing. In 2024, the solar's share in Pakistan's power generation has been 14.3% as compared to those of China (8.4%) and India (7.4%)[9]. Pakistan needs to reap more from the low hanging strategies targeting climate financing. Rapid solarization in Pakistan is one of the strategic areas that can attract more funding. A drastic hike in electricity tariffs by 155% over the last few years has created a substantial shift towards off-grid solar solutions, notably in the residential sector. A 227%[10] YoY jump in solar panel imports (16GW) has been observed in FY24 from 4.9 GW in FY23. While, during the first nine months of FY25, net metering capacity has reached 4.9 GW[11], indicating a

7ESG standards and ethical practices in terms of Environment, Social and Governance.
8Zero Emissions means production of no harmful greenhouse gases (GHGs) or pollutants into the atmosphere.
9https://www.reuters.com/business/energy/pakistans-solar-revolution-leaves-its-middle-class-behind-2025-04-29/
10Renewables First & Herald Analytics, "The Great Solar Rush in Pakistan", 2024, www.renewablesfirst.org
11Renewables First, "Pakistan Electricity Review", 2025, https://renewables-first.org/

significant spike in this transition. These figures show that the fast rate of solarization in Pakistan is an emblem of energy transition and if fully-utilized can create global carbon market opportunities.

To achieve the targets of climate resilience in Pakistan, indigenous solutions can be integrated into national adaptation strategies. For instance, National Adaptation Plan (NAP) (2023–2030) underscores the significance of developing climate-smart irrigation, strengthening agroforestry, empowering rainwater management, and conserving plant genetics in vulnerable regions (Dawn, 2023). To achieve this purpose, the state has taken concrete initiatives such as the GLOF-II Project, supported by $36.96 million from the Green Climate Fund aims to install early-warning systems, stabilize slopes to establish safe havens across 24 valleys and rehabilitate irrigation schemes to benefit around 700,000 people (Dawn, 2025). Besides, the Public Sector Development Program (PSDP) has earmarked 20% (≈ Rs 925 billion) of new schemes in FY 2023–24 as "green", to ensure systemic resilience investments estimated at US $348 billion through 2030 (Planning Commission, 2023). Similarly, it is commendable that for food security, climate-smart agriculture can be scaled up and indigenous knowledge can be harnessed (FAO, 2021). These initiatives can substantiate the argument that embedding indigenous and locally tailored adaptation solutions into national strategies can help achieve Pakistan's resilience targets.

CONCLUSION

This study makes Pakistan a strong case for climate financing to transform vulnerabilities into opportunities. Now is the time to shift Pakistan from a victim narrative to strategic engagement to position the country on the road to achieve sustainable climate adaptation. For this, the need is to identify the priorities areas Pakistan needs to target strategically to be a leader in climate resilience. The priority areas such as renewable energy expansion, climate-resilient agriculture, water management, and urban resilience should be focused to get a transformational impact.

At COP30, climate finance stands as the core agenda, with Pakistan's case underscoring the need for accessible and accountable mechanisms. However, persistent regulatory gaps, limited financial capacities, and lack of expertise continue to restrict the deployment of green and innovative finance. Although recent COPs have advanced funding instruments, financial targets, and frameworks for adaptation and carbon markets, significant challenges remain in translating these commitments into practice. As the way forward, Pakistan should strategically reposition itself as a leader in climate resilience rather than a passive recipient of aid. To get this end, Pakistan should strategically frame its COP30 agenda around these pillars. Pakistan should strengthen its negotiation capacity to secure just access to Loss and Damage funding. To achieve this purpose, Pakistan should ensure effective use of climate funds and build its institutional readiness through transparent governance and regulatory reforms. Besides, Pakistan should mobilize blended finance and technology partnerships to scale renewable energy and resilience-building projects. For Pakistan, the trajectory to climate-resilient development depends on bridging financial gaps and strengthening collaboration at both national and international levels. COP30 provides Pakistan a decisive arena to manifest its climate diplomacy that aims to position Pakistan as a policy leader driving equitable, innovative, and scalable climate finance solutions.

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TOURISM IN A WARMING WORLD

Marzia and Ajmal Kakar

In 2024, tourism accounted for 10 percent of the global economy, contributing US$10.9 trillion to global GDP. The sector supported 357 million jobs worldwide, approximately one in every ten jobs, highlighting its central role in the labor market. International visitor spending also surged, reaching US$1.9 trillion (WBG, 2025). As one of the world's largest socio-economic sectors, global tourism operates through multiple interconnected components, coastal tourism, mountain and winter tourism, nature- and wildlife-based tourism, cultural and heritage tourism, and urban leisure travel, each of which relies on climatic stability, healthy ecosystems, reliable seasons, and predictable environmental conditions. This structural dependence makes tourism profoundly vulnerable to climate variability, positioning climate change as both a disruptor and a determinant of its future trajectory.

Across all major tourism components, climate change is already altering destination appeal and operational viability. Rising temperatures reduce thermal comfort in traditional summer hotspots; extreme weather events disrupt accessibility and destroy infrastructure; sea-level rise threatens beaches and coastal ecosystems; glacial melt destabilizes mountain tourism; and biodiversity loss undermines eco-tourism markets. These pressures are compounded by shifting traveler preferences, where risk perception, weather uncertainty, and ecological degradation influence mobility decisions. As a result, climate change is no longer a future threat but an active force reshaping tourism flows, revenue patterns, seasonality, and long-term competitiveness.

Each major component of global tourism is experiencing distinct technical impacts driven by climate change. Coastal tourism, which hosts nearly 80% of global tourist activity, faces beach erosion, coral bleaching, saltwater intrusion, and rising storm surges; destinations like the Maldives, Seychelles, Miami, and Bangkok now spend billions on adaptation (IPCC, 2022). Mountain and winter tourism is destabilized by glacier retreat, reduced snow reliability, and increased risk of avalanches and glacial lake outburst floods (GLOFs), leading to shortened ski seasons in the Alps, Himalayas, and Rockies. Nature-based tourism, valued at USD 600 billion annually, is declining due to ecosystem collapse—coral bleaching in the Great Barrier Reef (Hughes et al., 2021), wildlife loss in East Africa (Gössling et al., 2021), and rapid Arctic ice melt that shortens safe travel windows (AMAP, 2021). Cultural and heritage tourism is threatened by climate-induced degradation of iconic sites like Venice, Mohenjo Daro, Machu Picchu, and the Pyramids of Giza, where flooding, erosion, and heat stress erode both cultural assets and local economies. Urban tourism, meanwhile, faces growing operational risks from heatwaves, air pollution, and extreme rainfall—forcing cities to reconsider infrastructure resilience and visitor safety.

The cumulative impact of these transformations is staggering: climate change is projected to reduce global tourism revenues by up to USD 4 trillion by 2050, with Mediterranean arrivals alone expected to decline by 10–30%, and small island economies facing GDP contractions exceeding 15% during major climate shocks (Scott & Gössling, 2022; OECD, 2023). Tourism-dependent communities, especially in developing regions, remain at the frontline of cascading socio-economic vulnerabilities, job losses, income instability, damaged heritage sites, and disrupted local markets.

These global transformations take on even sharper edges in South Asia, one of the world's most climate-vulnerable yet tourism-rich regions. The subcontinent's tourism economy, stretching from the Himalayan icefields of Nepal and Pakistan to the coral atolls of the Maldives and Sri Lanka's monsoon-sculpted coasts, thrives on landscapes that are now being reshaped at unprecedented speed. In many ways, South Asia mirrors global climate-tourism disruptions, but with amplified exposure: denser populations, weaker infrastructure, limited adaptive capacity, and ecosystems already stressed by overuse. As climate shocks intensify, they intersect with complex social and economic systems, creating deeper fault lines for tourism that depend heavily on natural beauty, cultural continuity, and environmental predictability.

Rising sea levels and stronger cyclones pose a threat to important tourism resources in coastal South Asia. Coral bleaching, shoreline erosion, and saline intrusion lower beach quality and jeopardize resort infrastructure, posing existential threats to the Maldives, a nation where tourism generates nearly 30% of GDP. Extreme rainfall and coastal flooding are just two examples of the frequent climate disruptions that have crippled tourism operations and increased insurance premiums in Sri Lanka, whose post-conflict economic recovery was largely dependent on coastal tourism. Similar beach loss and storm-related damage are plaguing India's vast tourism belt along Goa, Kerala, Odisha, and the Bay of Bengal, necessitating costlier protective measures. These pressures are a reflection of both the ecological fragility and the economic interdependence of coastal communities and tourism.

The Himalayas, which are shared by India, Nepal, Bhutan, and Pakistan, have seen the most significant changes brought about by climate change. Here, livelihoods and landscapes are being altered by melting glaciers. The Himalayan glaciers are retreating at one of the fastest rates in the world, which has shortened winter travel seasons, caused slope instability, and increased the frequency of floods caused by glacial lake outbursts. At altitudes where cold once predominated, Nepal's trekking routes face increased landslides, erratic weather windows, and heat stress. Bhutan's "high value, low impact" controlled tourism model is currently struggling to protect mountain trails and historic monasteries from erosion and unpredictable rainfall. Unprecedented heatwaves, water scarcity, and landslides are plaguing India's hill stations, from Shimla to Ladakh, discouraging tourists and taxing aging infrastructure.

It is within this broader regional crisis that Pakistan's tourism landscape finds itself undergoing profound change. Pakistan's northern areas: Gilgit-Baltistan, Chitral, Hunza, Swat, and the Kaghan and Naran valleys, have long been celebrated for their alpine coolness, glacier-carved valleys, and culturally rich mountain communities. But these same features make them acutely vulnerable to climate volatility. Home to more than 7,000 glaciers (the world's largest concentration outside the Arctic and Antarctic), Pakistan's mountains are warming faster than the global average. Rapid glacier melt has led to the formation of over 3,000 glacial lakes, at least 36 of which are classified as dangerous due to the risk of sudden outburst floods. These events threaten roads, bridges, hotels, markets, and entire villages, shattering the backbone of local tourism economies.

In 2025, flash floods near Babusar Pass stranded hundreds of travelers as roads were washed out, disrupting peak-season tourism overnight. Landslides triggered by heat-induced glacier melt have repeatedly blocked the Karakoram Highway, Pakistan's crown jewel of tourism connectivity, leaving tourists stuck for days and causing significant financial losses for local businesses. In Gilgit-Baltistan, tourism authorities reported steep declines in arrivals during consecutive years of extreme weather, eroding incomes for tour operators, porters, drivers, and hospitality workers who rely heavily on the summer season.

Climate impacts in Pakistan extend beyond the mountains. Along the Makran and Karachi coasts, rising sea levels and cyclonic storms increasingly threaten beaches and recreational infrastructure. Urban tourism, particularly in Lahore, Karachi, and Islamabad, is disrupted by severe heatwaves, smog

episodes, and urban flooding that turn peak travel periods into hazardous intervals. Cultural and archaeological sites, from Mohenjo Daro to Taxila, face moisture damage, erosion, and heat-related degradation, complicating conservation efforts and reducing visitor appeal.

What makes Pakistan's climate-tourism nexus particularly complex is the interplay between environmental degradation, infrastructure gaps, and governance limitations. Many tourist hotspots lack resilient construction standards, climate-informed land-use planning, or disaster response systems capable of protecting visitors. Roads are often built without geotechnical climate assessments; riverbank hotels sit at the edge of flood-prone areas; early warning systems are patchy; and local governments struggle to regulate unsafe construction or illegal encroachments. These vulnerabilities magnify the economic impact of each climate event and extend recovery times, undermining investor confidence in the tourism sector.

However, the difficulties also offer a chance to reevaluate Pakistan's tourism strategy. Pakistan can chart a more resilient course by aligning with South Asian adaptation strategies and global best practices. This entails expanding cultural tourism, encouraging community-based ecotourism, investing in wellness and spiritual tourism, and creating year-round attractions that lessen the strain on climate-exposed seasons in order to diversify tourism offerings beyond climate-sensitive activities. By implementing climate-informed zoning, enforcing building codes, investing in early warning systems, and managing waste sustainably, stronger governance can safeguard tourists and communities while increasing trust in Pakistan as a secure and dependable travel destination.

Additionally, South Asian regional cooperation can promote shared resilience. Pakistan can adopt tested models more quickly if it engages in cross-border knowledge exchange on Himalayan risk management, coastal adaptation, and sustainable tourism, especially with Nepal, Bhutan, India, Sri Lanka, and the Maldives. The transition to a more adaptable and regenerative tourism industry can be further supported by collaborating with development partners on climate finance, training, and research.

The geography, seasonality, and viability of tourism are all being redefined by climate change worldwide, but nowhere more so than in South Asia and Pakistan. The next phase of tourism will depend on reimagining change rather than fighting it as melting glaciers and disappearing coasts alter the landscape. Pakistan's challenge and its opportunity lies in leveraging this moment to build a sector that is not only economically vibrant but environmentally and socially resilient, guided by long-term vision rather than short-term gains. In this new climate reality, the future of tourism will belong to those destinations that protect their ecosystems, empower their communities, and adapt with foresight and courage.

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IS WATER POVERTY THE NEXT BIG THREAT TO URBAN STABILITY?

Muhammad Hassam Shahid

Water poverty has emerged as a severe challenge for Pakistan's metropolitan specifically Islamabad, Lahore, Karachi, and Rawalpindi. Urban water poverty can be defined as having not access to safe, dependable, and affordable water, and numerous evidence indicates that water poverty is increasing in these cities not only due to physical absence but also due to under pricing, poor governance, and inadequate urban planning. The signs of this devastating crisis are visible: women waiting in a queue's long hours for water tankers in Karachi, Rawalpindi residents drilling more deeper every year in search of groundwater and expanding housing projects in Lahore without hydrological assessment[1]. These trends show an imbalance between the increasing water demand and supply, with adverse consequences that will reflects in productivity, social, and health.

Water scarcity trends in Pakistan shows the emergency of this hidden challenge.

Pakistan has seen a decline in per capita water availability from 5260 m^3 in 1950 to merely 860 m^3 in 2023, placing the Pakistan in the water scare country[2]. The world resource institute ranked Pakistan amongst 17 countries listed in the category of suffering from Extremely High baseline water stress country in 2023[3]. Almost 90% of the freshwater is consumed by the Indus Basin Irrigation System, leaving less than 10% of the supplies for the cities[4].

1Mahmood, M. U., Abbas, S., Usman, M., Qureshi, J., & Masood, A. Spatio-Temporal Dynamics of Ground Water Level of Lahore Metropolitan and its Relationship with Urbanization and Rainfall.
2Afzal, M., Begum, I., Batool, H., Gulzar, S., & Nawaz, B. (2024). Water scarcity in Pakistan: Implications to regional security and peace. Pakistan Economic Review, 7(1), 104–147.
3World Resource Institute. 25 Countries, Housing One-Quarter of the Population, Face Extremely High-Water Stress, 2023.
4World Bank. Pakistan: Getting More from Water, 2019.

At the same time, increasing population also intensifying the Pakistan's water demand: Urban Population in Pakistan has increased to 83 million in 2023, and it is expected to increase to 110 million by 2035[5]. This speedy increase in population has outpaced the water utilities capacities which was designed decades ago.

Karachi offers a stark illustration of this widening supply–demand imbalance. Karachi's daily water demand has reached to almost 1200 million gallons per day (MGD), whereas the Karachi Water and Sewerage Corporation supplies only 580 MGD[6]. Almost half of the Karachi's population lives in informal settlement where Corporation supplies does not reach, leaving residents to depend on the tankers charging high rates Rs. 5000 to Rs. 7000 per tanker in summer[7]. WASA, Lahore is responsible to provide water in Lahore, and its supply heavily depends on groundwater. Almost 1.4 million m^3 groundwater is extracted in Lahore daily by WASA, reasoning to groundwater declines of almost I metre annually[8]. In neighbourhood, such as Ichra, Misri Shah, Gulberg, Mustafa Abad, Shimla Hill, Mozang and Ravi Road groundwater has been decreased to more than 200 feet, increasing the extraction cost. Despite having access to surface water such as Simly Dam, Khanpur Dam and Rawal Sam, both Islamabad and Rawalpindi face severe water scarcity for 2-4 month due to rapid increase in urbanization[9].

Above mentioned challenges showing that Pakistan's urban water scarcity is physical as much as institutional. Main distortion lies in the pricing. Water providing agencies usually charges Rs. 300-600 as water tariffs, without considering the household size[10]. Such under pricing leaves no incentives for households to conserve and prevents the water providing agencies to cover their expenses. In results, most WASAs recover only two-third of their operational expenses[11], resulting interrupted water supply. Non-revenue water (NRW) includes the leakages, theft and unmetered connection, is another issue attached with other issue, and its range is almost 40% which is above the benchmark[12] .

Groundwater is considered as the lifeline of metropolitans and is facing severe scarcity. Currently, in Pakistan more than 1.25 million tube wells are operating privately and without any rules and monitoring[13]. Almost 594 tubewells are operated by the WASA alone in Lahore which leads to the depletion as well as increase in contaminations[14]. Same trends have been observed in Rawalpindi and Islamabad where unregulated societies drilling deeper to extract the diminishing water.

Water poverty has a dual consequence both social as well as economic. Residents of informal settlements in Karachi pay almost 10% of their income to the tankers[15], an additional burden that aggravating the inequality. Small business such as car washes, and laundries facing disruptions due to the limited water supply, putting a limit on earnings. Rawalpindi's Property without reliable water sources has seen a decline in property values, whereas water secure areas see appreciation.

Health outcomes in Pakistan also showing the severity of the water crisis. Almost 40% of hospital beds are filled with the waterborne disease patients[16]. Waterborne disease leas to the repeated infections among urban children, trapped into the vicious cycle of malnutrition and impaired cognitive development. In informal and low-income settlements, women also face a water scarcity burden and spends almost 1-2 hours in collecting the clean water which reduces time for other activities such as education and economic opportunities[17].

5Asian Development Bank. (2024). Pakistan national urban assessment: Pivoting toward sustainable urbanization.
6Karachi Water & Sewerage Corporation (KWSC). Operational Data, 2023.
7Urban Resource Center. Why Karachi Thirst for Water, 2025.
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17UN Women. National Report on the Status of Women in Pakistan, 2023.

The stability of urban is at increasing risks. Water scarcity in Karachi and Hyderabad have instigated the protest, which are linked to distributional inequalities. The increasing water tanker market is clearly a sign of Institutional failures, which increase the tension among society[18]. Water scarce metropolitan Pakistan is at risk of growing instability without structural reforms.

Institutions need to move towards the coherent reforms agenda to achieve the long-term solutions, several examples from Singapore and Phnom Penh shows that water governance depends on the pricing, infrastructure investment, digitalization, and urban planning. Metropolitan cities share common structural constraints and that can be solves through evidence-based reforms.

Considering these patterns indicates a water system that is continuously failing due to the institutional weaknesses, urbanization, and lack of investment. The cost associated with these fragmentations are alarming: health burden, dependence on tanker mafia, and inequality. If water scarcity in Pakistan is considered as a seasonal emergency instead of governance issue, instability in metropolitan will be inevitable. To avoid this scarcity, the focus must shift from usual steps to rational pricing, and efficient governance. Pathways given below outline the necessary reforms that are necessary to place water system on a sustainable path.

REFORMS PATHWAYS

Water pricing must shift from fixed charges to Increasing Block Tariff (IBT) structure that recovers not only the operational expenses but also exhibit the consumption levels and promote the conservation. Under-pricing has incapacitated the financial system of water providing agencies, and IBT can create a fiscal space for upgradation.

GID-based groundwater monitoring system can detect the groundwater extraction trends, and can identify the dry zones, to enforce the limits on the drilling. Without GIS-based mechanism, metropolitan in Pakistan will continue to witness devastating depletion of groundwater.

Non-Revenue is a critical issue and reducing it can be a critical reform. Leakage detection, replacement of old rusted pipes, and digital metering can lower the NRW level, which is already surpassed the benchmark.

Groundwater recharge investment must be on the priority list. Rooftop rainwater harvesting and recharge wells construction can significantly slow the groundwater depletion. These steps are proven effective in Jordan and Spain and offers a cheap solution for Pakistan.

Engaging educational institutes such as schools and universities can foster a behavioural change and can create a culture of conservation. Awareness campaigns can shift the public towards wiser use.

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18Human Rights Commission of Pakistan (HRCP). Mapping Social Movements in Pakistan Report, 2021

AUGMENTING COST OF CLIMATE INACTION

Wajid Islam & Junaid Ahmed

Newton's third law reminds us that "every action has a reaction, nature is no exception to the law. Nature has its own way of reminding us that every action has a cost. The recent floods in Pakistan were one such reminder, swift, unforgiving and far beyond our preparedness to handle. This was not simply a weather event. It exposed the deep vulnerabilities, which is created over the years of careless planning, environmental neglect and unchecked expansion. Whole villages were uprooted in a matter of seconds and livelihoods disappeared with the rising water. Millions of people have been affected while thousands of homes were converted into ruins. Critical infrastructure like roads and bridges were washed away. The message is clear that when we disturb the balance of nature, it returns the impact with greater force. The table below show the damages caused by the recent floods.

Table: Flood Damages and Losses in Pakistan (2025)

Category / Sector	Indicator	Impact / Damage	Est Financial Loss (Rs. Billion)	Source
Human Loss	Lives lost	1,039+	–	NDMA, 2025
	People displaced	4.0 million+	–	NDMA, 2025
Housing	Houses damaged/destroyed	229,763 (92% in Punjab)	92	PDMA Reports
Agriculture	Crop, livestock, fisheries, forestry	Extensive crop and livestock loss	430	PDMA, SUPARCO
Infrastructure (Transport)	Roads & bridges destroyed	2,811 km roads, 790 bridges	206	NDMA, MoC
Power Sector	Transmission lines, transformers, poles	Widespread service disruption	25	Power Division
Health Sector	Health facilities damaged	243 units	2.0	NDMA
Education	Educational institutions damaged	2,267 schools/colleges	5.0	NDMA
Industry & Commerce	SME & large-scale industries	Partial production & export loss	30–35 (est.)	MoI & PIDE analysis
Social Infrastructure	Public buildings, WASH, heritage	Partial damage in all provinces	32.1	PDMA & NH&C Div.
Total Estimated Damage	–	–	822 (≈ USD 2.9 billion)	MoPD&SI, 2025
GDP Impact (FY2026)	Growth reduction	From 4.2% → 3.5–3.9%	–	MoPD&SI estimates
Employment Impact	Additional unemployment	0.22 million workers	–	MoPD&SI estimates

Source: Author Formation from various sources

In the northern regions of Khyber Pakhtunkhwa, Malakand division, huge rocks have rolled down and wiped out entire villages as a result of cloud bursts. It was not mere a chance, rather it was a consequence of our own choices. The same mountains that turned out to be a sign of fear for the locals once stood as a sign of beauty and glory. It was covered with thick pine and walnut forests; however, humans have deprived its natural beauty and made it bare, stripped of their roots. The mountains are reduced to stones and patches of grass. Being a beautiful valley, rainfalls and cloudbursts are not new to it. Nevertheless, human interventions have perturbed the whole ecosystem. The mountains where trees once held the soil firm are now witnessing emptiness and a widespread human population. Ultimately, the nature strikes back through flash flood and made the area uninhabitable for the coming few decades, to reclaim its territory.

The nature shows no restrain of taking back what belongs to it. In major cities, residential societies have been built on the dry beds of rivers, resultantly every monsoon, nature reminds us of our arrogance. The same story unfolds in Swat, where people encroach upon the river's path each year. Locals say that if a river stone appears in your field, it is the "egg" of the river, and one day, whether in ten years or a hundred, the river will come to claim it. That old wisdom carries a warning we have long stopped listening to, nature never forgets its territory.

Our ancestor's knowledge was far better than ours, to live in harmony with the land. They understood the logic of the hills, where water flows, where wind settles, and where a home should or should not be built. The older generations knew how to live with the land. Today, we build wherever our greed allows, guided by cement rather than sense. The hills that once echoed with folk wisdom now resound with construction noise. We call it progress, but it's just ignorance in a modern form.

Pakistan's problem is not only climate change; it is the priority of choosing to ignore planning altogether for it. Cities are expanding without any understanding of geography or ecology. Houses sprawl across fragile plains, riverbeds, and flood zones. No one is heeding to the indigenous knowledge that once kept communities safe from disaster, even there is no planning from government.

Many countries have entire cities located along rivers and coastlines, but their infrastructure is resilient, adaptive, and in harmony with the environment. They don't fight against nature; instead, they learn from it. The tragedy in Pakistan lies in doing the opposite, rivers' beds, forests, and hills are converted into residential societies, and then we wonder why floods sweep away our homes and fields.

The North–South climate debate is not without merit. It is a fact that Pakistan contributes a little to the global greenhouse gas emissions. Still, the country ranks among the vulnerable and affected by climate change. For instance, in 2010 flood, the country lost 2.4 million hectares of unharvested crops. Similarly, in the floods of 2022, UNDP estimated that 33 million people were directly affected with 1730 fatalities and a loss and damage of $30 billion, apart from $16.3 billion for reconstruction and rehabilitation. Now, in 2025, the country again incurred heavy losses.

Still, unfairness in the global climate narrative does not exempt us from our responsibilities. We may not have caused the storm, but we have stripped away the trees that could have softened its blow. Pakistan may not control global emissions, but some things are in our control. We have control over deforestation, construction on waterways, and respecting the natural course of rivers. These basic things do not require any international funding or complex interventions. These are steps in our own hands. If we continue to ignore them, then we alone will bear the cost of our negligence.

Nature is not cruel, it follows a strict balance. When it is disturbed, nature restores itself with any cost. The floods, landslides, and heatwaves are not random acts of fate but the consequences of decades of neglect and exploitation. The vengeance of climate change is not just in rising waters; it is in the silence of the forests we cut, the rivers that return for their land, and the mountains that crumble under our carelessness. The land once looked after us is no reminding us of the bargain we broke.

If we do not give proper attention to the issue of climate, Pakistan will bear more losses in the coming years. The below graph shows the future projection that how climate can induce losses in the coming years till 2030. In the baseline scenario the country can anchor $20 to $22b, in moderate case the losses can be $27 to $30b, while in extreme case the losses can reach to $35b to $40b.

Source: Author formation

The nature reclaims what we are neglecting but still it offers us a chance to rethink and rebuild. The recent floods are not just a disaster, it is a call for policy action and environmental responsibility. Firstly, there is need of integrating nature into the development planning. No project should be carried out without the prior permission of the relevant authorities. Secondly, climate resilient infrastructure should be promoted in the flood prone areas. Thirdly, it is the need of hour to strengthen early warning and disaster preparedness, which the country currently lacks.

Also, it is important to revive the indigenous and local knowledge to mitigate the losses and promote sustainability because local problems need local solution. Besides, reforestation and preserving natural ecosystem should be made a national security priority, it can solve many of the problems of the country. Lastly, sustainable planning should be carried out to lessen the impact of the repeated disasters and coordination between different departments should be enhanced.

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PAKISTAN's ENVIRONMENTAL PATHWAYS: INSIGHTS AND SOLUTIONS FROM PIDE's RESEARCH

Muhammad Faisal Ali

Pakistan is facing an environmental emergency, with severe challenges that demand immediate and comprehensive action. The nation is struggling with numerous environmental issues, including air pollution, deforestation, waste management, water scarcity, and water quality. Among the most alarming concerns is the urban smog, which has reached critical levels. Five of Pakistan's major cities now rank among the top 20 globally for poor air quality, posing serious health risks. This is why Pakistan's environmental performance is not good on international indices. According to the 2024 Environmental Performance Index, Pakistan is ranked 179 out of 180 countries.[1]

Key contributors to this environmental deterioration include emissions-intensive energy production, rapid and unplanned urbanization, high consumption of low-quality fuel, and the large number of two-stroke vehicles, which contribute to smog and the significant reduction in tree cover, particularly in urban areas. Pakistan's forest area (currently around 4.9 percent) continues to shrink, further exacerbating the problem. Moreover, our behaviors are not environment friendly due to the absence of strict regulation, where regulation exists there it is compromised. Despite the country's contribution to global emissions remaining below 1 percent, both its overall and per capita emissions have been on a steady rise since 1998. This, coupled with increasing temperatures and worsening climate conditions, puts Pakistan at the forefront of climate-related risks, particularly for its most vulnerable communities.

1https://epi.yale.edu/

The mounting environmental threats highlight the need for a coordinated policy response to mitigate the damage and build resilience against future impacts. Immediate action is required to address the root causes, including inefficient resource management and governance challenges, which are intensifying the country's environmental vulnerabilities. Pakistan must focus on reducing emissions, halting deforestation, and improving air quality through sustainable urban planning and reforms, reducing no. of fuel run vehicles, transitioning towards clean energy.

At the forefront of this advocacy is the Pakistan Institute of Development Economics (PIDE), which has been pushing for sustainable environmental policies. Through a series of webinars, reports, knowledge briefs, articles, and policy briefs, PIDE has consistently provided practical solutions to tackle issues such as air pollution, especially smog, climate change, and deforestation. Over the years, PIDE has built a comprehensive narrative on the country's environmental challenges, offering expert-driven insights into how Pakistan can move towards a more sustainable future.

PIDE stresses the importance of comprehensive policy reforms, regional cooperation, and the adoption of sustainable practices. The country is particularly vulnerable to climate change-related risks such as glacial melt and rising temperatures, making it crucial for policymakers to act now.

In addition to addressing governance inefficiencies, Pakistan must work towards regional cooperation on environmental issues, particularly in dealing with transboundary pollution. Sustainable practices, resource conservation, and long-term planning are essential to prevent further environmental degradation and to protect future generations from the looming threats of climate change.

The key recommendations from PIDE's environmental advocacy focus on:

Plummeting Smog, particularly in big urban centers, should be the top priority. While policy responses have been introduced, such as transitioning to cleaner fuel and promoting electric vehicles, broader systemic changes are needed. Farmers are not the primary contributors to smog, but emissions from crop residue burning can be greatly reduced with a relatively small reallocation of financial resources, especially compared to large-scale infrastructure projects like building flyovers. Redirecting funds to provide or facilitate technological solutions for farmers could have a significant impact. Additionally, addressing this issue requires regional cooperation, particularly with neighboring countries like India, to effectively manage transboundary pollution.[2,3,4 &5]

PIDE calls for enhanced public transport infrastructure and policies, such as higher car parking fees, to encourage a shift from private cars to public transport, which can lead to lower emissions and reduced air pollution in urban areas[6].

A transition to Electronic Voting Systems is strongly advocated to reduce both economic and environmental costs, citing the potential for reduced deforestation alongside more streamlined election processes.[7&8]

Climate change, inefficient agricultural practices, and poor water governance drive Pakistan's water scarcity crisis. It calls for reforms such as improving water governance, economic water pricing[9], and the application of efficient irrigation technologies at a larger scale, and infrastructure investment to ensure long-term water security.[10]

A green finance ecosystem aligned with sustainable development goals is also stressed. The intersection of Islamic finance with green finance, proposing instruments like Green Sukuk to fund sustainable development initiatives. This approach aligns environmental responsibility with Islamic principles.[11]

2https://pide.org.pk/research/smog-the-fifth-season-in-pakistan/
3https://pide.org.pk/research/farmers-not-the-principal-culprits/
4https://pide.org.pk/research/farmers-are-not-the-main-culprits-of-smog/
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A comprehensive approach to e-waste management, integrating policy reforms, public education, and international collaboration, is necessary to mitigate the harmful effects of e-waste on both human health and the environment in Pakistan.[12]

Tourism in Gilgit-Baltistan (GB) contributes to the economy but has led to environmental degradation and socio-cultural disruptions. Promoting ecotourism, better regulations, and more community involvement to mitigate the negative impacts of tourism is advocated.[13]

Extreme climate vulnerability is also exposed in Pakistan due to recurring and devastating floods, causing massive economic and social losses. For disaster management, hard infrastructural solutions are both costly and time-consuming, so climate risk insurance offers an immediate and scalable solution. Despite rising demand for climate risk insurance, weak supply, low awareness, affordability issues, and institutional gaps hinder the progress, requiring government-backed subsidies, stronger regulation, and public-private partnership.[14]

GB, with more than 7000 glaciers is key source of water for Pakistan but these glaciers are rapidly melting due to climate change which consequently intensify floods, landslides, and GLOFs. Traditional post-disaster aid is insufficient. Disaster insurance supported by public private partnerships and international climate finance, offers a sustainable path to financial resilience. Demand exist in GB too, but supply side is almost non-existent, require urgent attention.[15]

Though GB disaster management authority exist and provide urgent reponse in case of disasters but due to limited resources both technical and financial, outdated systems and bureaucratic delays undermine the disaster response. Urgent institutional reforms, modern equipment, trained technical staff, better and advanced early warning system and participatory risk governance are essential for climate resilence.[16]

Wealthy nations must finance low cost mitigation in low middle income countries through carbon markets and technology transfer. Cost effective projects in forests, energy, and industry can deliver global climate gains with local development benefits.[17] Pakistan can harness carbon credit markets by expanding renewable energy especially solar power. With vast solar potential and growing net metering, current avoided emissions could generate USD 21 to 43 million annually.

Therefore, by strengthening verification systems, grid integration and policy frameworks can turn clean energy into both solution for climate change and a sustainable revenue stream.[18]

The integration of indigenous knowledge with enhanced public engagement is emphasized in environmental solutions, urging policy reforms to ensure sustainable development in Pakistan. Ultimately, the future of Pakistan's environment will depend on a coordinated effort that involves government institutions, the private sector, and civil society working together to create a resilient and sustainable nation.

Dr. Muhammad Faisal Ali is a Research Fellow at the Pakistan Institute of Development Economics. He has years of experience in the field of research and policy analysis, with his work focusing on climate change adaptation, disaster risk management, and agricultural and environmental economics.

12https://pide.org.pk/research/analyzing-the-effects-of-e-waste-on-human-health-and-environment-a-study-of-pakistan/
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